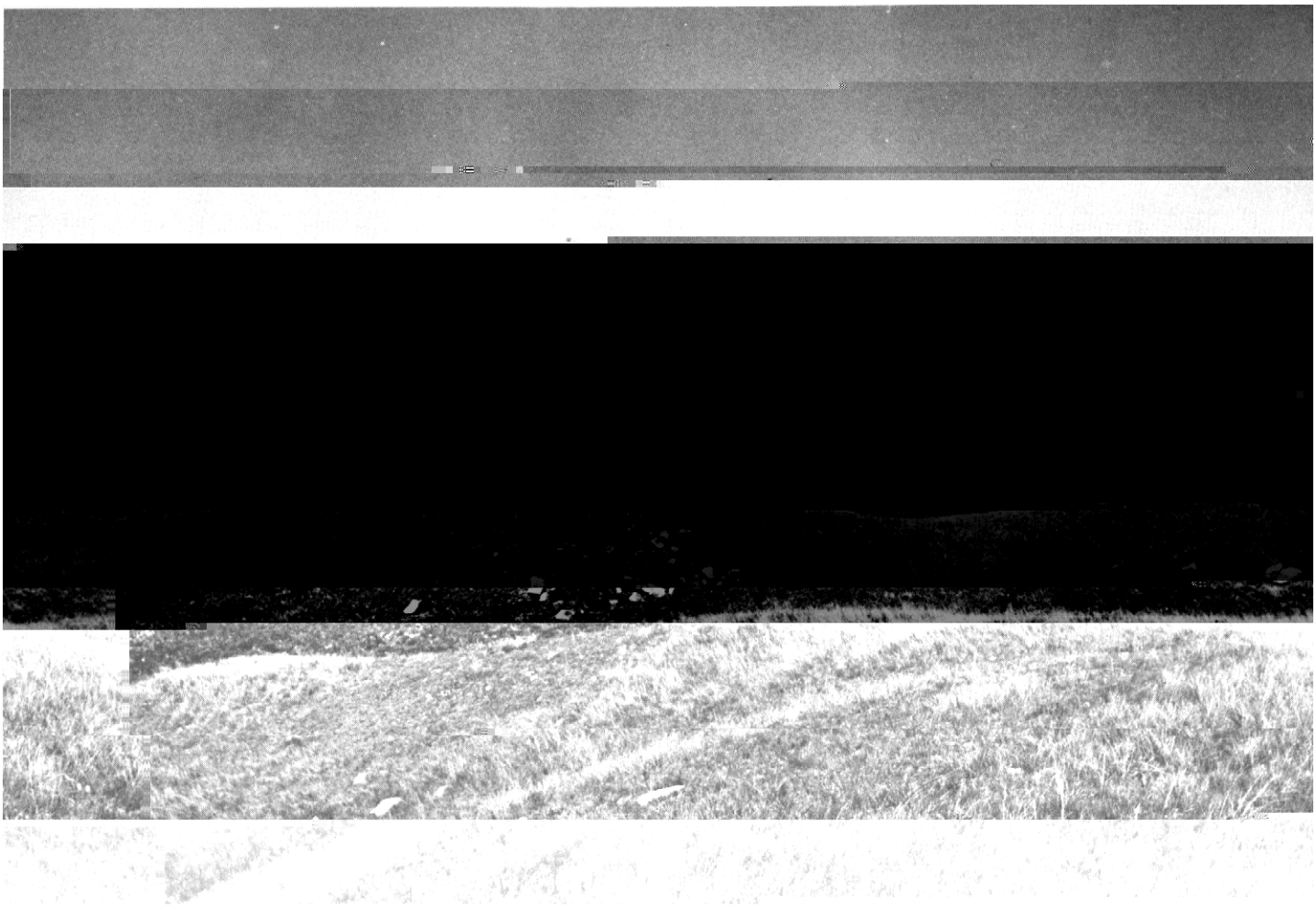
Soil Survey of

Yankton County, South Dakota

United States Department of Agriculture
Soil Conservation Service

in cooperation with
South Dakota Agricultural Experiment Station



HOW TO USE

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

2. Note the number of the map sheet and turn to that sheet.

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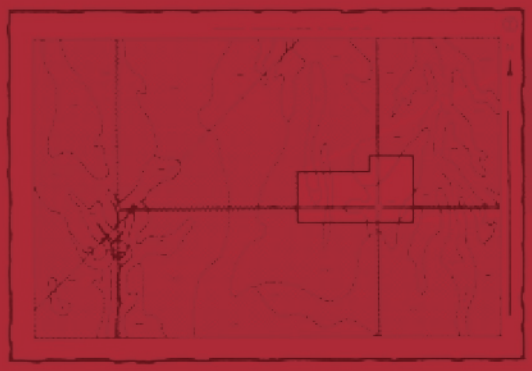

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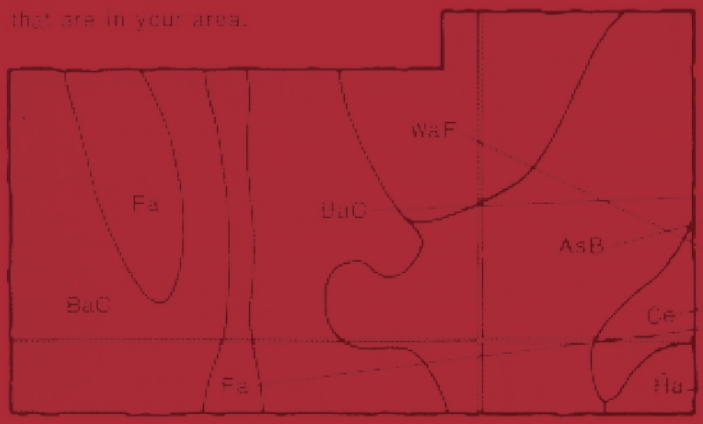

Symbols

AsB
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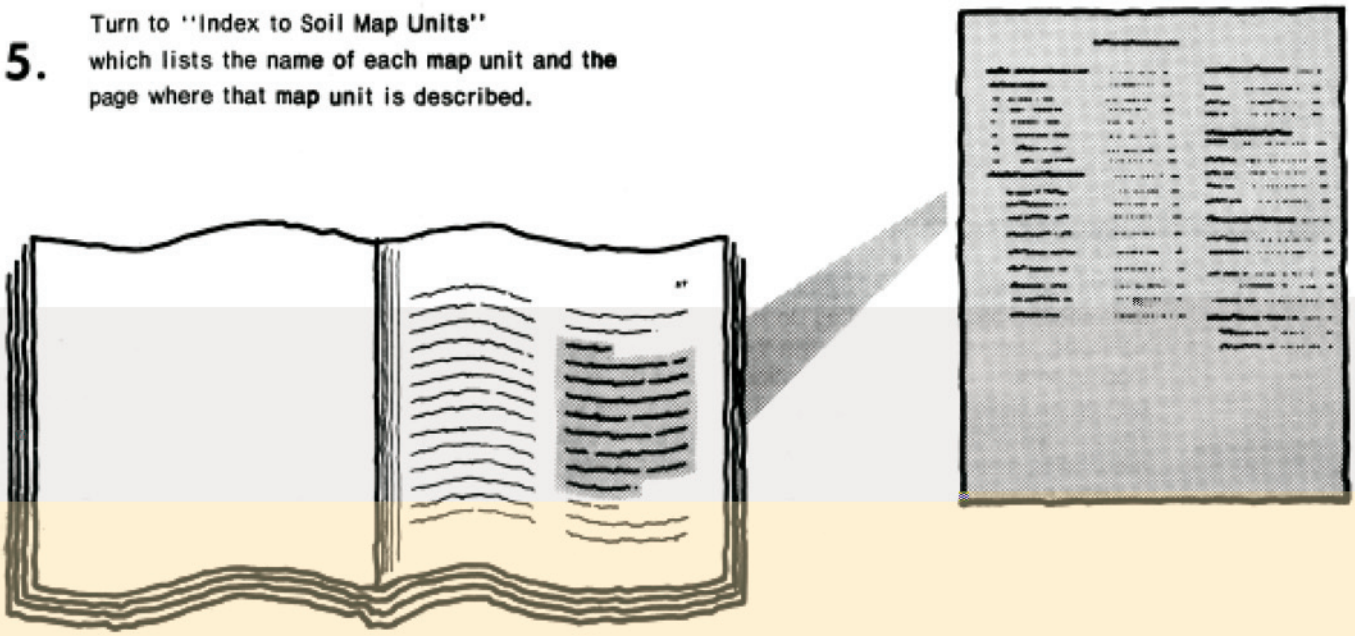
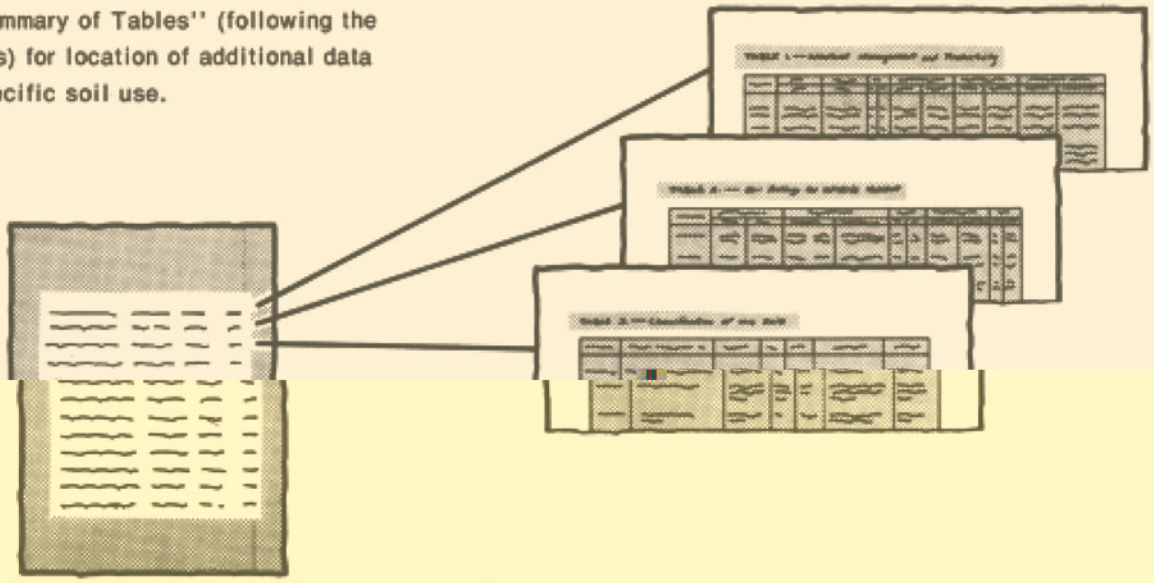
THIS SOIL SURVEY

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

Major fieldwork for this soil survey was completed in the period 1973-1976. Soil names and descriptions were approved in 1977. Unless otherwise indicated, statements in the publication refer to conditions in the survey area in 1977. This survey was made cooperatively by the Soil Conservation Service and the South Dakota Agricultural Experiment Station. It is part of the technical assistance furnished to the Yankton County Conservation District. Financial assistance was furnished by the South Dakota Department of Revenue and the Yankton County Conservation District.

Soil maps in this survey may be copied without permission, but any enlargement of these maps can cause misunderstanding of the detail of mapping and result in erroneous interpretations. Enlarged maps do not show small areas of contrasting soils that could have been shown at a larger mapping scale.

Cover: Ethan-Betts loams, 15 to 40 percent slopes, in the foreground. Beaver Lake is in the background.

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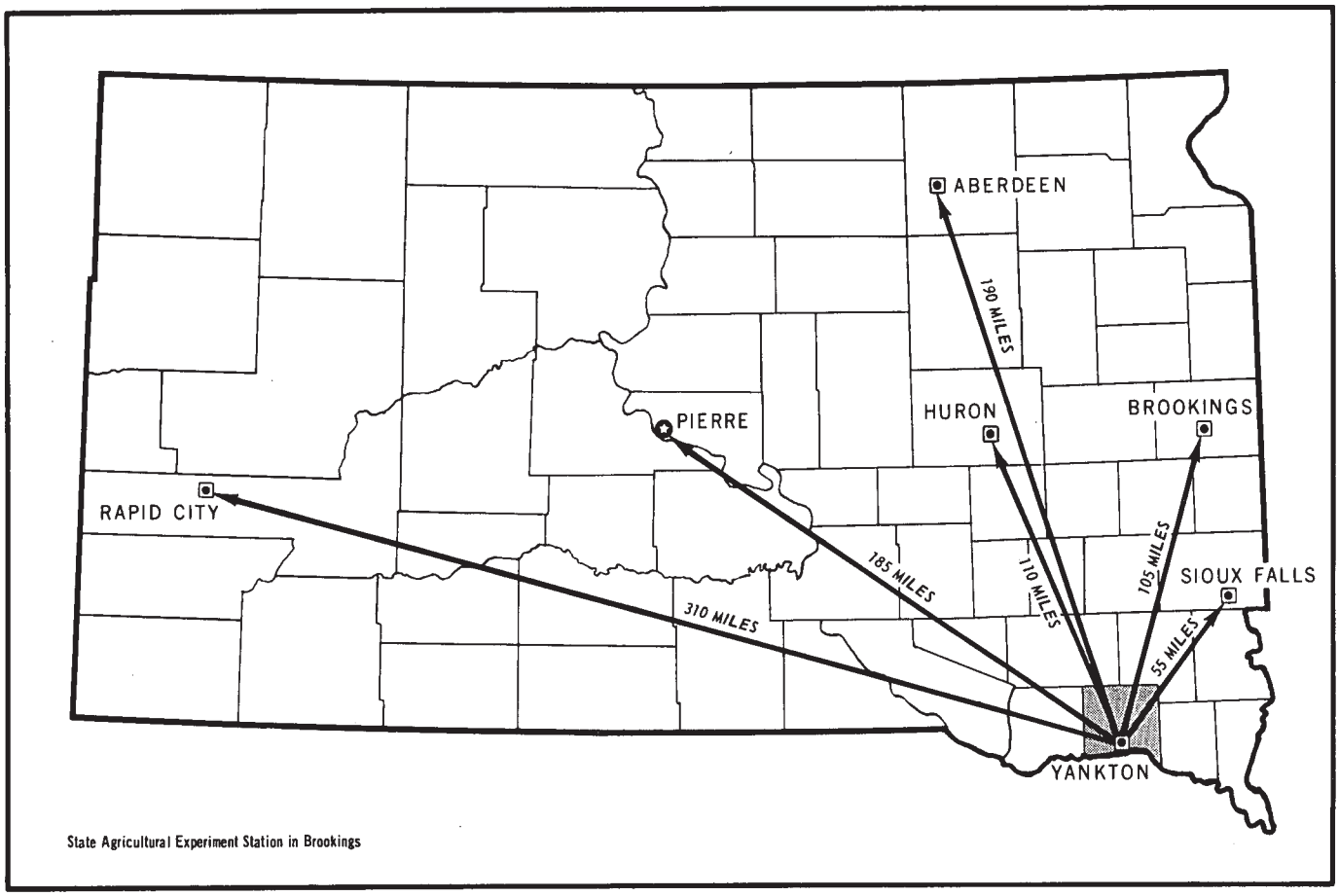
Foreword

This soil survey contains much information useful in any land-planning program in Yankton County, South Dakota. Of prime importance are the predictions of soil behavior for selected land uses. Also highlighted are limitations or hazards to land uses that are inherent in the soil, improvements needed to overcome these limitations, and the impact that selected land uses will have on the environment.

This soil survey has been prepared for many different [illegible]



Location of Yankton County in South Dakota.

SOIL SURVEY OF YANKTON COUNTY, SOUTH DAKOTA

By Edgar H. Erez, Soil Conservation Service

the warmer part of the year in an irregular pattern and in small areas.

Climatic data in this section were specially prepared for the Soil Conservation Service by the National Climatic Center, Asheville, North Carolina.

Physiography and relief

signed a bill establishing the Territory of Dakota. Yankton was made the capitol.

Yankton County was organized in 1862. The Homestead Act of 1862 had a large impact on the settlement of the county. After a railroad reached Yankton in 1872, many immigrants settled in the area. Yankton College, the first college in the territory, was founded in 1881 by

The water resources in the county generally are adequate for domestic use and for livestock. The principal surface water resources are Lewis and Clark Lake, Marindahl Lake, Beaver Lake, the Missouri River, and the James River. Many small dams, dugouts, and flows of Clay, Turkey, Beaver, and Marne Creeks provide livestock water in most years. Ground water from wells is available in most parts of the county. The source of water for shallow wells, ranging in depth from 15 to 200 feet, is the glacial till deposits in the uplands or the alluvial sediments on the bottom land along the Missouri River. The source of water for deep wells is sandstone, at a depth of 225 to 630 feet. Water quantity generally is greater and quality poorer in the deep wells. A few of the aquifers have enough water to meet the demands of large-scale irrigation systems.

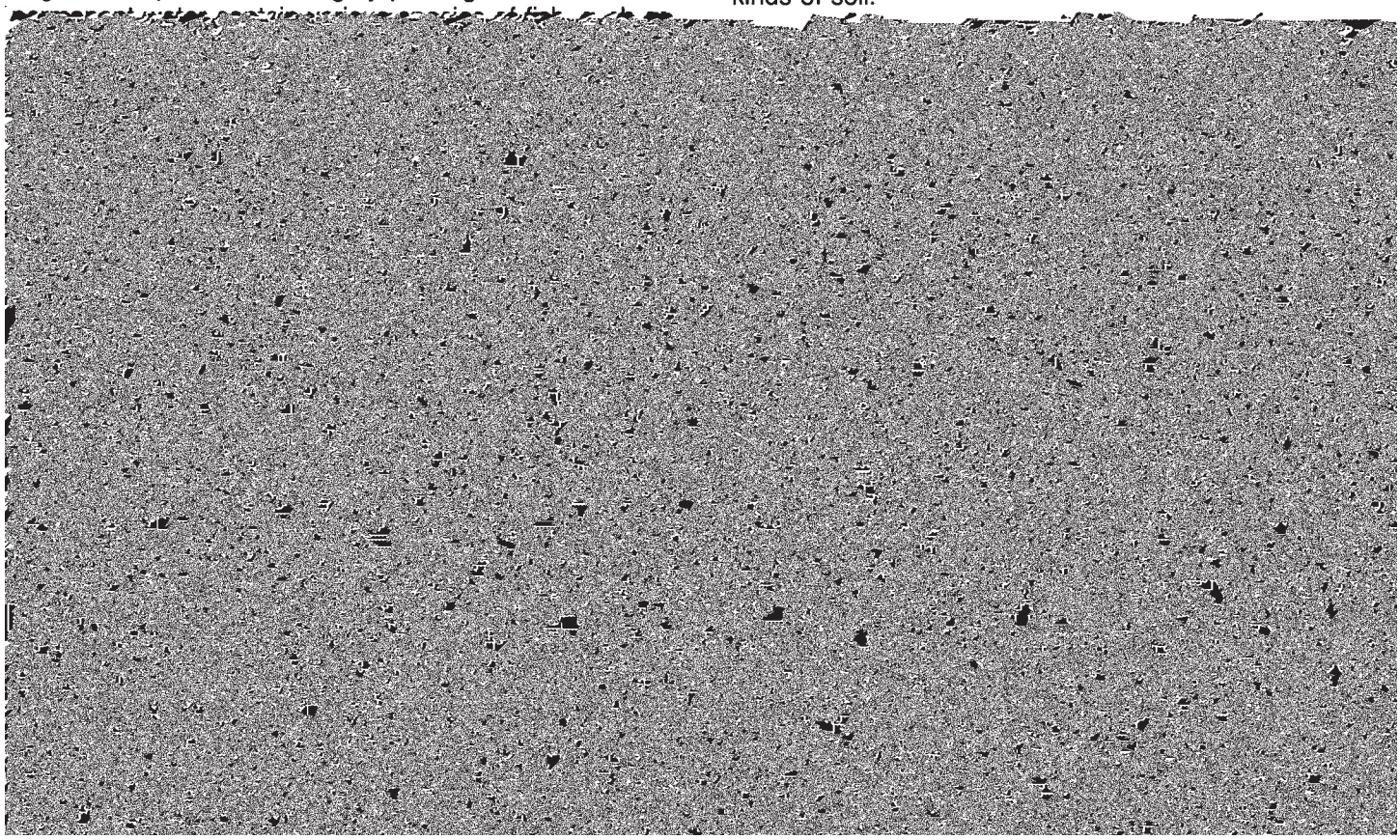
Mineral resources in the county consist of sand and gravel deposits, Pierre shale, and Niobrara chalk rock. The sand and gravel deposits are mined for road construction material and concrete aggregate. Some Niobrara chalk rock is mined for use as agricultural lime. During the period 1891 to 1910, a quarry in the Niobrara chalk rock near Gavins Point Dam produced 1,900,000 barrels of cement (*6*).

Wildlife resources include the whitetail deer throughout the county and such upland game birds as bobwhite, ring-necked pheasant, and gray partridge. Most areas of

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

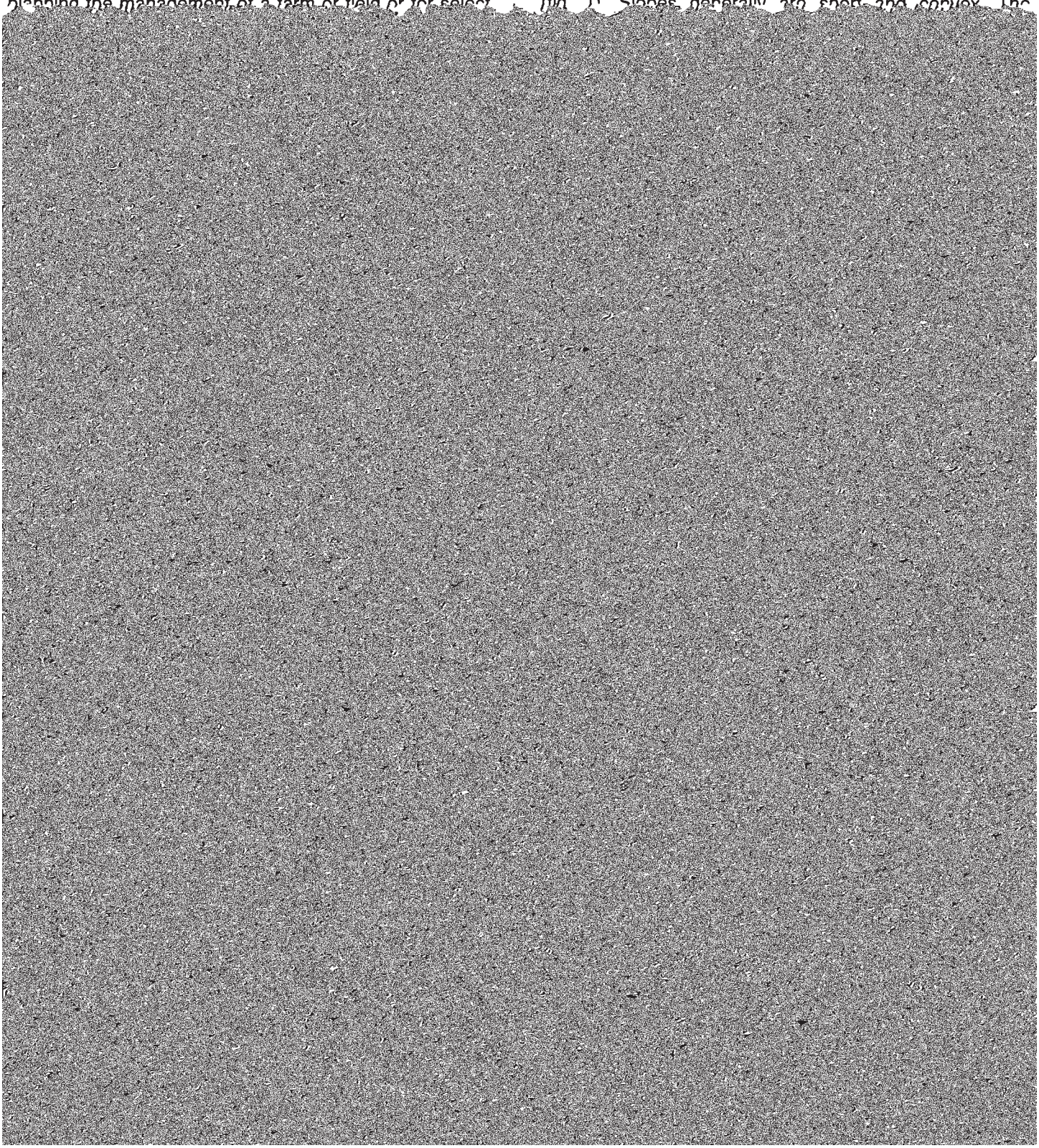
The areas shown on a soil map are called soil map units. Some map units are made up of one kind of soil, others are made up of two or more kinds of soil, and a few have little or no soil material at all. Map units are discussed in the sections "General soil map for broad land-use planning" and "Soil maps for detailed planning."

While a soil survey is in progress, samples of soils are taken as needed for laboratory measurements and for engineering tests. The soils are field tested, and interpretations of their behavior are modified as necessary during the course of the survey. New interpretations are added to meet local needs, mainly through field observations of different kinds of soil in different uses under different levels of management. Also, data are assembled from other sources, such as test results, records, field experience, and information available from state and local specialists. For example, data on crop yields under defined practices are assembled from farm records and from field or plot experiments on the same kinds of soil.



Because of its small scale, the map does not show the kind of soil at a specific site. Thus, it is not suitable for planning the management of a farm or field or for select

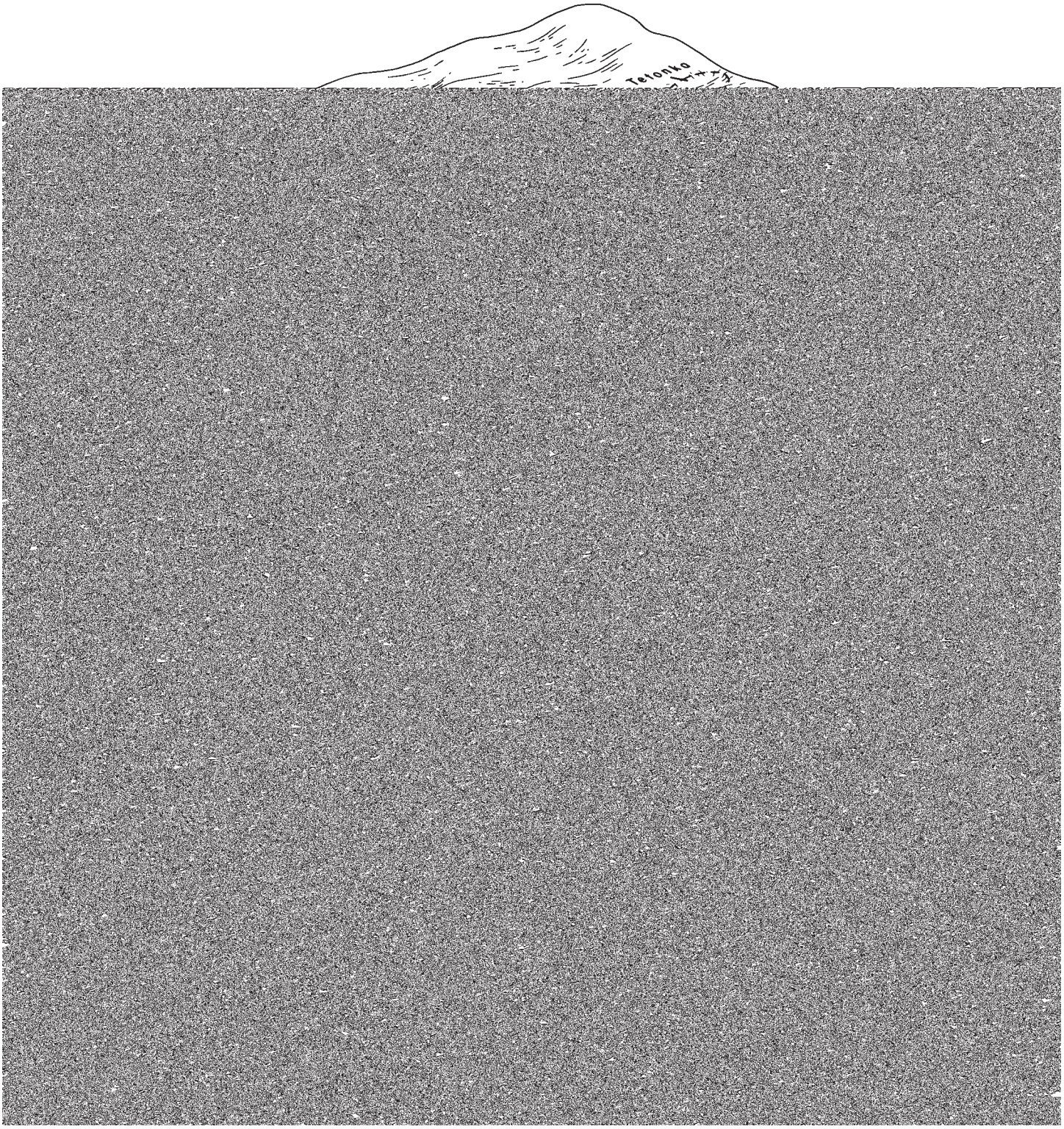
This map unit is on a glacial till plain that is characterized by gentle rises, swales, and enclosed depressions (fig. 1). Slopes, generally, are short and convex. The



Bonilla soils are moderately well drained and are in swales. Slopes are concave and range from 0 to 6 percent. Typically, the surface layer is dark grayish brown loam. The subsoil is dark grayish brown friable loam

defined in the areas where entrenched drainageways occur. Rare flooding occurs on the Trent soils in the spring and after heavy rains.

This map unit makes up about 15 percent of the


Teton

moisture, maintaining fertility, and controlling erosion in the more sloping areas are the main concerns of management if the soils are used for crops.

This map unit has good potential for crops, tame pasture and hay, rangeland, openland wildlife habitat, and rangeland wildlife habitat. It has fair potential for most building sites and most sanitary facilities.

4. Ethan-Betts

Deep, moderately steep and steep, well drained and excessively drained loamy soils on uplands

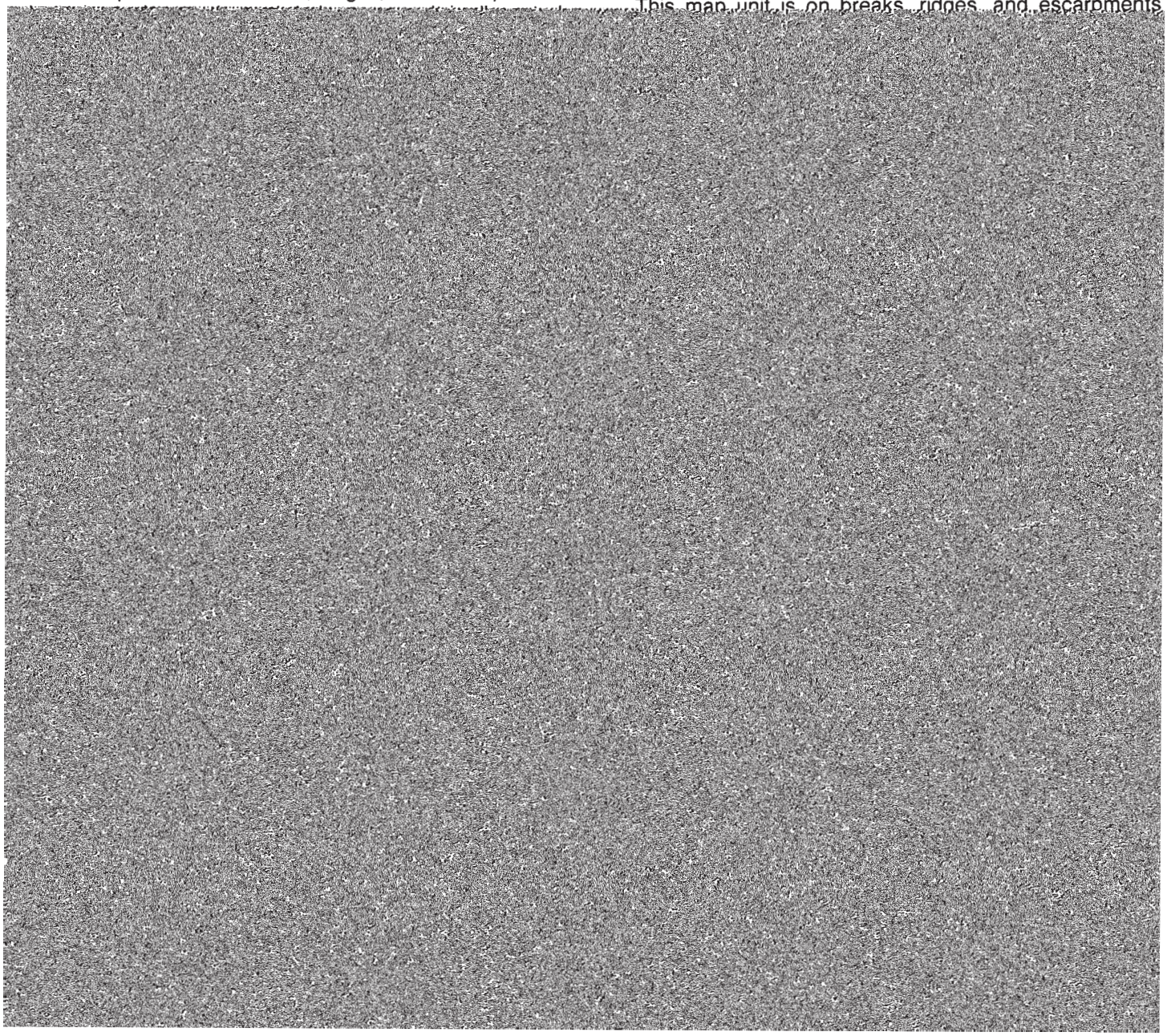
This map unit is on breaks, ridges, and escarpments and controlling erosion are the main concerns of management.

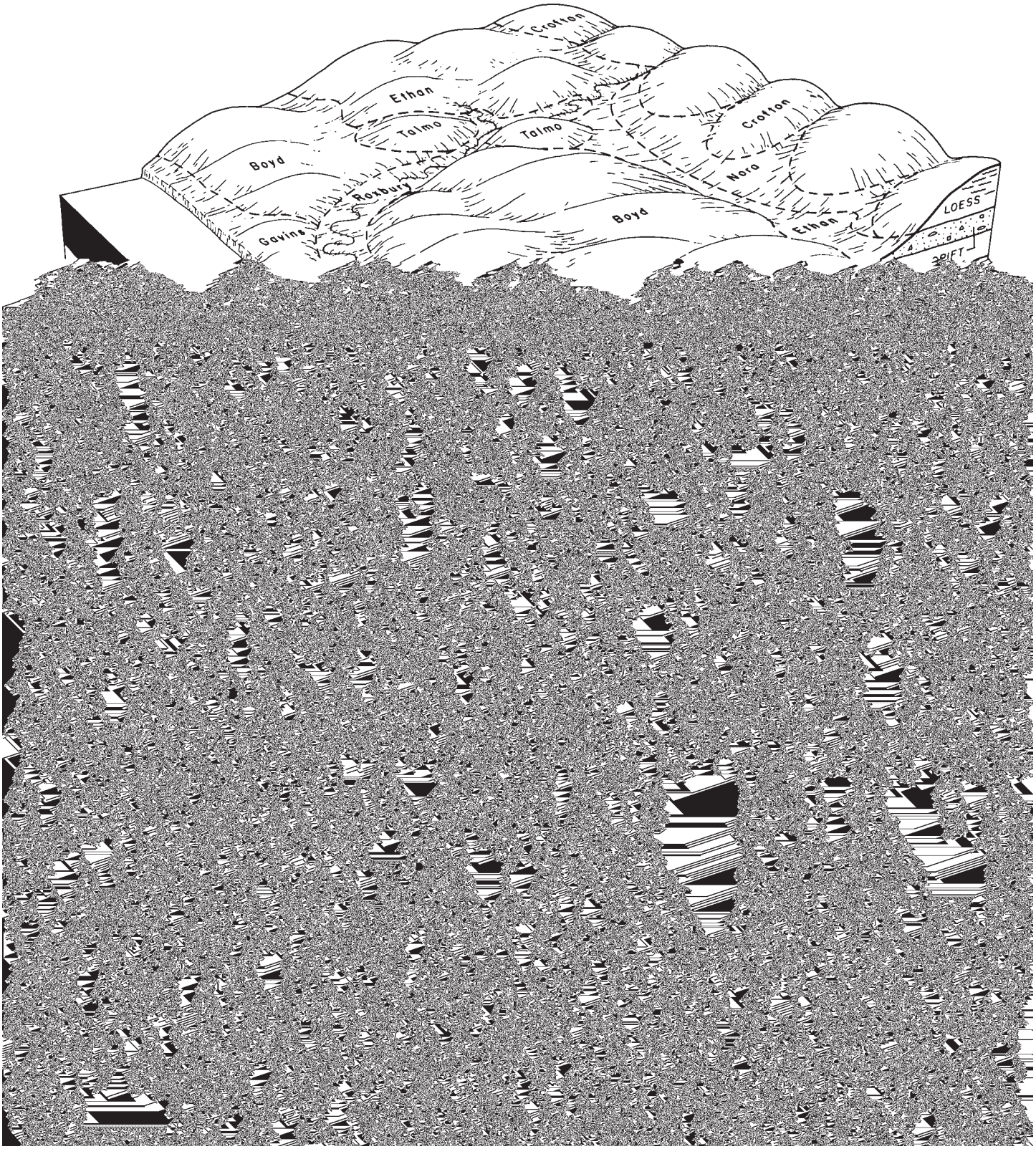
The Ethan soils have good potential and the Betts soils fair potential for rangeland and rangeland wildlife habitat. Good sites for dams, for livestock water, and for fishing are in some of the deeper draws. These soils have poor potential for crops, tame pasture and hay, and openland wildlife habitat. They generally are too steep for buildings and most sanitary facilities.

5. Crofton-Boyd-Ethan

Deep and moderately deep, strongly sloping to steep, well drained silty, clayey, and loamy soils on uplands

This map unit is on breaks, ridges, and escarpments




Crofton
Ethan
Talmo
Talmo
Crofton
Boyd
Nora
Roxbury
Boyd
Ethan
Gavins
LOESS
DRIFT

brown, calcareous loam. The subsoil is grayish brown and pale brown, friable, calcareous loam. The underlying material is pale brown and very pale brown, mottled, calcareous clay loam.

Clamo soils are poorly drained and are on flood plains. Slopes are 0 to 2 percent. Typically, the surface layer is dark gray silty clay loam. The subsoil is dark gray, firm silty clay loam. It is calcareous in the lower part. The underlying material is gray and dark gray, calcareous silty clay loam.

Davis soils are well drained and are on foot slopes. Slopes range from 2 to 9 percent. Typically, the surface layer is very dark gray silt loam. The subsoil is, in sequence downward, dark gray, friable silt loam; dark grayish brown, friable loam; and light grayish brown, friable, calcareous clay loam. The underlying material is light brownish gray and pale brown, calcareous clay loam.

Minor in this map unit are Betts, James, Lamo, Talmo, and Thurman soils. The excessively drained Betts soils are on some of the crests and ridgetops. The poorly drained James soils and the somewhat poorly drained Lamo soils occur as areas intermingled with areas of the Clamo soils on bottom land. The James soils have salts

7. Baltic-Roxbury-Lakeport

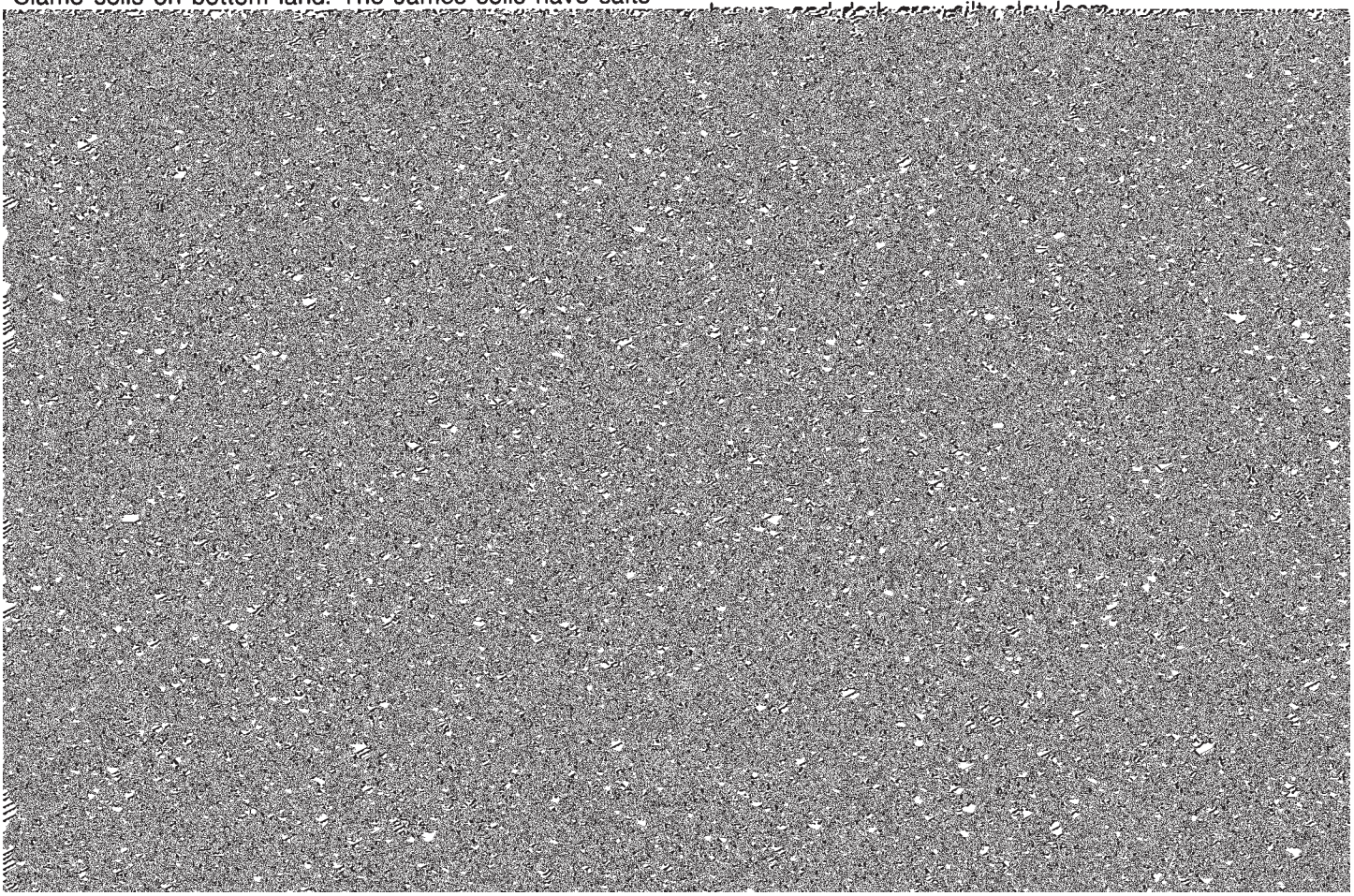
Deep, nearly level, very poorly drained to moderately well drained loamy, silty, and clayey soils on flood plains

This map unit is on bottom land (fig. 4). It is a broad flat that has very little relief and is dissected by drainage ditches that intercept runoff when flooding occurs. The soils are subject to flooding during snowmelt and after heavy rains.

This map unit makes up about 5 percent of the county. It is about 30 percent Baltic soils, 25 percent Roxbury soils, 15 percent Lakeport soils, and 30 percent minor soils.

Baltic soils are poorly drained and very poorly drained and are on the lower parts of the landscape. Slopes are less than 1 percent. Typically, the surface layer is dark gray and gray, calcareous silty clay. The subsoil is dark gray, firm, calcareous silty clay. The underlying material is gray and light gray, calcareous silty clay.

Roxbury soils are moderately well drained and are on alluvial fans. Slopes are 0 to 2 percent. Typically, the surface layer is dark grayish brown, calcareous silt loam. The subsoil is grayish brown, very friable silty clay loam. The underlying material is grayish brown, very pale



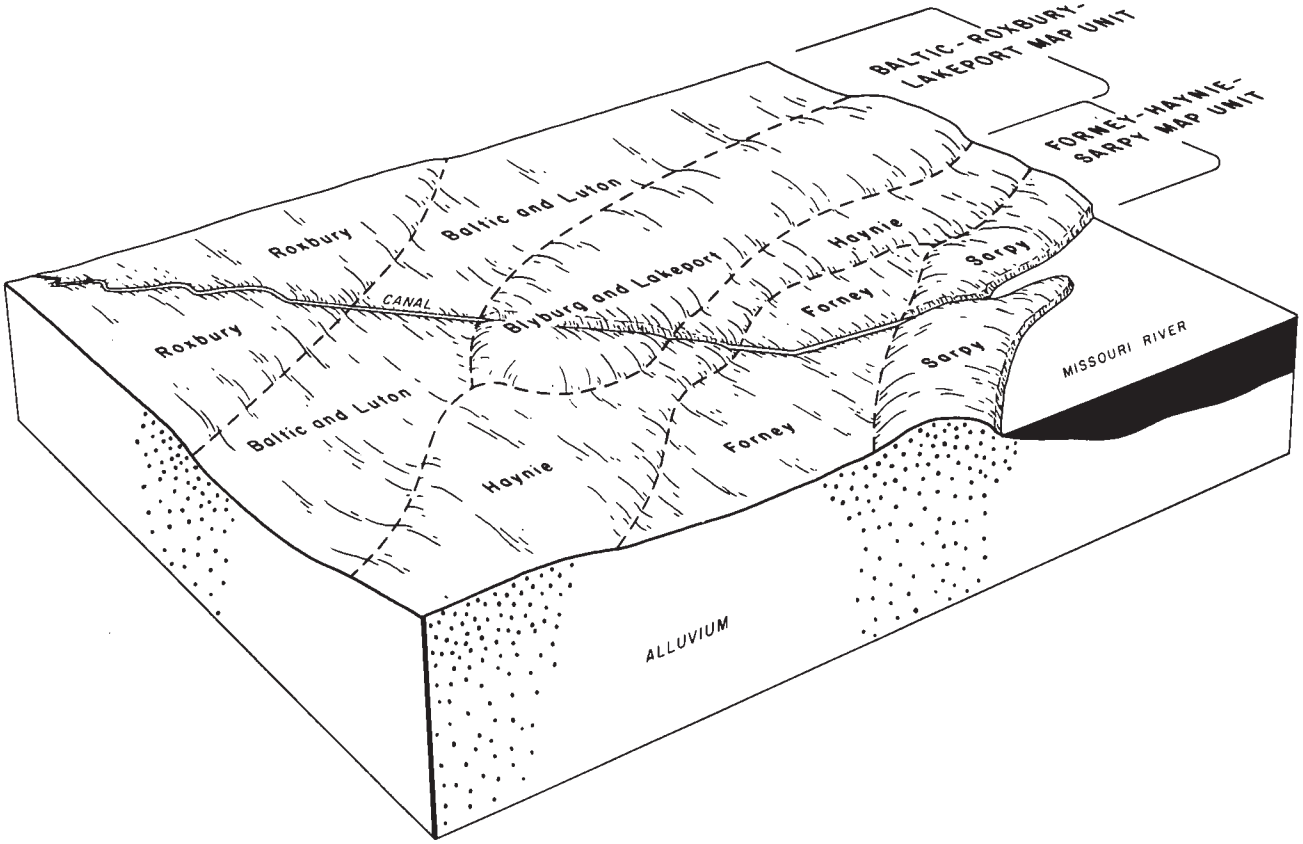


Figure 4.—Pattern of soils in the Baltic-Roxbury-Lakeport and Forney-Haynie-Sarpy map units.

All three soils generally have poor potential for building sites and sanitary facilities.

Forney soils are poorly drained and are on the lower parts of the landscape. Slopes are 0 to 2 percent. Typi-

soils occur as areas intermingled with areas of the Haynie and Sarpy soils.

Permeability is very slow in the Forney soils, moderate in the upper part of the Haynie soils and slow in the lower part, and rapid in the Sarpy soils. Available water capacity is moderate in the Forney soils, high in the Haynie soils, and low in the Sarpy soils. Fertility is medium in the Forney soils and low in the Haynie and Sarpy soils.

Most of this map unit is used for crops. Many areas of the Haynie and Sarpy soils are used for truck gardening. The chief crops are corn, soybeans, and alfalfa. Wetness is a problem on the Forney soils and in low lying areas. Improving tilth, increasing the water intake rate, maintaining fertility, and controlling soil blowing are the main concerns of management if the major soils are farmed.

These soils have good potential for rangeland and for tame pasture and hay. Forney and Sarpy soils have fair potential and Haynie soils good potential for cultivated crops. Forney and Haynie soils have good potential and Sarpy soils poor potential for openland wildlife habitat. All three soils have fair potential for rangeland wildlife habitat. Forney and Sarpy soils have poor potential and Haynie soils only fair potential for most building sites and sanitary facilities because of flooding.

Soil maps for detailed planning

The map units shown on the detailed soil maps at the back of this publication represent the kinds of soil in the survey area. They are described in this section. The descriptions together with the soil maps can be useful in determining the potential of a soil and in managing it for food and fiber production; in planning land use and developing soil resources; and in enhancing, protecting, and preserving the environment. More information for each map unit, or soil, is given in the section "Use and management of the soils."

Preceding the name of each map unit is the symbol that identifies the soil on the detailed soil maps. Each soil description includes general facts about the soil and a brief description of the soil profile. In each description, the principal hazards and limitations are indicated, and the management concerns and practices needed are discussed.

The map units on the detailed soil maps represent an area on the landscape made up mostly of the soil or soils for which the unit is named. Most of the delineations shown on the detailed soil map are phases of soil series.

Soils having profiles that are almost alike make up a *soil series.* Except for allowable differences in texture of the surface layer or of the underlying substratum, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement in the profile. A soil series commonly is named for a town or geographic feature near the place where a soil of that series was first observed and mapped. The Gayville series, for example, was named for the town of Gayville in Yankton County.

Soils of one series can differ in texture of the surface layer or in the underlying substratum and in slope, erosion, stoniness, salinity, wetness, or other characteristics that affect their use. On the basis of such differences, a soil series is divided into phases. The name of a *soil phase* commonly indicates a feature that affects use or management. For example, Baltic clay loam is one of several phases within the Baltic series.

Some map units are made up of two or more dominant kinds of soil. Such map units are called soil complexes, soil associations, and undifferentiated groups.

A *soil complex* consists of areas of two or more soils that are so intricately mixed or so small in size that they cannot be shown separately on the soil map. Each area includes some of each of the two or more dominant soils, and the pattern and proportion are somewhat similar in all areas. Clarno-Bonilla loams, 1 to 6 percent slopes, is an example.

A *soil association* is made up of soils that are geographically associated and are shown as one unit on the map because it is not practical to separate them. A soil association has considerable regularity in geographic pattern and in the kinds of soil that are a part of it. The extent of the soils can differ appreciably from one delineation to another; nevertheless, interpretations can be made for use and management of the soils. Crofton-Boyd association, 15 to 40 percent slopes, is an example.

Most map units include small, scattered areas of soils other than those that appear in the name of the map unit. Some of these soils have properties that differ substantially from those of the dominant soil or soils and thus could significantly affect use and management of the map unit. These soils are described in the description of each map unit. Some of the more unusual or strongly contrasting soils that are included are identified by a special symbol on the soil map.

Some mapped areas include places that have little or no soil material and support little or no vegetation. Such places are called *miscellaneous areas*; they are delineated on the soil map and given descriptive names. Pits, gravel, is an example. Some of these areas are too small to be delineated and are identified by a special symbol on the soil map.

The acreage and proportionate extent of each map unit are given in table 4, and additional information on properties, limitations, capabilities, and potentials for many soil uses is given for each kind of soil in other tables in this survey. (See "Summary of tables.") Many of the terms used in describing soils are defined in the Glossary.

The names of some map units on the detailed soil maps do not fully agree with those in the published

surveys of adjacent Clay and Hutchinson Counties. Differences are the result of changes in concepts of the soil series or the map units.

Ba—Baltic clay loam. This deep, poorly drained, nearly level soil is in backwater areas on bottom land along the Missouri River. It is frequently flooded during periods of heavy rain or rapid snowmelt. Areas of this soil range from 10 to 160 acres in size and are irregular in shape.

Typically, the surface layer is black, calcareous clay loam about 16 inches thick. The subsoil is about 24 inches of dark gray, firm, calcareous silty clay. The underlying material to a depth of 60 inches is dark gray, calcareous silty clay. In places, the surface layer is loam, silt loam, or silty clay loam. In some areas, the underlying material is stratified.

Included with this soil in mapping are small areas of Luton and Roxbury soils. These soils make up less than 15 percent of any one mapped area. Luton soils have no lime in the surface layer and subsoil. Roxbury soils contain less clay throughout than the Baltic soil. Both included soils are on the slightly higher parts of the landscape.

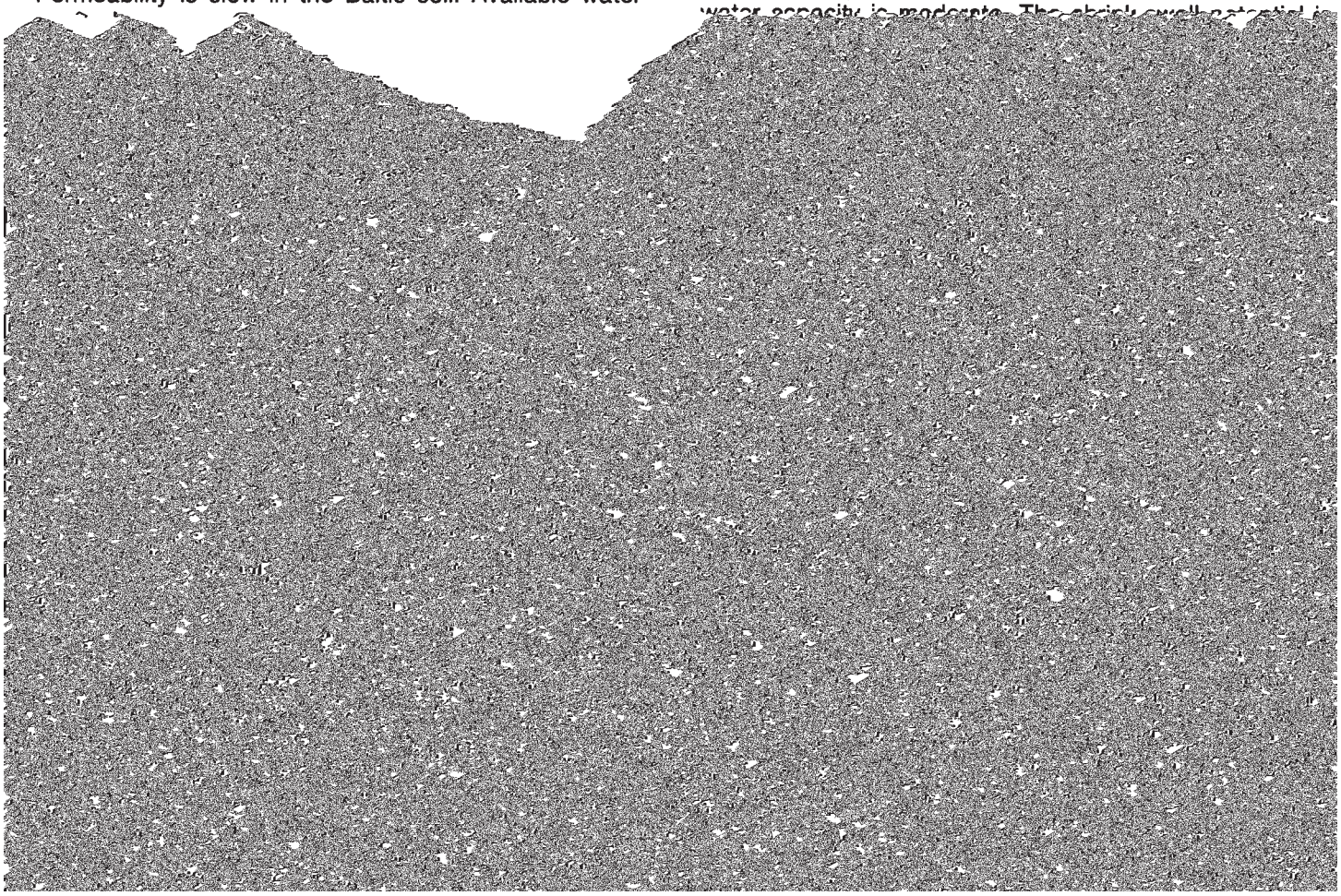
Permeability is slow in the Baltic soil. Available water

Bb—Baltic silty clay. This deep, poorly drained, nearly level soil is in backwater areas on bottom land along the Missouri River. It is frequently flooded during periods of heavy rain or rapid snowmelt. Areas of this soil range from 10 to several hundred acres in size and are irregular in shape.

Typically, the surface layer is calcareous silty clay about 24 inches thick. It is dark gray in the upper part and gray in the lower part. The subsoil is about 12 inches of dark gray, firm, calcareous silty clay. The underlying material to a depth of 60 inches is calcareous silty clay. It is gray in the upper part and light gray in the lower part. In places, the surface layer is less than 24 inches thick and the surface layer and subsoil contain less clay. Some areas have about 12 inches of overwash.

Included with this soil in mapping are small areas of Luton and Roxbury soils. These soils make up less than 15 percent of any one mapped area. Luton soils are leached of lime in the surface layer and subsoil. Roxbury soils contain less clay throughout than the Baltic soil and are moderately well drained. Both included soils are on the slightly higher parts of the landscape.

Permeability is slow in the Baltic soil, and available water capacity is moderate. The shrink-swell potential is



land along the Missouri River. It is frequently flooded during periods of heavy rain or rapid snowmelt. It occurs as an area that is approximately 900 acres in size and is long and broad.

Typically, the surface layer is calcareous silty clay about 24 inches thick. It is dark gray in the upper part and gray in the lower part. The subsoil is about 12

Typically, the Betts soil has a surface layer of grayish brown, calcareous loam about 3 inches thick. Next is a transitional layer of pale brown, friable, calcareous clay loam about 5 inches thick. The underlying material to a depth of 60 inches is light brownish gray, calcareous clay loam over light gray and pale yellow, calcareous clay loam. In places, the surface layer is thicker and darker.

Typically, the Gavins soil has a surface layer of grayish

Figure 5.—Little bluestem and yucca on Betts-Gavins complex, 15 to 40 percent slopes.

Be—Blake silty clay loam. This deep, somewhat soils have sand below a depth of 24 inches. Havnie soils

improves fertility, maintains tilth, and increases the water intake rate.

This soil is well suited to windbreaks and environmental plantings. All climatically adapted trees grow well on this soil. Competing vegetation prevents maximum tree growth. It can be controlled by timely cultivation and by herbicides.

This soil is well suited to tame grasses for pasture and hay. Proper stocking rates, pasture rotation, timely deferment of grazing, and weed control help keep the pastures in good condition.

If buildings are constructed on this soil, the site should be built up and runoff should be diverted. Ground water can seep into basements during wet periods. If roads are constructed across areas of this soil, the base material should be strengthened and the roads should be graded to shed water. The effluent from sanitary facilities can pollute the ground water. Capability unit I-1; Silty range site.

Bf—Blencoe silty clay. This deep, nearly level, somewhat poorly drained soil is on the higher parts of the bottom land along the Missouri River. Flooding is a hazard, but it occurs only as local runoff; Gavins Point Dam holds back the potential floodwater in the Missouri River. Areas of this soil range from 10 to 40 acres in size and are irregular in shape.

and increases the infiltration rate. Fieldwork may be delayed during wet periods because of the flooding and the high water table.

This soil is well suited to windbreaks and environmental plantings. Trees that need a large amount of moisture, such as cottonwood and willows, grow well on this soil. Competing vegetation prevents maximum tree growth. It can be controlled by timely cultivation and by herbicides.

This soil is well suited to tame grasses for pasture and hay. Proper stocking rates, pasture rotation, timely deferment of grazing, and weed control help keep the pasture in good condition.

Buildings constructed on this soil should be protected from local flooding. The foundations and footings should be reinforced to prevent the structural damage caused by the shrinking and swelling of the soil. Ground water can seep into basements during wet periods. If roads are constructed across areas of this soil, the base material should be strengthened. Also, the roads should be graded to shed water.

Sewage lagoons function well if the clayey upper part of the soil is 2 feet or more thick. If this part is less than 2 feet thick, however, the effluent can pollute the ground water. The effluent from all other sanitary facilities can pollute the ground water because of the moderately permeable underlying material. Capability unit IIw-1; Overflow range site.

Figure 6.—An area of Blencoe-Gayville complex. The light spots are Gayville soil.

Lakeport and Salix soils. These soils make up less than 15 percent of any one mapped area. They contain more clay in the underlying material than the Blencoe and Gayville soils. They occur in a random pattern throughout this map unit.

Permeability is very slow in the subsoil of the Blencoe and Gayville soils and moderate in the underlying material. Available water capacity is high in the Blencoe soil and moderate in the Gayville soil. Organic-matter content is moderate and natural fertility medium in both soils. The shrink-swell potential is high in the surface layer and subsoil. Runoff is slow. These soils have a seasonal high water table at a depth of 1 to 3 feet in most years.

Almost all areas of these soils are farmed. The Blencoe soil has good potential for cultivated crops, rangeland, tame pasture and hay, openland wildlife habitat, and windbreaks and environmental plantings. The Gayville soil has poor potential for cultivated crops, tame pasture and hay, openland wildlife habitat, and windbreaks and environmental plantings. Both soils have poor potential for building sites and sanitary facilities.

This map unit is poorly suited to cultivated crops and tame pasture and hay because the Gayville soil is so closely intermingled with the Blencoe soil throughout the mapped areas that farming the two soils separately is not practical. Returning crop residue to the soil improves tilth, maintains fertility, and increases the infiltration rate. Fieldwork may be delayed during wet periods because of the flooding and the high water table.

The Blencoe soil is well suited to windbreaks and environmental plantings, but trees grow poorly on the Gayville soil because of the dense claypan subsoil and the large amount of salts. Competing vegetation prevents maximum tree growth. It can be controlled by timely cultivation and by herbicides.

Buildings constructed on these soils should be protected from local flooding. The foundations and footings should be reinforced to prevent the structural damage caused by the shrinking and swelling of the soil. Ground water can seep into basements during wet periods. If roads are constructed across areas of these soils, the base material should be strengthened. Also, the roads should be graded to shed water.

Sewage lagoons function well where the clayey upper part of the soil is 2 feet or more thick. If this part is less than 2 feet thick, however, the effluent can pollute the ground water. The effluent from all other sanitary facilities can pollute the ground water because of the moderately permeable underlying material. Blencoe soil in capability unit IIw-1, Overflow range site; Gayville soil in capability unit VIw-3, Saline Lowland range site.

BhB—Blendon-Thurman complex, 0 to 6 percent slopes. These deep, well drained and somewhat excessively drained, nearly level and gently sloping soils are on uplands. Areas of these soils range from 15 to 100 acres in size and are irregular in shape. They are about 40 to 50 percent Blendon soil and about 25 to 35 percent Thurman soil. The Thurman soil is on the higher parts of the landscape, and the Blendon soil is on the lower parts. The two soils occur as areas so closely intermingled or so small that it is not practical to separate them in mapping.

Typically, the Blendon soil has a surface layer of dark gray loam about 8 inches thick. The subsoil is about 25 inches thick. It is dark grayish brown, very friable loam in the upper part and dark grayish brown and brown, very friable fine sandy loam in the lower part. The underlying material to a depth of 60 inches is yellowish brown and light yellowish brown loamy fine sand. In places, the dark colors extend to a depth of less than 20 inches.

Typically, the Thurman soil has a surface layer of dark grayish brown fine sandy loam about 10 inches thick. Next is a transition layer about 20 inches thick. The upper part is dark grayish brown, very friable sandy loam; the lower part is brown, loose loamy sand. The underlying material to a depth of 60 inches is very pale brown, calcareous loamy sand.

Included with these soils in mapping are small areas of Bonilla and Clarno soils. These included soils make up less than 25 percent of any one mapped area. Bonilla and Clarno soils contain more silt and clay than the Blendon and Thurman soils and formed in glacial till. Bonilla soils are on toe slopes and in slight swales. Clarno soils are on the higher parts of the landscape.

Permeability is moderately rapid in the Blendon soil and rapid in the Thurman soil. Available water capacity is moderate in both soils. The Blendon soil is high in fertility and in organic-matter content. The Thurman soil is

moderate in fertility and medium in organic-matter content. Runoff is slow on both soils.

Most areas are cultivated or are used for tame pasture and hay. These soils have fair potential for cultivated crops and openland wildlife habitat. They have good potential for rangeland, rangeland wildlife habitat, tame pasture and hay, and windbreaks and environmental plantings. They have good potential for most building sites and poor potential for most sanitary facilities.

These soils are suited to cultivated crops, but they are subject to soil blowing. Returning crop residue to the soil improves fertility, increases organic-matter content, and controls soil blowing. Stripcropping also can control soil blowing.

These soils are well suited to tame pasture and hay. Proper stocking rates, pasture rotation, timely deferment of grazing, and weed control help keep pastures in good condition.

eous silt loam and very fine sandy loam. In places, the surface layer is silty clay loam.

Included with this soil in mapping are small areas of Blencoe, Gayville, Lakeport, and Salix soils. These soils make up less than 15 percent of any one mapped area. Blencoe soils contain more clay in the upper part and Lakeport and Salix soils more clay throughout than the Blyburg soil. Gayville soils have a claypan subsoil. Included soils occur in a random pattern throughout the map unit.

Permeability is moderate in the Blyburg soil, and available water capacity is high. Organic-matter content and fertility also are high. Runoff is slow.

Almost all areas of this soil are farmed. The soil has good potential for cultivated crops, tame pasture and hay, windbreaks and environmental plantings, rangeland, and openland wildlife habitat. It has poor potential for most building sites and fair potential for most sanitary

Included with this soil in mapping are small areas of Lamo soils, which make up less than 10 percent of any one mapped area. These soils are more poorly drained than the Bon soil and contain less sand throughout the profile. They are in slightly lower lying areas.

Permeability is moderate in the Bon soil. Available water capacity is high. Organic-matter content and fertility also are high. Runoff is slow.

Most areas are farmed. This soil has good potential for cultivated crops, rangeland, tame pasture and hay, wind-

Typically, the Crossplain soil has a surface layer of dark gray clay loam about 14 inches thick. The subsoil is about 28 inches thick. It is gray, firm clay in the upper part and light brownish gray clay loam in the lower part. The underlying material to a depth of 60 inches is pale olive, calcareous clay loam that has accumulations of lime.

Included with these soils in mapping are small areas of Clarno soils, which make up less than 15 percent of any one mapped area. Clarno soils have a thinner subsoil

BoE—Boyd-Ethan association, 15 to 40 percent slopes. These moderately deep and deep, well drained, moderately steep and steep soils are on upland ridges and along entrenched drainageways. Areas are irregularly shaped and range from 80 to 800 acres in size. They are about 45 to 55 percent Boyd soil, 30 to 40 percent Ethan soil, and 15 percent minor soils. The Boyd soil is on the mid and lower side slopes. The Ethan soil is on the upper side slopes and on ridgetops. The minor soils are in areas as much as 20 acres in size, but as a result of the potential of all the soils for various uses, separately mapping the larger areas of the Ethan soil and of the minor soils is not practical.

Typically, the Boyd soil has a surface layer of dark grayish brown silty clay about 3 inches thick. The subsoil is about 20 inches thick. The upper part is dark grayish brown, firm, calcareous silty clay, and the lower part is grayish brown, very firm, calcareous silty clay that has spots of lime. The underlying material to a depth of 30 inches is light olive gray, calcareous clay and shale chips. Below this to a depth of 60 inches is light olive

These soils are well suited to rangeland. The natural plant cover is a mixture of mid grasses on the ridges and on the upper and mid slopes. The lower slopes have an overstory of bur oak and green ash and an understory of mixed shrubs. Management that maintains an adequate vegetative cover and ground mulch helps prevent excessive soil loss and increases the infiltration rate. If rangeland is overgrazed, bluestems and green needlegrasses are replaced by short grasses and less palatable species. A planned grazing system that includes proper grazing use and deferred grazing helps to maintain or improve the range condition and control erosion. Good sites for stock water dams are in some of the deeper draws.

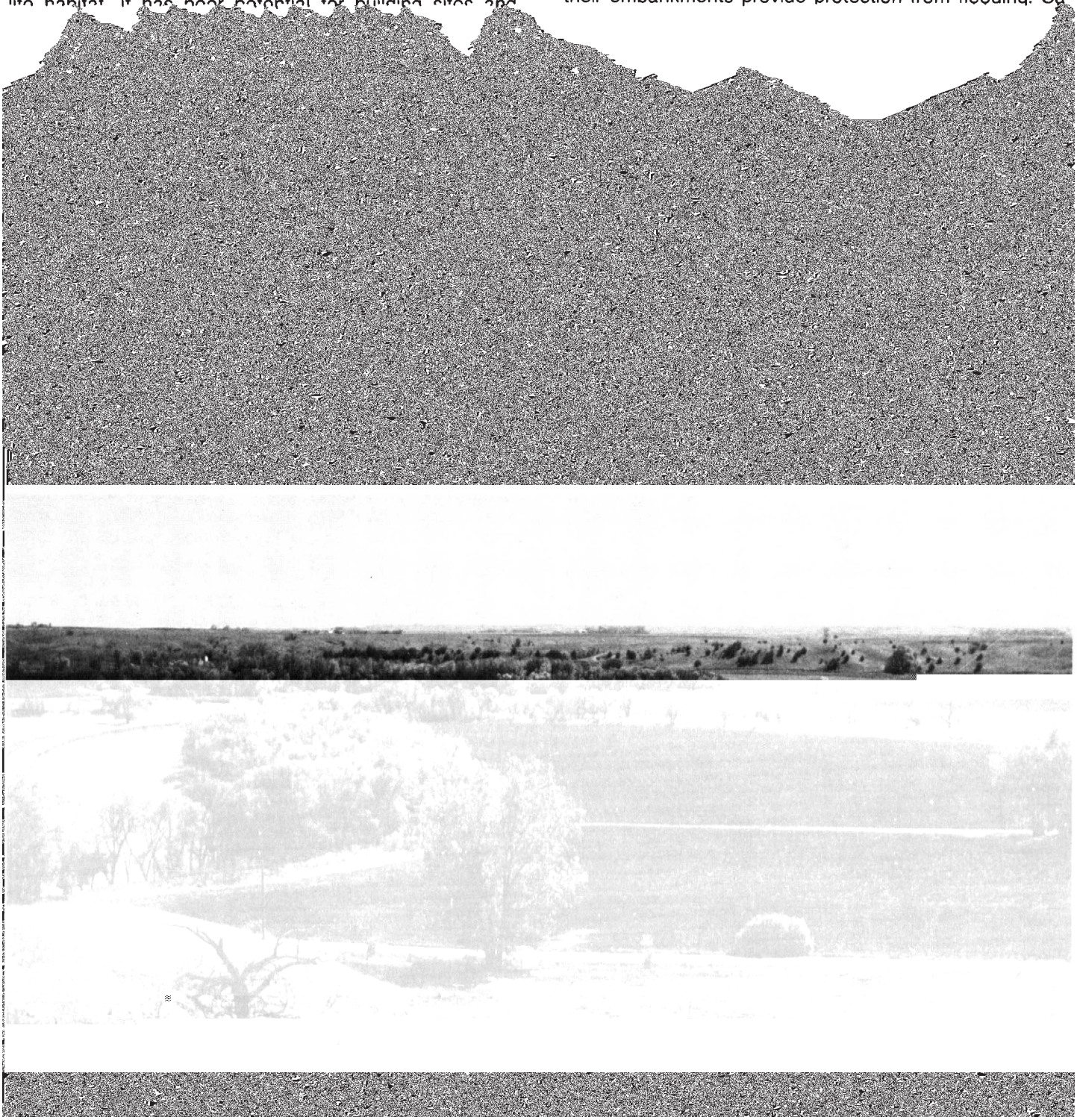
These soils are too steep for cultivated crops. Soil loss is too great under present farming practices.

These soils are well suited to rangeland wildlife habitat. The native trees growing on the side slopes and in the draws provide habitat for woodland wildlife, such as deer and squirrels. Providing winter food and cover increases the population of desired wildlife species. Excluding or limiting livestock for all or part of the grazing

soil has a perched water table at a depth of 1.5 to 3 feet most of the year. Runoff is slow.

Most areas are farmed. This soil has good potential for cultivated crops, tame pasture or hay, rangeland, windbreaks and environmental plantings, and openland wildlife habitat. It has poor potential for building sites and

It is poorly suited to local roads. The high shrink-swell potential, wetness, and low strength are the major problems. Strengthening the base material and grading the roads help overcome the low strength and the wetness and flooding. Sewage lagoons function well on this soil; their embankments provide protection from flooding. Ca-



salts near the surface. They occur in a random pattern throughout the map unit. Lamo soils contain less clay than the Clamo soil and are slightly higher on the landscape.

Permeability is slow in the Clamo soil, and available water capacity is high. The shrink-swell potential is high. Organic-matter content and fertility are high. Runoff is slow. This soil has a water table within a depth of 3 feet in most years.

Most of the drained areas are farmed. If drained, this soil has good potential for cultivated crops, tame pasture and hay, windbreaks and environmental plantings, rangeland, and openland wildlife habitat. It has poor potential for building sites and sanitary facilities.

This soil is suited to cultivated crops. The major management problem is the seasonal wetness caused by common flooding or the high water table. Because of the slow permeability, the soil dries slowly after a rain. Providing good surface drainage helps remove excess water. Returning crop residue helps maintain tilth and aerates the soil.

This soil is suited to tame pasture and hay. Control of grazing during wet periods, proper stocking rates, pasture rotation, timely deferment of grazing, and weed control help keep the pasture in good condition.

This soil generally is not suitable as a site for buildings and sanitary facilities because of the susceptibility to flooding and the high water table. Roads constructed across areas of this soil should be graded to prevent flooding. The base material should be strengthened. Capability unit IIw-3; Subirrigated range site.

Cc—Clamo Variant silty clay loam. This deep, poorly drained, nearly level soil is on the bottom land along the James River. It is frequently flooded by stream overflow for long periods. Areas of this soil range from 10 to 40 acres in size. Most are long and follow the course of the river.

Typically, the surface layer is dark gray, calcareous silty clay loam about 16 inches thick. The subsoil is about 10 inches of grayish brown, firm, calcareous silty clay loam. To a depth of 38 inches, the underlying material is grayish brown, calcareous silt loam. Below this to a depth of 60 inches, it is gray, calcareous silt loam. In places, the soil contains more clay throughout.

Included with this soil in mapping are small areas of James soils, which make up less than 10 percent of any one mapped area. These soils contain more clay in the subsoil and underlying material than the Clamo Variant and have salts near the surface. They occur in a random pattern throughout the map unit.

Permeability is slow in the subsoil of the Clamo Variant and moderate in the underlying material. Available water capacity is high. The shrink-swell potential is high in the surface layer. Organic-matter content and fertility are high. Runoff is slow. The seasonal high water table is within 1 foot of the surface.

Most areas are farmed. This soil has good potential for cultivated crops, tame pasture and hay, windbreaks and environmental plantings, and rangeland and for openland wildlife habitat. It has poor potential for building sites and sanitary facilities.

This soil is suited to cultivated crops. The major management problem is the seasonal wetness caused by the frequent flooding or the high water table. Because of a slow infiltration rate, this soil dries slowly after a rain. Returning crop residue helps maintain tilth and aerates the soil.

This soil is suited to tame pasture and hay. Controlled grazing during wet periods, proper stocking rates, pasture rotation, timely deferment of grazing, and weed control help keep the pasture in good condition.

This soil generally is not suitable as a site for buildings and sanitary facilities because of the susceptibility to flooding and the high water table. Buildings without basements can be constructed if the site is built up and protected from flooding. Roads constructed across areas of this soil should be graded to prevent flooding. The base material should be strengthened. Capability unit IIw-3; Subirrigated range site.

CdA—Clarno loam, 0 to 2 percent slopes. This deep, well drained, nearly level soil is on uplands. Areas of this soil range from 5 to 120 acres in size and are irregular in shape. Slopes generally are smooth.

Typically, the surface layer is dark grayish brown loam about 11 inches thick. The subsoil is friable clay loam about 22 inches thick. The upper part is grayish brown, the middle part is brown, and the lower part is pale brown, is calcareous, and has spots and streaks of soft lime that extend into the underlying material. The underlying material to a depth of 60 inches is pale yellow, calcareous clay loam containing accumulations of lime. In some of the swales, the soil is dark colored to a greater depth. In places, the underlying material is stratified. In some areas, the surface layer and subsoil contain more silt.

Included with this soil in mapping are small areas of Tetonka soils. These soils make up less than 15 percent of any one mapped area. They are poorly drained and are in depressions.

Permeability is moderate in the subsoil of the Clarno soil and moderately slow in the underlying material. Available water capacity is high. Organic-matter content and fertility also are high. Runoff is slow.

Almost all areas are farmed. This soil has good potential for cultivated crops, tame pasture and hay, windbreaks and environmental plantings, rangeland, and openland wildlife habitat. It has fair potential for most building sites and sanitary facilities.

This soil is well suited to cultivated crops. It has few limitations. Returning crop residue to the soil helps maintain fertility, improves tilth, and increases the infiltration rate.

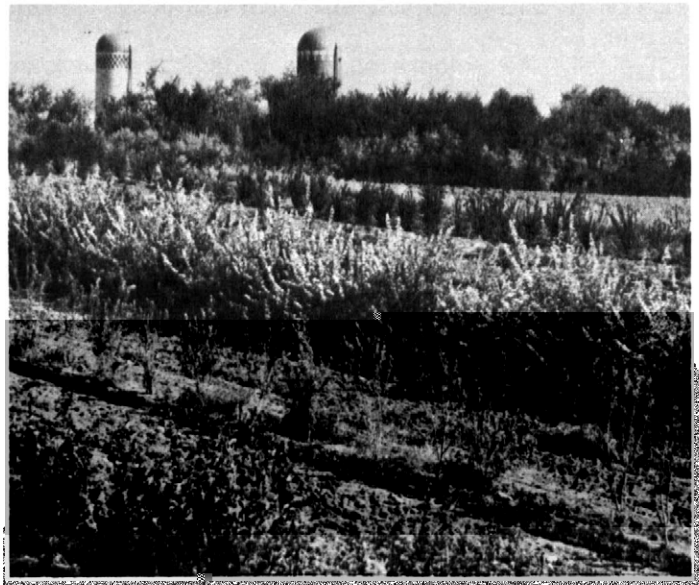
The soil is well suited to tame pasture and hay. Proper stocking rates, pasture rotation, timely deferment of grazing, and weed control help keep pastures in good condition.

This soil is well suited to windbreaks and environmental plantings. Competing vegetation prevents maximum tree growth. It can be controlled by timely cultivation and by herbicides.

This soil is well suited to rangeland. The native vege-

calcareous clay loam that has spots of lime. The underlying material to a depth of 60 inches is pale yellow, mottled, calcareous loam or clay loam that has accumulations of lime.

Included with these soils in mapping are small areas of Enet, Ethan, and Tetonka soils. These included soils make up less than 20 percent of any one mapped area. Enet soils have sand and gravel at a depth of 20 to 40 inches. Their position on the landscape is similar to that



contain more silt. In some areas, a water table is perched at a depth of 3 to 5 feet.

Typically, the Crossplain soil has a surface layer of dark gray clay loam about 14 inches thick. The subsoil is about 28 inches thick. It is gray, firm clay in the upper part and light brownish gray clay loam in the lower part. The underlying material to a depth of 60 inches is pale olive, calcareous clay loam that has accumulations of lime.

Typically, the Stickney soil has a dark grayish brown silt loam surface layer about 10 inches thick. The subsoil

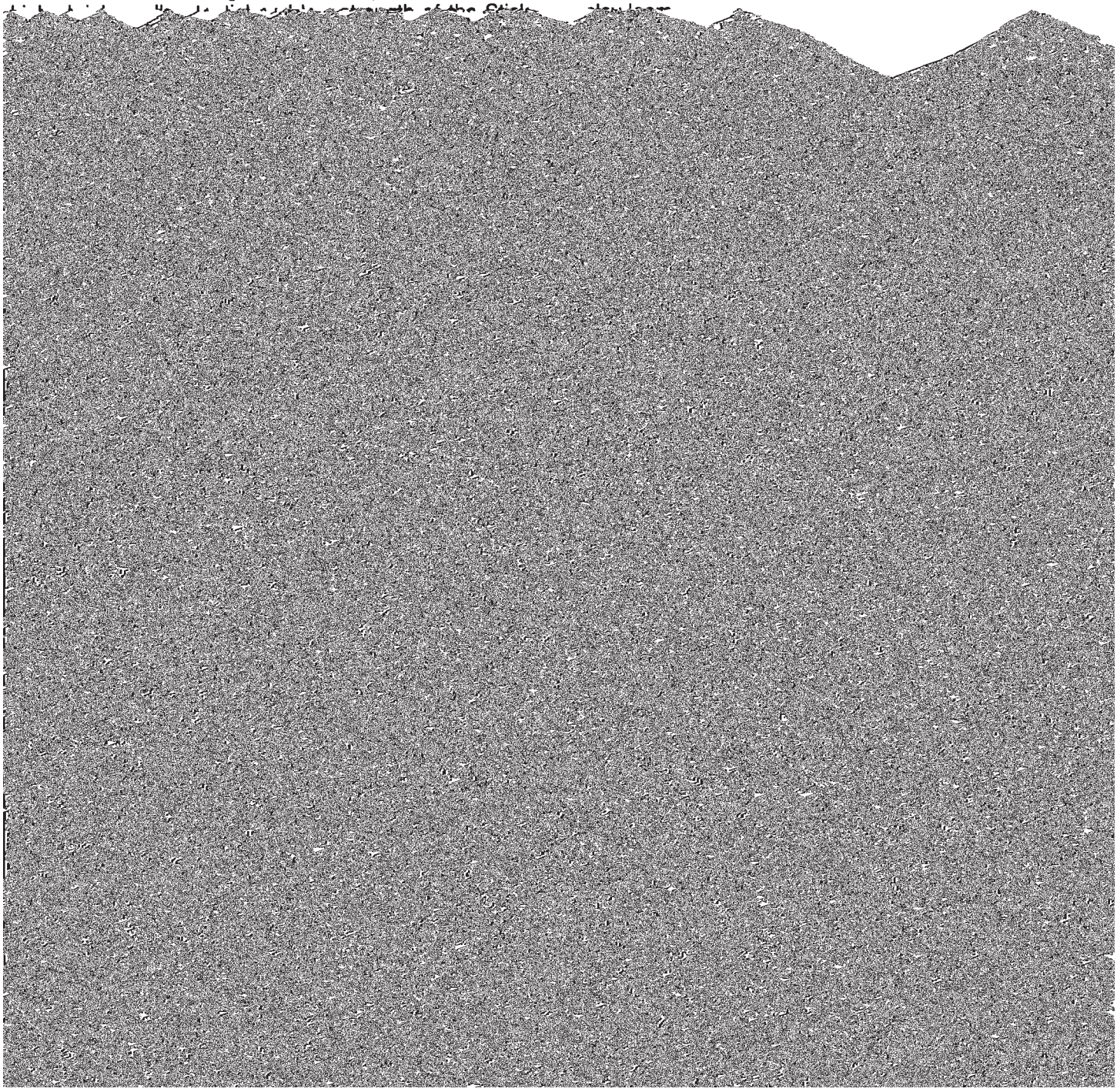
puddling of the surface layer. Proper stocking rates, pasture rotation, timely deferment of grazing, and weed control help keep pastures in good condition.

In most areas these soils are well suited to windbreaks and environmental plantings. Competing vegetation prevents maximum tree growth. It can be controlled by timely cultivation and by herbicides.

Buildings should be constructed only on the Clarno soil because of flooding on the Crossplain soil and the

pale olive, calcareous clay loam that has accumulations of lime.

Typically, the Tetonka soil has a dark gray silt loam surface layer about 10 inches thick. The subsurface layer is gray and dark gray silt loam about 7 inches thick. The subsoil is about 31 inches thick. The upper part is dark gray, friable silty clay loam; the lower part is dark gray and gray, firm silty clay. The underlying material to a depth of about 60 inches is grayish brown, mottled silty



Buildings should be constructed only on the Clarno soil because of flooding on the Crossplain and Tetonka soils. Reinforcing the footings and foundations helps overcome the moderate shrink-swell potential and low strength of the Clarno soil. If local roads are constructed across areas of these soils, the base material should be strengthened. Also, the roads should be graded to shed water. Additional drainage is needed on the Tetonka soil.

Septic tank absorption fields function adequately in the Clarno soil if they are enlarged to overcome the slow absorption rate. Sewage lagoons function well on all three soils. Those on Crossplain and Tetonka soils are protected from flooding by their own embankments. Capability unit IIw-1; Clarno soil in Silty range site, Crossplain soil in Overflow range site, Tetonka soil in Wetland range site.

CoE—Crofton-Boyd association, 15 to 40 percent slopes. These deep and moderately deep, well drained, moderately steep and steep soils are on upland ridges and along entrenched drainageways. Areas are irregularly shaped and range from 60 to several hundred acres in size. They are about 45 to 55 percent Crofton soil, 30 to 40 percent Boyd soil, and 15 percent minor soils. The Crofton soil is on the ridges and upper side slopes. The Boyd soil is on the mid and lower side slopes. The minor soils are in areas as much as 20 acres in size, but as a result of the potential of all the soils for various uses, separately mapping the larger areas of the Boyd soil and of the minor soils is not practical.

Typically, the Crofton soil has a surface layer of calcareous silt loam about 6 inches thick. The upper part is grayish brown, and the lower part is brown. Below the [illegible] have loose sand and gravel at a depth of 10 inches or less.

Permeability is moderate in the Crofton soil and slow or very slow in the Boyd soil. Available water capacity is high in the Crofton soil and low in the Boyd soil. Both soils are medium in fertility and moderate in content of organic matter. The shrink-swell potential and the susceptibility to landslides are high in the Boyd soil. Runoff is rapid on both soils.

All areas of these soils support native grass or native trees and are used for grazing. The Boyd soil has good potential and the Crofton soil fair potential for rangeland and rangeland wildlife habitat. Both soils have poor potential for cultivated crops, tame pasture and hay, openland wildlife habitat, and windbreaks and environmental plantings. They have poor potential for building sites and sanitary facilities.

These soils are best suited to rangeland. The native vegetation on the ridges and the upper slopes is a mixture of tall and mid grasses. The mid and lower slopes have an overstory of bur oak and green ash and an understory of mixed shrubs and mid and tall grasses. Management practices that maintain an adequate vegetative cover and ground mulch help prevent excessive soil losses and increase the infiltration rate. If rangeland is overgrazed, bluestems and other tall grasses are replaced by needleandthread, sideoats grama, and blue grama. A planned grazing system that includes proper grazing use and deferred grazing helps to maintain or improve the range condition and control erosion.

These soils are poorly suited to cultivated crops, windbreaks and environmental plantings, and tame pasture [illegible]

two soils occur as areas so closely intermingled or so small that it is not practical to separate them in mapping.

Typically, the Crofton soil has a surface layer of calcareous silt loam about 6 inches thick. The upper part is grayish brown, and the lower part is brown. Below the surface layer is a transitional layer of brown, friable, calcareous silt loam about 6 inches thick. The underlying material to a depth of 60 inches is light yellowish brown, calcareous silt loam. In places, the soil is not so silty.

Typically, the Nora soil has a surface layer of dark grayish brown silt loam about 7 inches thick. The subsoil is about 23 inches thick. It is brown, friable silt loam in the upper part and light olive brown, friable, calcareous silt loam in the lower part. The underlying material to a depth of 60 inches is light yellowish brown, calcareous silt loam. In places, the dark colors extend deeper than 20 inches. In some areas, lime is within a depth of 12 inches.

Included with these soils in mapping are small areas of Boyd, Ethan, and Talmo soils. These included soils make up less than 15 percent of any one mapped area. Boyd soils are on some of the lower side slopes. They contain more clay than the Crofton and Nora soils and formed in clayey shale. Ethan and Talmo soils are on some mid slopes and on small, convex rises or ridges lower on the landscape. Ethan soils contain more clay and sand than the Crofton and Nora soils and formed in glacial till. Talmo soils are underlain with sand and gravel at a depth of 10 inches or less.

Permeability is moderate and available water capacity

timely deferment of grazing, and weed control help keep pastures in good condition.

These soils are well suited to rangeland and woodland wildlife habitat. Providing winter food and cover improves the habitat for wildlife. Measures that exclude livestock or limit the number of livestock for all or part of the grazing season also improve the habitat.

These soils generally are too steep for buildings and most sanitary facilities. If roads are constructed in areas of these soils, the road cuts should be seeded to prevent excessive roadside erosion. Capability unit VIe-3; Crofton soil in Thin Upland range site, Nora soil in Silty range site.

DaB—Davis silt loam, 2 to 9 percent slopes. This deep, well drained, gently sloping and moderately sloping soil is on fans and foot slopes in the uplands (fig. 9). Individual areas of this soil range from 10 to 80 acres in size and are generally long and narrow.

contain more clay throughout than the Davis soil and are poorly drained. They are in flat areas on the lower parts of the landscape. Clarno soils are shallower to lime than the Davis soil and formed in glacial till. Ethan soils have a thinner surface layer than the Davis soil and have lime at or near the surface. Clarno and Ethan soils are on the steeper slopes and on slight rises.

Permeability is moderate in the Davis soil. Available water capacity is high. Organic-matter content and fertility also are high. Runoff is medium.

Most areas are native rangeland because this soil is on flat places closely associated with nonarable soils

Typically, the surface layer is dark grayish brown, calcareous loam about 12 inches thick. The underlying material to a depth of 60 inches is light gray sandy loam over very pale brown very fine sandy loam and loamy fine sand. In places, the underlying material is stratified, multicolored loamy, silty, and sandy sediment. In some areas, a buried soil is below a depth of 24 inches. In places, the soil is loam throughout and the depth to lime is as much as 30 inches.

Included with this soil in mapping are small areas of Clamo and Delmont soils. These soils make up less than 15 percent of any one mapped area. Clamo soils contain

areas of this unit range from 10 to several hundred acres in size. They are about 45 to 55 percent Egan soil and 20 to 30 percent Chancellor soil. The Egan soil is on the higher parts of the landscape, and the Chancellor soil is

be delayed during wet periods because of flooding on the Chancellor soil.

These soils are well suited to tame pasture and hay. Proper stocking rates, pasture rotation, timely deferment

in the underlying material. In some areas, clay loam glacial till is at a depth of 40 to 60 inches.

Typically, the Ethan soil has a surface layer of dark grayish brown, calcareous loam about 8 inches thick. The subsoil is about 8 inches of friable, calcareous loam. It is grayish brown in the upper part and pale brown in the lower part. The underlying material to a depth of 60 inches is pale brown and very pale brown, mottled, calcareous clay loam that has spots of lime. In places, the surface layer is lighter in color.

Typically, the Trent soil has a surface layer of dark grayish brown silty clay loam about 13 inches thick. The subsoil is friable silty clay loam about 32 inches thick. The upper part is grayish brown, and the lower part is light brownish gray, is calcareous, and has spots and streaks of soft lime that extend into the underlying material. The underlying material to a depth of 60 inches is pale yellow, mottled, calcareous clay loam. In places, strata of silt and very fine sand are in the underlying material.

Included with these soils in mapping are small areas of Chancellor soils. These included soils make up less than 10 percent of any one mapped area. They are somewhat poorly drained and are in the deeper swales.

Permeability is moderate in the subsoil and moderately slow in the underlying material of the Egan, Ethan, and Trent soils. Available water capacity is high. Organic-matter content and fertility are high in the Egan and Trent soils. In the Ethan soil, organic-matter content is moderate or moderately slow and fertility low or medium. Runoff is medium on all three soils. The Trent soil has a perched water table at a depth of 4 to 6 feet part of the year.

Nearly all areas of these soils are farmed. The soils have good potential for cultivated crops and rangeland. The Egan and Trent soils have good potential and the Ethan soil fair potential for tame pasture and hay, windbreaks and environmental plantings, and openland wildlife habitat. The Egan and Ethan soils have fair potential and the Trent soil poor potential for most building sites.

mum tree growth. It can be controlled by timely cultivation and by herbicides.

Though used as rangeland in very few areas, these soils are well suited to rangeland. The native vegetation is mainly a mixture of mid and tall grasses. If rangeland is overgrazed, the tall grasses lose vigor and are replaced by less palatable species.

Buildings should be constructed only on the Egan and Ethan soils because of flooding on the Trent soil. Reinforcing the footings and foundations helps overcome the moderate shrink-swell potential and low strength of the Egan and Ethan soils. If local roads are constructed across areas of the three soils, the base material should be strengthened. Also, the roads should be graded to shed water and thus prevent the damage caused by frost action.

Septic tank absorption fields function adequately in the Egan and Ethan soils if they are enlarged to overcome the slow absorption rate. Sewage lagoons function well on all three soils. Those on the Trent soil are protected from flooding by their own embankments. Sealing the bottom of lagoons helps prevent seepage. The undulating areas should be leveled and shaped. Capability unit IIe-3; Egan and Ethan soils in Silty range site, Trent soil in Overflow range site.

EbC—Egan-Ethan-Trent complex, 2 to 9 percent slopes. These deep, well drained and moderately well drained, undulating and gently rolling soils are on uplands. Scattered stones are on the surface of some knolls and ridges. Slopes generally are short and convex. Individual areas of this unit range from 15 to several hundred acres in size and are irregular in shape. They are about 35 to 45 percent Egan soil, 25 to 35 percent Ethan soil, and 15 percent Trent soil.

The Egan soil is on the smooth middle parts of the landscape. The Ethan soil is on the crests of convex ridges and knolls. The Trent soil is in swales and on foot slopes. It is subject to brief, rare or common flooding in periods of heavy rain or rapid snowmelt. The three soils

inches is pale brown and very pale brown, mottled, calcareous clay loam that has spots of lime.

Typically, the Trent soil has a surface layer of dark grayish brown silty clay loam about 13 inches thick. The subsoil is friable silty clay loam about 32 inches thick. The upper part is grayish brown, and the lower part is light brownish gray, is calcareous, and has spots and streaks of lime that extend into the underlying material. The underlying material to a depth of 60 inches is pale yellow, mottled, calcareous clay loam.

overgrazed, bluestems and needlegrasses are replaced by less palatable species. If overuse continues for many years, Kentucky bluegrass and weeds occupy the site.

Buildings should be constructed only on the Egan and Ethan soils because of flooding on the Trent soil. Reinforcing the footings and foundations helps overcome the moderate shrink-swell potential and low strength of the Egan and Ethan soils. If local roads are constructed across areas of the three soils, the base material should be strengthened. Also, the roads should be graded to

Permeability is moderate in the subsoil of the Egan soil and moderately slow in the underlying material. It is moderate through the Wentworth soil. Available water capacity is high in both soils. Organic-matter content and fertility also are high. Runoff is slow.

Almost all areas are farmed. These soils have good potential for cultivated crops, rangeland, windbreaks and environmental plantings, tame pasture and hay, and openland wildlife habitat. They have fair potential for most building sites and most sanitary facilities.

These soils are well suited to cultivated crops. Returning crop residue to the soil helps to maintain fertility, improve tilth, and increase the infiltration rate.

These soils are well suited to tame pasture and hay. Proper stocking rates, pasture rotation, timely deferment of grazing, and weed control help keep pastures in good condition.

These soils are well suited to windbreaks and environmental plantings. Competing vegetation prevents maximum tree growth. It can be controlled by timely cultivation and by herbicides.

These soils are well suited to rangeland, but very few areas are used as rangeland. The native vegetation is mainly a mixture of mid and tall grasses. If rangeland is overgrazed, the tall grasses lose vigor and are replaced by less palatable species.

Reinforcing the footings and foundations of buildings helps to prevent the structural damage caused by the low strength and shrinking and swelling of these soils. On sites for local roads and streets, the base material should be strengthened or replaced to help prevent the damage caused by frost action and low strength. Enlarging the absorption area of septic tank absorption fields helps overcome the slow absorption rate of these soils. Sewage lagoons function well on the Egan soil. Sealing the bottom and sides helps control seepage from the lagoons built in areas of the Wentworth soil. Capability unit I-2; Silty range site.

EcB—Egan-Wentworth silty clay loams, 2 to 6 percent slopes. These, deep, well drained, gently sloping soils are on uplands. Slopes are long and smooth. Individual areas of this unit range from 50 to 300 acres in size and are irregular in shape. They are about 45 to 55 percent Egan soil and 35 to 45 percent Wentworth soil. The Egan soil is on the upper parts of the landscape. The Wentworth soil is on the middle and lower parts of the landscape. The two soils occur as areas so closely intermingled or so small that it is not practical to separate them in mapping.

Typically, the Egan soil has a surface layer of dark grayish brown silty clay loam about 7 inches thick. The subsoil is friable silty clay loam about 21 inches thick. The upper part is brown; the middle part is pale brown; the lower part is light yellowish brown, is calcareous, and has spots and streaks of lime. The underlying material to a depth of 60 inches is pale yellow, mottled, calcareous clay loam.

Typically, the Wentworth soil has a surface layer of dark grayish brown silty clay loam about 10 inches thick. The subsoil is friable silty clay loam about 28 inches thick. The upper part is grayish brown, the middle part is brown, and the lower part is light olive brown and is calcareous. The underlying material to a depth of 60 inches is light yellowish brown silty clay loam. In places, strata of silt and very fine sand are below a depth of 50 inches.

Included with these soils in mapping are small areas of Clarno, Ethan, and Trent soils. These included soils make up less than 10 percent of any one mapped area. Clarno and Ethan soils are not so silty as the Egan and Wentworth soils and formed in glacial till. They generally are on the slight rises in areas where slopes are smooth. Trent soils are moderately well drained and are on toe slopes and in swales.

Permeability is moderate in the subsoil of the Egan soil and moderately slow in the underlying material. It is moderate through the Wentworth soil. Available water capacity is high in both soils. Organic-matter content and fertility also are high. Runoff is medium.

Almost all areas are farmed. These soils have good potential for cultivated crops, rangeland, windbreaks and environmental plantings, tame pasture and hay, and openland wildlife habitat. They have fair potential for most building sites and most sanitary facilities.

These soils are well suited to cultivated crops. The main concerns of management are controlling erosion and maintaining fertility. Returning crop residue to the soil improves fertility and tilth, helps to control erosion, and increases the infiltration rate. Because slopes are long and smooth, terraces can be constructed to help control erosion.

These soils are well suited to tame pasture and hay. Proper stocking rates, pasture rotation, timely deferment of grazing, and weed control help keep pastures in good condition.

These soils are well suited to windbreaks and environmental plantings. Competing vegetation prevents maximum tree growth. It can be controlled by timely cultivation and by herbicides.

These soils are well suited to rangeland, but very few areas are used as rangeland. The native vegetation is mainly a mixture of mid and tall grasses. If rangeland is overgrazed, the tall grasses lose vigor and are replaced by less palatable grasses.

Reinforcing the footings and foundations of buildings helps to prevent the structural damage caused by the low strength and shrinking and swelling of these soils. On sites for local roads and streets, the base material should be strengthened or replaced to help prevent the damage caused by frost action and low strength. Enlarging the absorption area of septic tank absorption fields helps overcome the slow absorption rate of these soils.

Sewage lagoons function well on the Egan soil. Sealing the bottom and sides helps control seepage from the lagoons built in areas of the Wentworth soil. Land shaping is needed in the steeper areas. Capability unit IIe-3; Silty range site.

EdA—Egan-Whitewood silty clay loams, 0 to 3 percent slopes. These deep, well drained and somewhat poorly drained, gently undulating soils are on uplands. Slopes are complex and short. Individual areas of this unit range from 15 to 375 acres in size. They are about 50 to 60 percent Egan soil and 25 to 35 percent Whitewood soil. The Egan soil is on the higher parts of the landscape. The Whitewood soil is in swales or on the lower parts of the landscape. It is subject to common, very brief flooding during periods of heavy rain or rapid snowmelt. The two soils occur as areas so closely intermingled or so small that it is not practical to separate them in mapping.

Typically, the Egan soil has a surface layer of dark grayish brown silty clay loam about 7 inches thick. The subsoil is friable silty clay loam about 21 inches thick. The upper part is brown; the middle part is pale brown; the lower part is light yellowish brown, is calcareous, and has spots and streaks of lime. The underlying material to a depth of 60 inches is pale yellow, mottled, calcareous clay loam. In places, the soil is wetter.

Typically, the Whitewood soil has a surface layer of dark grayish brown silty clay loam about 19 inches thick. The subsoil is silty clay loam about 23 inches thick. The upper part is dark grayish brown and is friable; the lower part is very dark grayish brown, dark grayish brown, and gray and is firm. The underlying material to a depth of 60 inches is gray and light brownish gray, mottled clay loam. In places, strata of silt and very fine sand are below a depth of 40 inches. In some areas, the subsoil contains more clay.

Included with these soils in mapping are small areas of Tetonka soils. These included soils make up less than 15 percent of any one mapped area. They contain more clay in the subsoil than the Egan and Whitewood soils. They are in small, enclosed depressions and are poorly drained.

Permeability is moderate in the subsoil of the Egan soil and moderately slow in the underlying material. It is moderately slow in the Whitewood soil. Available water capacity is high in both soils. Organic-matter content and fertility also are high. Runoff is slow. The Whitewood soil has a perched water table that fluctuates between the surface and a depth of 2 feet in most years.

Almost all areas are farmed. These soils have good potential for cultivated crops, rangeland, windbreaks and environmental plantings, and openland wildlife habitat. The Egan soil has good potential and the Whitewood soil fair potential for tame pasture and hay and for rangeland wildlife habitat. The Egan soil has fair potential and the Whitewood soil poor potential for most building sites and sanitary facilities.

These soils are suited to cultivated crops. The main concerns of management are the wetness of the Whitewood soil and maintenance of fertility in the Egan soil. Returning crop residue to the soil improves fertility and tilth and increases the infiltration rate. Planting and harvesting may be delayed on the Whitewood soil because of flooding and wetness.

These soils are well suited to tame pasture and hay. Proper stocking rates, pasture rotation, timely deferment of grazing, and weed control help keep pastures in good condition.

These soils are well suited to windbreaks and environmental plantings. Competing vegetation prevents maximum tree growth. It can be controlled by timely cultivation and by herbicides.

These soils are well suited to rangeland, but very few areas are used as rangeland. The native vegetation is mainly a mixture of mid and tall grasses. If rangeland is overgrazed, the tall grasses lose vigor and are replaced by less palatable species.

Buildings should be constructed only on the Egan soil because of flooding in the Whitewood soil. Reinforcing the footings and foundations helps overcome the moderate shrink-swell potential and low strength of the Egan soil. If local roads are constructed across areas of these soils, the base material should be strengthened or replaced. Also, the roads should be graded to shed water and thus prevent the damage caused by frost action and low strength.

Septic tank absorption fields function adequately in the Egan soil if they are enlarged to overcome the slow absorption rate. Sewage lagoons function well on both soils. Those located on the Whitewood soil are protected from flooding by their own embankments. Capability unit I-2; Egan soil in Silty range site, Whitewood soil in Subirrigated range site.

EhA—Enet-Delmont loams, 0 to 2 percent slopes. These nearly level, well drained and somewhat excessively drained soils are on high upland flats and stream terraces. The Enet soil is moderately deep to sand and gravel and the Delmont soil shallow to sand and gravel. Areas of these soils range from 5 to 80 acres in size and are irregular in shape. They are about 45 to 55 percent Enet soil and 30 to 40 percent Delmont soil. The two soils occur as areas so closely intermingled or so small that it is not practical to separate them in mapping.

Typically, the Enet soil has a surface layer of very dark gray loam about 8 inches thick. The subsoil is friable loam about 26 inches thick. The upper part is very dark grayish brown, and the lower part is dark brown. The underlying material to a depth of 60 inches is light brownish gray, calcareous, loose sand and gravel. Coatings of lime are on the gravel in the upper part. In

places, the soil has lime closer to the surface and is wetter.

Typically, the Delmont soil has a surface layer of very dark grayish brown loam about 7 inches thick. The subsoil is about 11 inches of very dark grayish brown, very friable loam. The underlying material to a depth of 60 inches is grayish brown and light yellowish brown, calcareous sand and gravel.

Included with these soils in mapping are small areas of Blendon, Clarno, and Thurman soils. These included soils make up less than 20 percent of any one mapped area. They occur in a random pattern throughout the map unit. Their underlying material is not sand and gravel.

Permeability is moderate in the subsoil of the Enet soil and rapid in the underlying material. It is moderately rapid in the subsoil of the Delmont soil and rapid in the underlying material. Available water capacity is moderate in the Enet soil and low in the Delmont soil. Organic-matter content and fertility are high in the Enet soil. Organic-matter content is moderate and fertility medium in the Delmont soil. Runoff is slow on both soils.

Almost all areas are farmed or used as rangeland. These soils have good potential for cultivated crops and fair potential for openland wildlife habitat. The Enet soil has good potential and the Delmont soil poor potential for rangeland and rangeland wildlife habitat. The Enet soil, the size of bare areas increases. Proper stocking rates, uniform grazing distribution, and timely deferment of grazing help keep the range and the soil in good condition.

These soils are well suited to building site development, but the sides of shallow excavations can cave in. Septic tank absorption fields function well on these soils, but the effluent from all sanitary facilities can pollute shallow ground water. The Delmont soil is a good source of sand and gravel. Capability unit IIs-3; Enet soil in Silty range site, Delmont soil in Shallow to Gravel range site.

EhB—Enet-Delmont loams, 2 to 6 percent slopes. These well drained and somewhat excessively drained, gently sloping soils are on stream terraces and outwash plains. The Enet soil is moderately deep to sand and gravel and the Delmont soil shallow to sand and gravel. Slopes generally are short and slightly convex. Individual areas range from 5 to 80 acres in size and are irregular in shape. They are about 40 to 50 percent Enet soil and 35 to 45 percent Delmont soil. The two soils occur as areas so closely intermingled or so small that it is not practical to separate them in mapping.

Typically, the Enet soil has a surface layer of very dark gray loam about 8 inches thick. The subsoil is friable loam about 26 inches thick. The upper part is very dark grayish brown, and the lower part is dark brown. The

Delmont soil fair potential for tame pasture and hay. Both soils have good potential for most building sites and poor potential for most sanitary facilities.

These soils are better suited to small grain and tame pasture and hay than to row crops. The main concerns of management are conserving moisture and controlling

Included with this soil in mapping are small areas of Talmo soils. These soils make up less than 10 percent of any one mapped area. They have loose sand and gravel at a depth of 10 inches or less. They occur in a random pattern throughout the map unit.

Permeability is moderate in the subsoil of the Ethan

mottled, calcareous clay loam that has spots of lime. In places, the underlying material has strata of sand and small pebbles. In areas that are heavily wooded, the surface layer is thicker and darker. In some areas, the depth to lime is greater.

Typically, the Betts soil has a surface layer of grayish brown, calcareous loam about 3 inches thick. Next is a transitional layer of pale brown, friable, calcareous clay loam about 5 inches thick. The underlying material to a depth of 60 inches is light brownish gray, light gray, and pale yellow, calcareous clay loam. In places, strata of sand and small pebbles are in the lower part of the soil.

Included with these soils in mapping are small areas of Davis, Gavins, Roxbury, and Talmo soils. These included soils make up less than 20 percent of any one mapped area. Davis soils have a thicker surface layer than the Ethan and Betts soils. They are on toe slopes and in the less sloping areas. Gavins soils have soft chalk rock at a depth of 20 inches or less. Roxbury soils are more silty throughout than the Ethan and Betts soils. They are on terraces adjacent to drainageways. Talmo soils have loose sand and gravel at a depth of 10 inches or less. Like the Gavins soils, they occur in a random pattern throughout the map unit. Also included are areas of shale outcrop on some of the steeper breaks and side slopes.

Permeability is moderate in the subsoil of the Ethan and Betts soils and moderately slow in the underlying material. Available water capacity is high in both soils. Organic-matter content is moderate or moderately low in the Ethan soil and low in the Betts soil. Fertility is low or medium in the Ethan soil and low in the Betts soil. Runoff is rapid on both soils.

Most areas support native grass and are used for grazing. A few trees are in some drainageways. These soils have poor potential for cultivated crops, tame pasture and hay, windbreaks and environmental plantings, and openland wildlife habitat. The Ethan soil has good potential and the Betts soil fair potential for rangeland and rangeland wildlife habitat. Both soils have poor potential for building sites and sanitary facilities.

These soils are best suited to rangeland. The native vegetation is a mixture of mid and short grasses. The major problem of range management is erosion. Management that maintains an adequate vegetative cover and ground mulch helps prevent excessive soil losses and improves the moisture supply by reducing the runoff rate. If rangeland is overgrazed, bluestems and other tall species are replaced by needleandthread and sideoats grama. If overuse continues for many years, Kentucky bluegrass and weeds occupy the site. Proper stocking rates, uniform grazing distribution, timely deferment of grazing, and a planned grazing system help keep the range and the soil in good condition. Some of the

plantings. The native trees on the side slopes and in the draws provide habitat for such woodland wildlife as deer and squirrels.

These soils are too steep for buildings and sanitary facilities. If roads are constructed in areas of these soils, the road cuts should be seeded to prevent excessive roadside erosion. Capability unit VIIe-1; Ethan soil in Silty range site, Betts soil in Thin Upland range site.

EnC—Ethan-Bonilla loams, 3 to 9 percent slopes. These deep, well drained and moderately well drained, gently sloping and gently rolling soils are on uplands. Slopes are single or complex and are short. They generally are along drainageways, or they enclose the shorter drainageways. Individual areas of these soils range from 5 to 80 acres in size and are long and narrow. They are about 50 to 60 percent Ethan soil and 20 to 30 percent Bonilla soil.

The Ethan soil is on the mid and upper side slopes and on the tops of knobs. The Bonilla soil is on the toe slopes and in the broader swales. It is commonly flooded during periods of heavy rain or rapid snowmelt. The two soils occur as areas so closely intermingled or so small that it is not practical to separate them in mapping.

Typically, the Ethan soil has a surface layer of dark grayish brown, calcareous loam about 8 inches thick. The subsoil is about 8 inches of friable, calcareous loam. It is grayish brown in the upper part and pale brown in the lower part. The underlying material to a depth of 60 inches is pale brown and very pale brown, mottled, calcareous clay loam that has spots of lime. In places, the underlying material has strata of sand and small pebbles. In some areas, the depth to lime is greater.

Typically, the Bonilla soil has a surface layer of dark grayish brown loam about 7 inches thick. The subsoil is about 33 inches thick. The upper part is dark grayish brown, friable loam; the middle part is grayish brown and brown, firm clay loam; the lower part is pale olive, firm, calcareous clay loam that has spots of lime. The underlying material to a depth of 60 inches is pale yellow, mottled, calcareous loam or clay loam that has accumulations of lime.

Included with these soils in mapping are small areas of Crossplain and Thurman soils. These included soils make up less than 15 percent of any one mapped area. Crossplain soils are somewhat poorly drained and are in entrenched swales. Thurman soils contain more sand in the underlying material than the Ethan and Betts soils. They are on knobs and the upper slopes.

Permeability is moderate in the subsoil of the Ethan and Betts soils and moderately slow in the underlying material. Available water capacity is high in both soils. Organic-matter content is moderate or moderately low in

3 to 6 feet part of the year. Runoff is medium on both soils.

Most areas are farmed. These soils have fair potential for cultivated crops and good potential for rangeland. The Ethan soil has fair potential and the Bonilla soil good potential for tame pasture and hay and for windbreaks and environmental plantings. The Ethan soil has poor potential and the Bonilla soil good potential for openland wildlife habitat. The Ethan soil has good potential and the Bonilla soil fair potential for rangeland wildlife.

the slow absorption rate. The Bonilla soil is flooded too frequently to be used as a septic tank absorption field. Sewage lagoons function well on both soils, but considerable land shaping may be necessary on the Ethan soil. The lagoons in the Bonilla soil are protected from flooding by their own embankments. They should be sealed to prevent seepage. Capability unit IVe-2; Silty range site.

EoD—Ethan-Davis loams, 9 to 15 percent slopes. These deep, well drained, rolling and strongly sloping

for windbreaks and environmental plantings. The Davis soil has good potential for tame pasture and hay, for windbreaks and environmental plantings, and for openland wildlife habitat. Both soils have fair potential for most building sites and sanitary facilities.

These soils are well suited to rangeland. The native vegetation is a mixture of tall and mid grasses. The main concerns of management are conserving moisture and controlling erosion. Management that maintains an adequate vegetative cover and ground mulch helps prevent excessive soil losses and improves the moisture supplying capacity by reducing the runoff rate. Overgrazing reduces the protective vegetative cover and causes deterioration of the plant community. Under these conditions, bluestems and needlegrasses decrease in extent and are replaced by less palatable species. If overuse continues for many years, Kentucky bluegrass and weeds occupy the site. Proper stocking rates, uniform grazing distribution, timely deferment of grazing, and a planned grazing system help keep the range in good condition. Some areas are suitable sites for reservoirs.

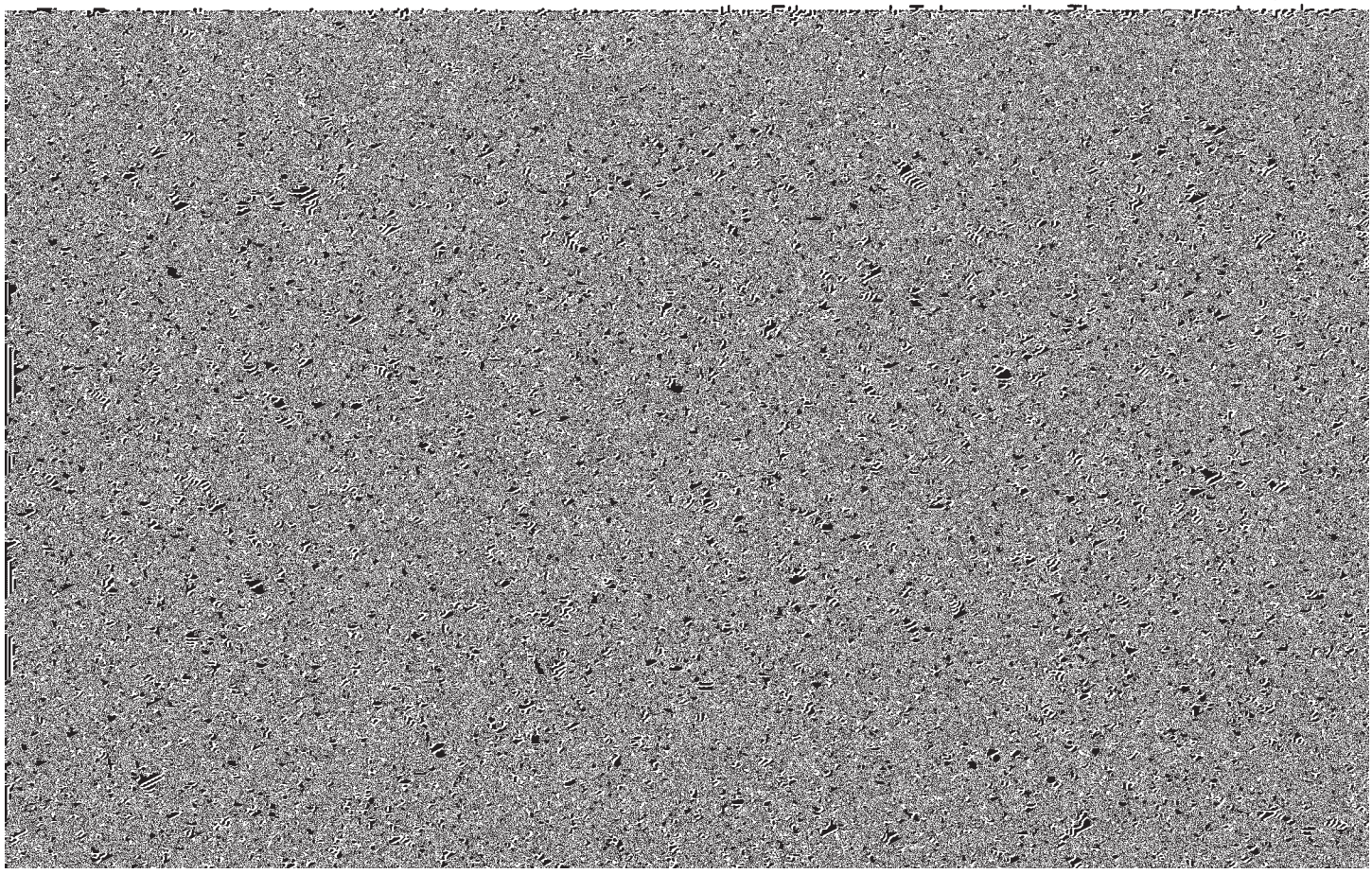
These soils are suited to tame pasture and hay, but careful management is needed to control erosion. Proper stocking rates, pasture rotation, timely deferment of grazing, and weed control help keep the pasture in good condition.

areas of this unit range from 10 to 50 acres in size and are irregular in shape. They are about 40 to 50 percent Ethan soil and 30 to 40 percent Talmo soil. The two soils occur as areas so closely intermingled or so small that it is not practical to separate them in mapping.

Typically, the Ethan soil has a surface layer of dark grayish brown, calcareous loam about 4 inches thick. The subsoil is about 12 inches of friable, calcareous loam. It is grayish brown in the upper part and pale brown in the lower part. The underlying material to a depth of 60 inches is pale brown and very pale brown, mottled, calcareous clay loam that has spots of lime. In places, the underlying material has thin strata of sand and small pebbles. On some of the ridges, the surface layer is thinner. In some of the less sloping areas, the depth to lime is greater.

Typically, the surface layer of the Talmo soil is about 9 inches thick. It is very dark grayish brown loam in the upper part and dark grayish brown, very friable, calcareous gravelly loam in the lower part. The underlying material to a depth of 60 inches is brown, calcareous sand and gravel.

Included with these soils in mapping are small areas of Davis, Delmont, and Thurman soils. These included soils make up less than 20 percent of any one mapped area. Davis soils have a thicker and darker surface layer than



less palatable species. If overgrazing is severe, weeds are established or the surface is bare. Establishing vegetation is difficult in overgrazed areas. The bare areas are subject to soil blowing. Proper stocking rates, uniform grazing distribution, timely deferment of grazing, and a planned grazing system help keep the range in good condition.

These soils are poorly suited to cultivated crops and windbreaks and environmental plantings. The Ethan soil is excessively steep, and the Talmo soil is too shallow to sand and gravel.

These soils are not well suited to tame pasture. The Ethan soil is too steep and the Talmo soil too shallow to sand and gravel. The Talmo soil produces very little pasture grass. The Ethan soil is susceptible to erosion

Permeability is very slow in the Forney soil. Available water capacity is moderate. Organic-matter content also is moderate, and fertility is medium. The shrink-swell potential is high. Runoff is very slow. This soil has a water table at a depth of 1 to 3 feet most of the year.

Almost all areas of this soil are farmed. The soil has good potential for rangeland, tame pasture and hay, windbreaks and environmental plantings, and openland wildlife habitat. It has fair potential for cultivated crops and rangeland wildlife habitat. It has poor potential for building sites and most sanitary facilities.

This soil is suited to cultivated crops. Returning crop residue to the soil improves tilth and fertility and increases the infiltration rate. Avoiding fieldwork when the soil is wet helps to prevent puddling of the soil. Planting

more clay in the surface layer and subsoil than the Grable soil.

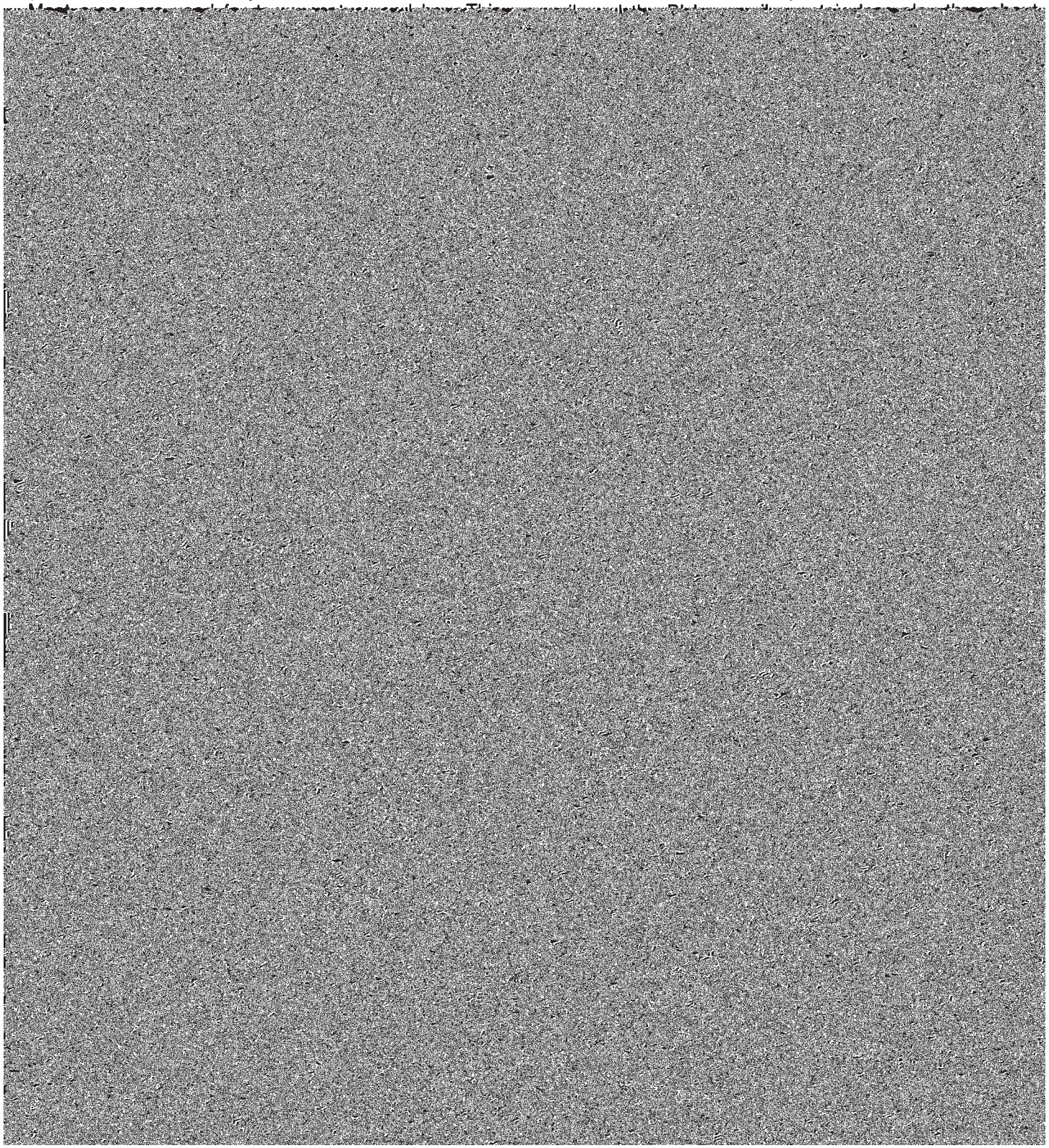
Permeability is moderate in the upper part of the

the landscape is similar to that of the Graceville soil. The Wentworth soils are on adjacent uplands.

Permeability is moderate in the upper part of the Gra-

Included with this soil in mapping are small areas of [illegible] soils contain more clay than the Haynie soil. The Onawa

are high. The shrink-swell potential also is high. Runoff is very slow. This soil has a water table that is within a depth of 1 foot most of the year.



than 15 percent of any one mapped area. They occur in a random pattern throughout the map unit. The Blencoe soils are shallower to loamy material than the Lakeport

Salmo soils contain visible salts. They are on the slightly lower parts of the landscape.

Permeability is moderately slow in the Lamo soil. Available water capacity is high. Organic-matter content and fertility also are high. Runoff is slow. This soil has a water table at a depth of 2 to 3 feet most of the year.

Most areas are farmed. If drained, this soil has good potential for cultivated crops, tame pasture and hay, windbreaks and environmental plantings, rangeland, and openland wildlife habitat. It has fair potential for rangeland wildlife habitat and poor potential for building sites and sanitary facilities.

This soil is well suited to cultivated crops. The main concern of management is the seasonal wetness caused and in content of organic matter, but it is difficult to work because tilth is poor. The soil shrinks or swells markedly during dry and wet periods. Runoff is very slow. The water table is within a depth of 1 foot most of the year.

Almost all areas are farmed. This soil has fair potential for cultivated crops, rangeland, and rangeland wildlife habitat. It has good potential for tame pasture, hay, windbreaks and environmental plantings, and openland wildlife habitat. The potential for building sites and most sanitary facilities is poor.

This soil is suited to cultivated crops. The main concern of management is excess water. Planting and harvesting may be delayed during wet periods. Crop residue management improves water intake and tilth.

This soil is poorly suited to building site development. Roads built across areas of this soil should be graded to help prevent the damage caused by flooding and wetness. Also, the base material should be replaced or strengthened to overcome the low strength. Sewage lagoons function well; their embankments provide protection from flooding. The soil is poorly suited to all other sanitary facilities because of flooding. Capability unit IIIw-2; Wetland range site.

Ld—Luton silty clay, depressional. This deep, very poorly drained, nearly level soil is in former backwater areas on bottom land along the Missouri River. It is commonly flooded for long periods. Areas are long and narrow and range from 5 to 80 acres in size.

Typically, the surface layer is very dark gray silty clay about 16 inches thick. The subsoil is about 34 inches of dark gray and gray, firm silty clay. It is calcareous in the

Because of flooding and wetness, this soil is not suited to building site development. Roads built across areas of this soil should be graded to help prevent the damage caused by flooding and wetness. Also, the base material should be replaced or strengthened to overcome low strength. Sewage lagoons function well on this soil; their embankments provide protection from flooding. The soil is poorly suited to all other sanitary facilities because of flooding. Capability unit Vw-2; Wetland range site.

Oa—Onawa silty clay. This deep, somewhat poorly drained, nearly level soil is in low areas near the present channel of the Missouri River. Common, brief flooding is a hazard, but it occurs only as local runoff; Gavins Point Dam holds back the potential floodwater in the Missouri River. Areas of this soil range from 10 to 300 acres in size and are generally long and broad.

ing, and weed control help keep pastures in good condition.

Buildings constructed on this soil should be protected from local flooding. Also, the foundations and footings should be reinforced to prevent the structural damage caused by shrinking and swelling of the soil. Ground water can seep into basements during wet periods. If roads are constructed across areas of this soil, the base material should be strengthened or replaced. Also, the roads should be graded to shed water. The effluent from sewage lagoons and septic tank absorption fields can pollute ground water because of the moderately permeable underlying material. Capability unit IIw-3; Clayey range site.

Ob—Owego silty clay loam. This deep, somewhat poorly drained, nearly level soil is on the lower parts of the bottom land along the Missouri River. It is commonly flooded during periods of heavy rain or rapid snowmelt. The flooding occurs only as local runoff; Gavins Point Dam holds back the potential floodwater in the Missouri

delayed during wet periods. Maintaining adequate cover during dry, windy periods helps control soil blowing.

This soil is well suited to windbreaks and environmental plantings. Competing vegetation prevents maximum tree growth. It can be controlled by timely cultivation and by herbicides.

This soil is well suited to tame pasture and hay. Proper stocking rates, pasture rotation, timely deferment of grazing, and weed control help keep pastures in good condition.

Buildings constructed on this soil should be protected from local flooding. Also, the foundations and footings should be reinforced to prevent the structural damage caused by the shrinking and swelling of the soil. Ground water can seep into basements during wet periods. If roads are constructed across areas of this soil, the base material should be strengthened or replaced. Also, the roads should be graded to shed water. The effluent from sewage lagoons and septic tank absorption fields can pollute ground water because of the very slowly permeable underlying material. Capability unit IIIw-3; Subirrigat-

part and yellow in the lower part. In places, bedrock is at a depth of 20 to 40 inches.

Included with this soil in mapping are small areas of Davis soils on foot slopes. These soils make up less

Rb—Roxbury loam, channeled. This deep, moderately well drained, nearly level soil is on stream terraces along the major creeks. A meandering channel is in the lower part of the mapped areas. The soil is commonly

Rc—Roxbury silt loam. This deep, moderately well drained, nearly level soil is on stream terraces and alluvial fans along the major creeks. It is commonly flooded for brief periods. Areas of this soil range from 10 to several hundred acres in size and generally are long and broad.

Typically, the surface layer is dark grayish brown, calcareous silt loam about 12 inches thick. The subsoil is about 12 inches of grayish brown, very friable silty clay loam. The underlying material to a depth of 60 inches is silty clay loam. It is grayish brown and very pale brown in the upper part and dark gray in the lower part. In places, the content of clay and silt is lower throughout. In some areas, the depth to lime is greater.

Included with this soil in mapping are small areas of Baltic, Grable, and Salmo soils. Baltic and Salmo soils are in the lower lying areas, and Grable soils are in a position on the landscape that is similar to that of the Roxbury soil. Baltic soils contain more clay throughout than the Roxbury soil and are not so well drained. Grable soils are underlain by fine sand. Salmo soils have visible salts at the surface and are not so well drained as the Roxbury soil.

Permeability is moderate in the Roxbury soil. Available water capacity is high. Organic-matter content and fertility also are high. Runoff is slow. This soil has a seasonal high water table at a depth of 3 to 5 feet.

Almost all areas are farmed. This soil has good potential for cultivated crops, tame pasture and hay, range-

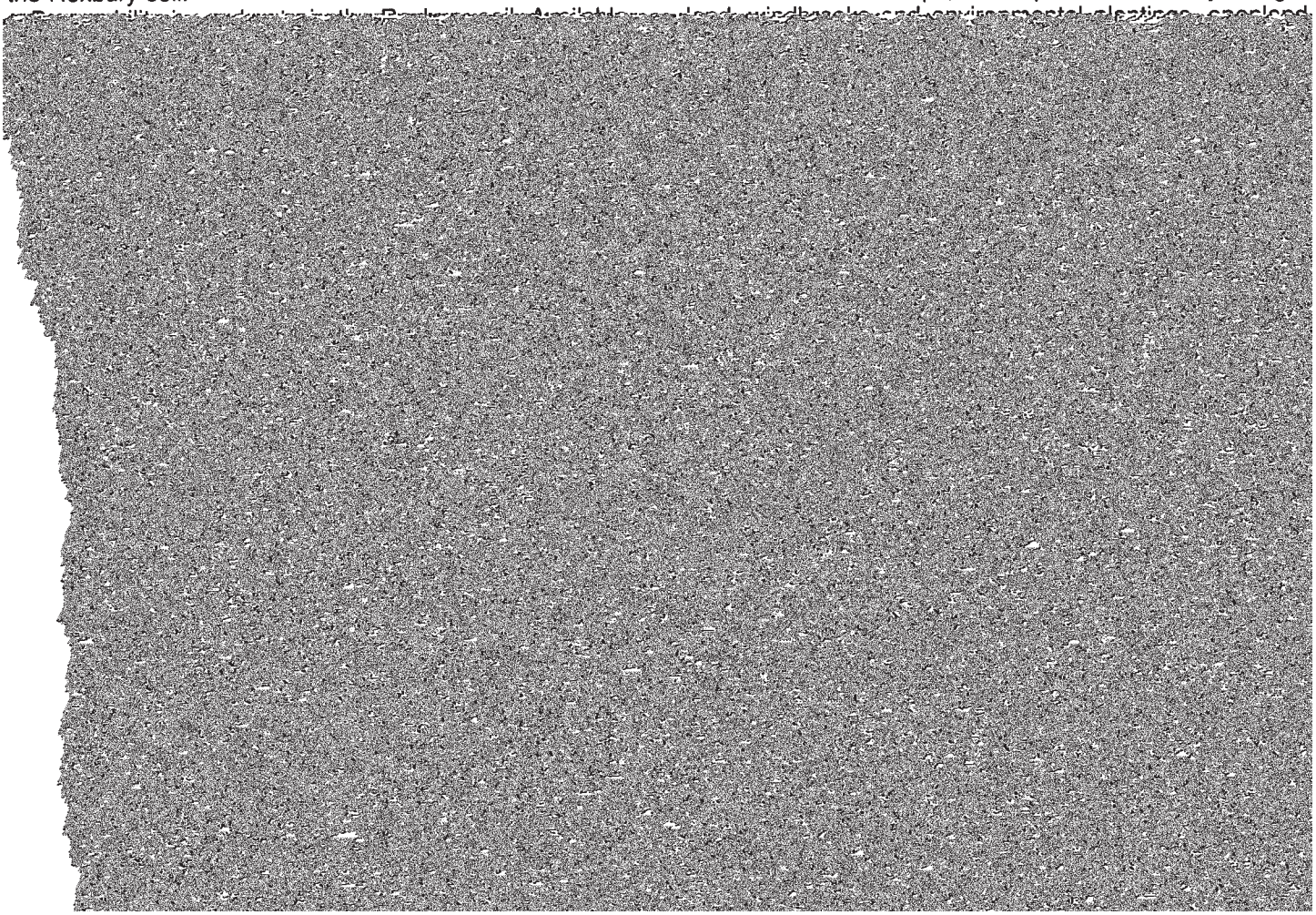
hazard, but it occurs only as local runoff; Gavins Point Dam holds back the potential floodwater in the Missouri River. Areas of this soil range from 20 to 200 acres in size and are irregular in shape.

Typically, the surface layer is dark gray silty clay loam about 16 inches thick. The subsoil is about 18 inches of dark gray, dark grayish brown, and light brownish gray, very friable silty clay loam. It is calcareous in the lower part. The underlying material to a depth of 60 inches is light gray silt loam over light gray very fine sandy loam. In places, the content of clay is higher throughout.

Included with this soil in mapping are small areas of Blencoe and Blyburg soils. These soils make up less than 10 percent of any one mapped area. They occur in a random pattern throughout the map unit. Blencoe soils contain more clay in the upper part than the Salix soil. Blyburg soils contain less clay in the upper part.

Permeability is moderate in the Salix soil. Available water capacity is high. Organic-matter content and fertility also are high. Runoff is slow. This soil has a seasonal high water table at a depth of 3 to 5 feet.

Almost all areas are farmed. This soil has good potential for cultivated crops, tame pasture and hay, range-



Typically, the surface layer is dark gray, calcareous silty clay loam about 3 inches thick. It has nests of salts. The subsurface layer is about 17 inches of very dark gray, firm, calcareous silty clay loam that has nests of salts. The underlying material to a depth of 60 inches is dark gray and has nests of salts throughout. It is silty clay loam in the upper part and silty clay in the lower part. In places, lime is leached deeper than 24 inches. Some areas have 10 to 20 inches of salt-free silt loam overwash. In some areas, sand and gravel is at a depth of 30 to 60 inches.

Included with this soil in mapping are small areas of Bon and Roxbury soils on the slightly higher parts of the landscape. These soils make up less than 15 percent of any one mapped area. They do not have salts and are better drained than the Salmo soil.

Permeability is moderately slow in the Salmo soil. Available water capacity is high. Organic-matter content also is high, and fertility is medium. Runoff is slow. The seasonal high water table is within a depth of 2.5 feet.

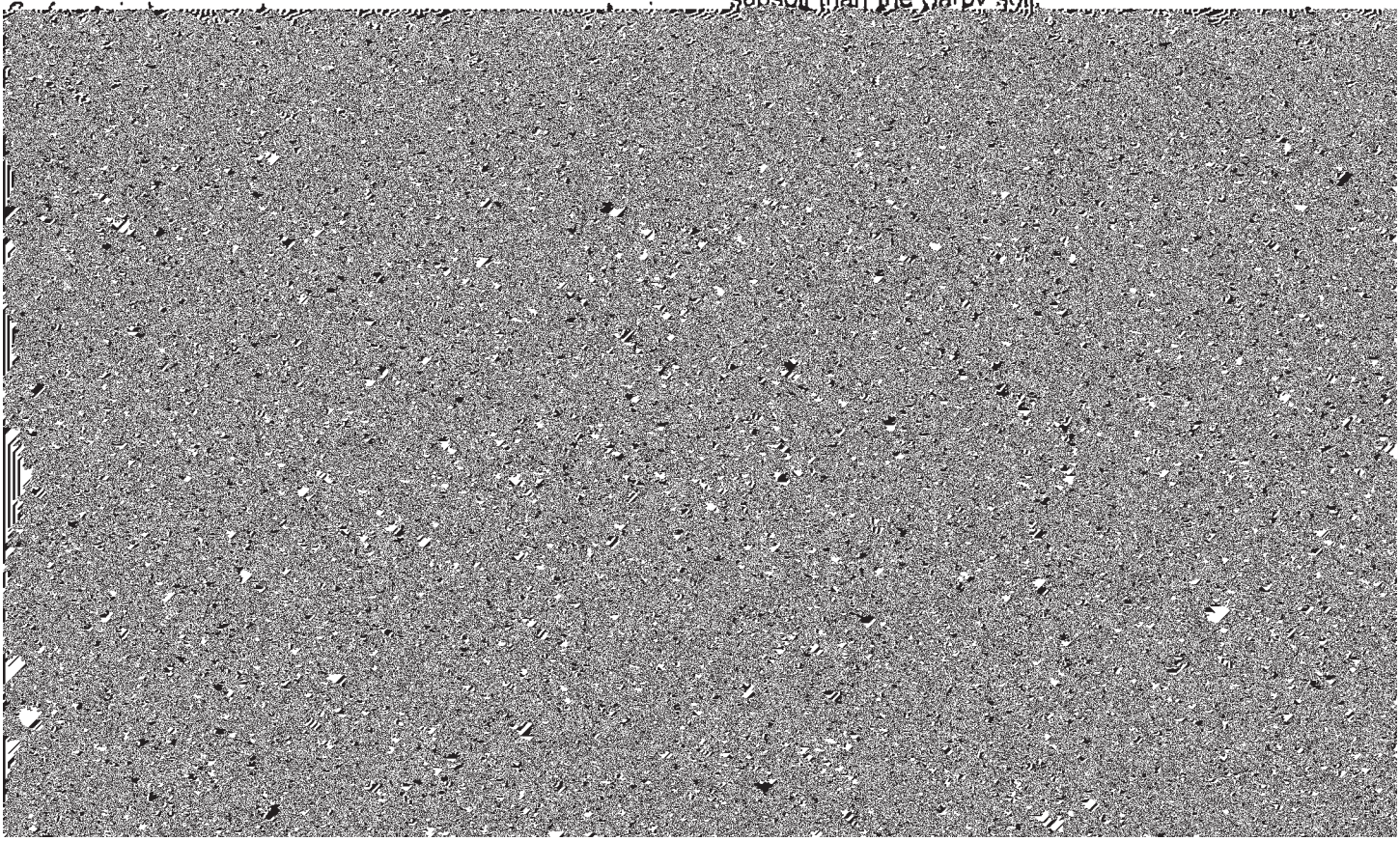
Almost all areas are rangeland. A few areas are farmed. This soil has poor potential for cultivated crops, windbreaks and environmental plantings, and openland wildlife habitat. It has fair potential for tame pasture and hay, rangeland, and rangeland wildlife habitat. The potential is poor for building sites and sanitary facilities.

This soil generally is too wet for most cultivated crops.

SdA—Sarpy loamy fine sand, 0 to 3 percent slopes. This deep, excessively drained, nearly level and gently undulating soil is on the bottom land adjacent to the Missouri River. Gavins Point Dam prevents major floods, but flooding frequently occurs during periods of high discharge from the dam. Areas of this soil range from 10 to 150 acres in size and generally follow the course of the river channel.

Typically, the surface layer is grayish brown, calcareous loamy fine sand about 9 inches thick. The underlying material to a depth of 60 inches is light brownish gray fine sand. In some places, as much as 25 percent of the surface layer is silty clay. In other places, thin strata of fine material are directly below the surface layer. In some areas, the soil is unstable and lacks a plant cover. In other areas, the seasonal high water table is within 5 feet of the surface.

Included with this soil in mapping are small areas of Blake, Haynie, and Onawa soils. These soils make up less than 15 percent of any one mapped area. Blake soils contain more clay throughout than the Sarpy soil. Their position on the landscape is similar to that of the Sarpy soil. Haynie soils are not so sandy as the Sarpy soil and contain more silt throughout. Their position on the landscape is similar to that of the Sarpy soil. Onawa soils are in the lower positions, such as small meander scars. They contain more clay in the surface layer and subsoil than the Sarpy soil.



nel and have an overstory of cottonwood and black willow. Management that maintains an adequate vegetative cover and ground mulch helps prevent excessive soil blowing and provides food and shelter for openland and woodland wildlife.

The flooding generally is too frequent for this soil to be suitable as a site for buildings or sanitary facilities. The effluent from all sanitary facilities can pollute the ground water. Capability unit IVs-1; Sands range site.

SeA—Sarpy-Grable complex, 0 to 4 percent slopes. These deep, nearly level and gently undulating, exces-

habitat. Both soils have poor potential for building sites and sanitary facilities.

The main concerns in farming these soils are controlling soil blowing and conserving moisture. Crop residue management, stripcrops, and field windbreaks help control soil blowing and conserve moisture. A cropping system in which grasses and legumes are grown during most years also helps to control soil blowing and improves fertility.

These soils are suited to tame pasture and hay. Species that are suited to a sandy soil that is low in fertility and droughty should be grown. Proper stocking rates

till and occur in a random pattern throughout the map unit.

Permeability is rapid in the Talmo and Thurman soils. Available water capacity is low in the Talmo soil and moderate in the Thurman soil. Organic-matter content is moderately low and fertility low in the Talmo soil. Organic-matter content is moderate and fertility medium in the Thurman soil. Runoff is slow on both soils.

Most areas support native grass. These soils have poor potential for cultivated crops, tame pasture and hay, windbreaks and environmental plantings, and openland wildlife habitat. The Talmo soil has poor potential and the Thurman soil good potential for rangeland and rangeland wildlife habitat. Both soils have poor potential for building sites and sanitary facilities.

These soils are best suited to rangeland. Because the Talmo soil is somewhat droughty, reestablishing vegetation is difficult in overgrazed areas. Management that maintains an adequate vegetative cover and ground mulch helps prevent excessive soil loss. If rangeland is overgrazed, the taller grasses are replaced by less productive, less palatable species. If overgrazing continues, Kentucky bluegrass and weeds dominate. Proper stocking rates, uniform grazing distribution, and timely deferment of grazing help keep the range and the soil in good condition.

These soils are too steep for cultivated crops, tame pasture and hay, and windbreaks and environmental plantings. Evergreen trees are the best windbreak and

near the surface and contain less clay in the subsoil than the Tetonka soil.

Permeability is very slow in the Tetonka soil. Available water capacity is high. The shrink-swell potential is high in the subsoil and underlying material. Organic-matter content is moderate, and fertility is medium. Runoff is very slow, and the soil is ponded in the spring. The seasonal high water table is perched within a depth of 1 foot.

Most of the less depressional areas are farmed or are used for tame pasture or hay. Some of the more depressional areas support native vegetation. If drained, this soil has good potential for cultivated crops and tame pasture and hay; fair potential for rangeland, rangeland wildlife habitat, and wetland wildlife habitat; and poor potential for windbreaks and environmental plantings and for openland wildlife habitat. If undrained, it has fair potential for crops, rangeland, rangeland wildlife habitat, tame pasture and hay, and wetland wildlife habitat and poor potential for windbreaks and environmental plantings and openland wildlife habitat. The potential for building sites and most sanitary facilities is poor.

This soil is suited to cultivated crops if it is drained. The main concern of management is the wetness caused by flooding after rains. Surface drainage systems help remove excess water. Planting and harvesting usually are delayed during wet periods. Undrained areas are poorly suited to crops.

This soil is well suited to tame pasture and hay if it is

ageways and on undulating knolls on the till plain. Slopes are single or complex. Individual areas of this unit range from 20 to 100 acres in size and are irregular in shape. They are about 40 percent Thurman soil and 35

ing, and weed control help keep pastures in good condition.

These soils are suited to windbreaks and environmental plantings, but optimum growth should not be expect-

mottled silty clay loam. In places, the underlying material has strata of silt and very fine sand.

Included with this soil in mapping are small areas of Whitewood and Chancellor soils. These soils make up less than 15 percent of any one mapped area. They are not so well drained as the Trent soil and are lower on the landscape. In addition, Chancellor soils contain more clay in the subsoil.

Permeability is moderate in the Trent soil. Available

gray, mottled silty clay. In places, the soil is not so deep to silty clay. In some areas, the surface layer contains more clay.

Included with this soil in mapping are small areas of Forney, Haynie, Onawa, and Sarpy soils. These soils make up less than 15 percent of any one mapped area. Forney soils contain more clay throughout than the Waubonsie soil. Haynie soils are silty throughout. Onawa soils are clayey in the upper part and silty and sandy in

strata of silt and very fine sand are below 50 inches. In other areas, the darker colors are at a greater depth.

Included with this soil in mapping are small areas of Chancellor and Tetonka soils. These soils make up less than 15 percent of any one mapped area. They are more poorly drained than the Wentworth soil and contain more clay. Chancellor soils are in entrenched swales, and Tetonka soils are in enclosed depressions.

Permeability is moderate in the Wentworth soil. Available water capacity is high. The shrink-swell potential is moderate. Organic-matter content and fertility are high. Runoff is slow.

Almost all areas are farmed. This soil has good potential for cultivated crops, rangeland, tame pasture and hay, windbreaks and environmental plantings, openland wildlife habitat, and rangeland wildlife habitat. It has fair potential for most building sites and sanitary facilities.

This soil is well suited to cultivated crops. It has few limitations. Returning crop residue to the soil helps maintain fertility, improves tilth, and increases the infiltration rate.

The soil is well suited to tame pasture and hay. Proper stocking rates, pasture rotation, timely deferment of grazing, and weed control help keep pastures in good condition.

This soil is well suited to windbreaks and environmental plantings. Competing vegetation prevents maximum tree growth. It can be controlled by timely cultivation and by herbicides.

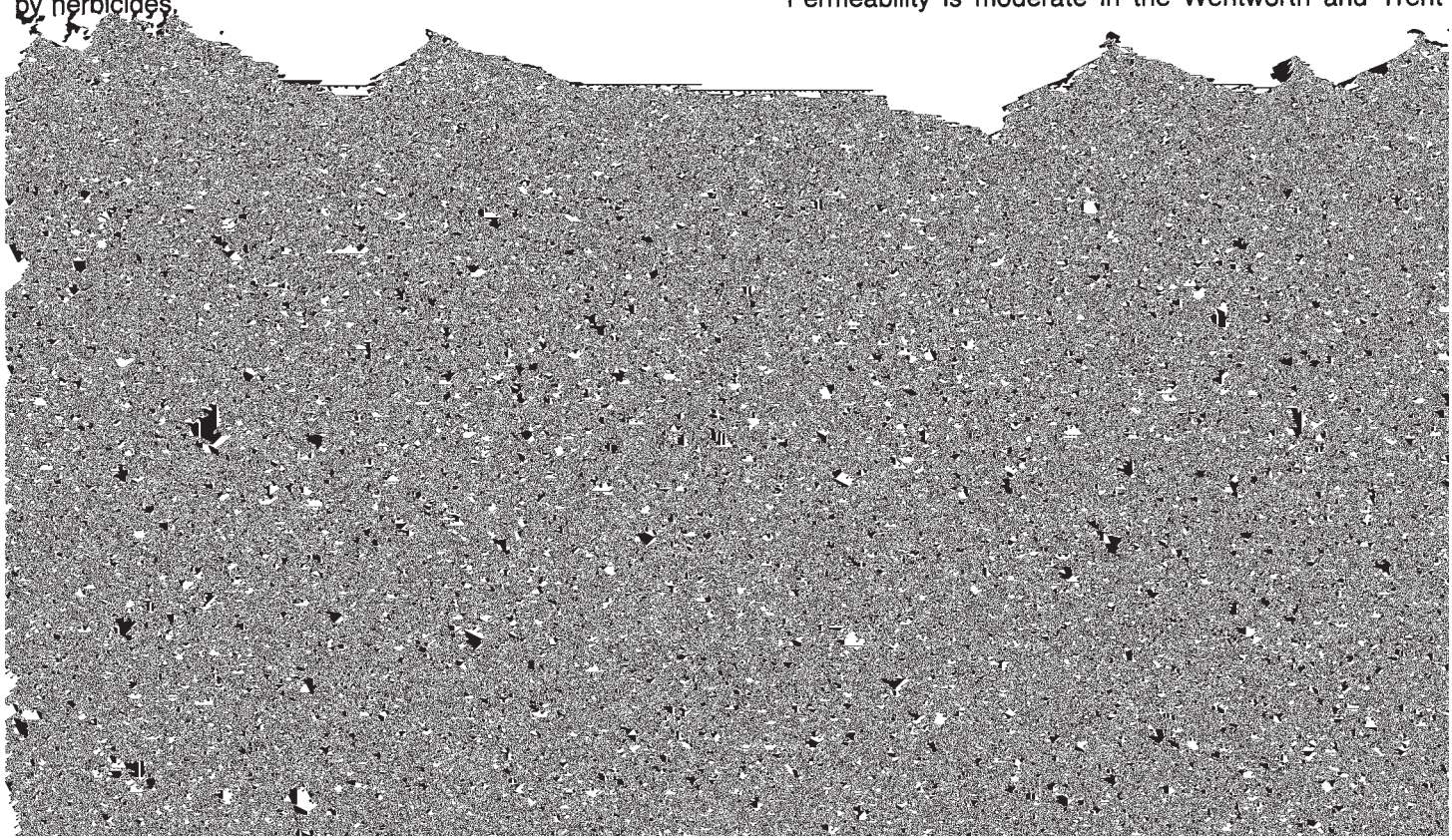
closely intermingled or small that it is not practical to separate them in mapping.

Typically, the Wentworth soil has a surface layer of dark grayish brown silty clay loam about 10 inches thick. The subsoil is friable silty clay loam about 28 inches thick. The upper part is grayish brown, the middle part is brown, and the lower part is light olive brown and is calcareous. The underlying material to a depth of 60 inches is light yellowish brown, calcareous silty clay loam. In places, strata of silt and very fine sand are below a depth of 50 inches. In some areas, clay loam glacial till is at a depth of 24 inches.

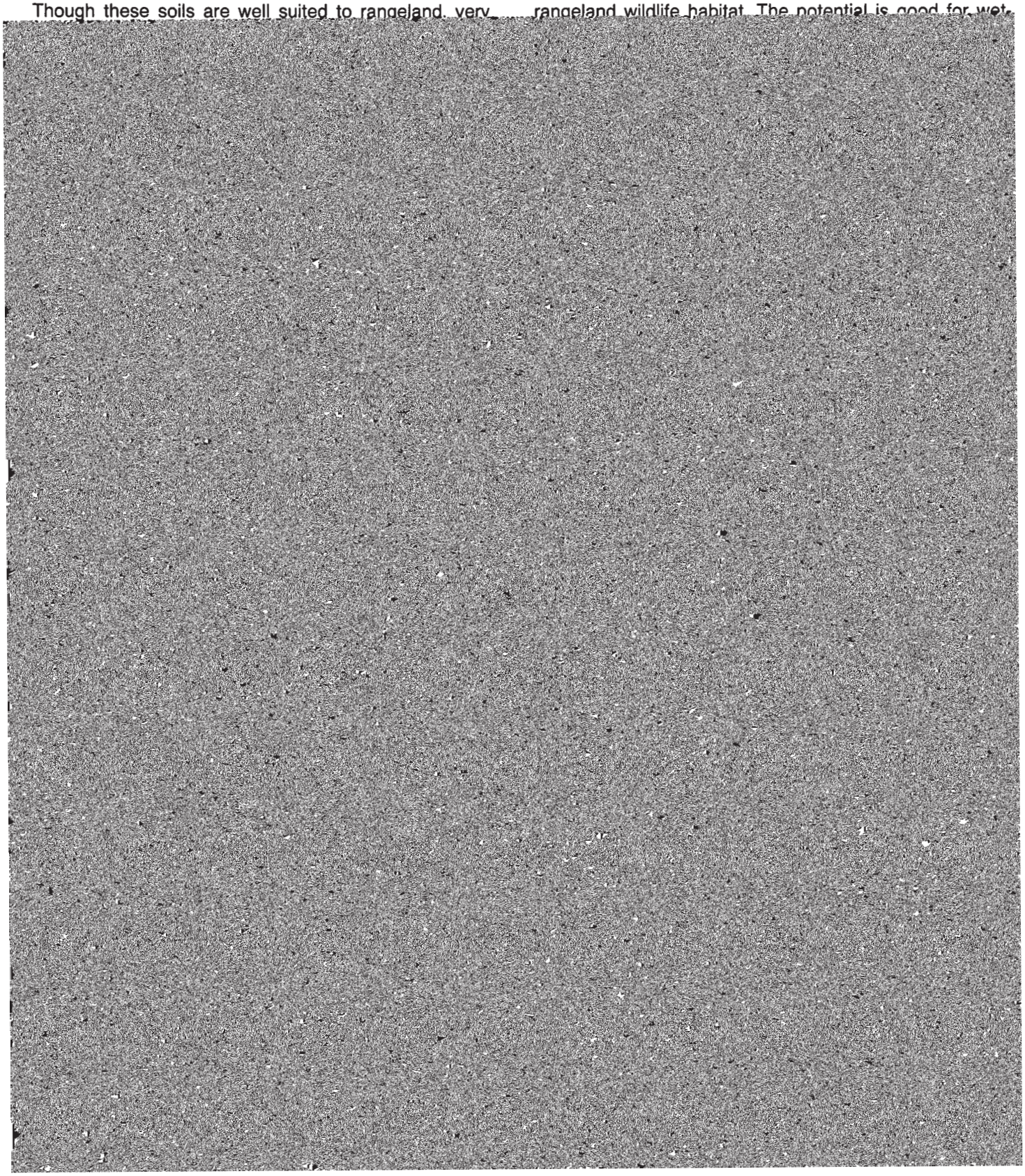
Typically, the Trent soil has a surface layer of dark grayish brown silty clay loam about 13 inches thick. The subsoil is about 32 inches thick. The upper part is grayish brown, friable silty clay loam; the lower part is light brownish gray, mottled, friable silty clay loam that has spots and streaks of soft lime extending into the underlying material. The underlying material to a depth of 60 inches is pale yellow, mottled silty clay loam.

Included with these soils in mapping are small areas of Chancellor and Ethan soils. These included soils make up less than 15 percent of any one mapped area. Chancellor soils are somewhat poorly drained and are in the more deeply entrenched swales. Ethan soils have a thinner surface layer than the Wentworth and Trent soils and are not so deep to lime. They are at the crest of slopes or on knobs.

Permeability is moderate in the Wentworth and Trent



Though these soils are well suited to rangeland, very rangeland wildlife habitat. The potential is good for wet-



sedges. This soil has good potential for wetland wildlife habitat. It has poor potential for cultivated crops, tame pasture and hay, rangeland, rangeland wildlife habitat, windbreaks and environmental plantings, and openland wildlife habitat and for building sites and sanitary facilities.

This soil is unsuited to cultivated crops, windbreaks and environmental plantings, tame pasture, and rangeland. It is too wet and is flooded too frequently to be used as a site for buildings and septic tank absorption fields. Sewage lagoons can be constructed in areas where the depth of the floodwater does not exceed 5 feet. Capability unit VIIIw-1; not assigned to a range site.

Use and management of the soils

The soil survey is a detailed inventory and evaluation of the most basic resource of the survey area—the soil. It is useful in adjusting land use, including urbanization, to the limitations and potentials of natural resources and the environment. Also, it can help avoid soil-related failures in uses of the land.

While a soil survey is in progress, soil scientists, conservationists, engineers, and others keep extensive notes about the nature of the soils and about unique aspects of behavior of the soils. These notes include data on erosion, drought damage to specific crops, yield estimates, flooding, the functioning of septic tank disposal systems, and other factors affecting the productivity, potential, and limitations of the soils under various uses and management. In this way, field experience and measured data on soil properties and performance are used as a basis for predicting soil behavior.

Information in this section is useful in planning use and management of soils for crops and pasture, rangeland, and woodland, as sites for buildings, highways and other transportation systems, sanitary facilities, and parks and other recreation facilities, and for wildlife habitat. From the data presented, the potential of each soil for specified land uses can be determined, soil limitations to these land uses can be identified, and costly failures in houses and other structures, caused by unfavorable soil properties, can be avoided. A site where soil properties are favorable can be selected, or practices that will overcome the soil limitations can be planned.

Planners and others using the soil survey can evaluate the impact of specific land uses on the overall productivity of the survey area or other broad planning area and on the environment. Productivity and the environment are closely related to the nature of the soil. Plans should maintain or create a land-use pattern in harmony with the natural soil.

Contractors can find information that is useful in locating sources of sand and gravel, roadfill, and topsoil. Other information indicates the presence of bedrock, wetness, or very firm soil horizons that cause difficulty in excavation.

Health officials, highway officials, engineers, and many other specialists also can find useful information in this soil survey. The safe disposal of wastes, for example, is closely related to properties of the soil. Pavements, sidewalks, campsites, playgrounds, lawns, and trees and shrubs are influenced by the nature of the soil.

Crops and pasture

Ralph W. Stensland, conservation argonomist, Soil Conservation Service, helped prepare this section.

The major management concerns in the use of the soils for crops and pasture are described in this section. In addition, the crops or pasture plants best suited to the soil, including some not commonly grown in the survey area, are discussed; 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 presented for each soil.

This section provides information about the overall agricultural potential of the survey area and about the management practices that are needed. The information is useful to equipment dealers, land improvement contractors, fertilizer companies, processing companies, planners, conservationists, and others. For each kind of soil, information about management is presented in the section "Soil maps for detailed planning." Planners of management systems for individual fields or farms should also consider the detailed information given in the description of each soil.

About 84 percent of the survey area was used for crops, hay, and pasture in 1975 (*13*). Corn, oats, soybeans, and grain sorghum are the main cash crops.

The potential of the soils in Yankton County for increased crop production is good. About 11,000 acres of potentially good cropland is currently used as rangeland, 8,000 acres as pasture, and 5,000 acres as permanent hayland.

In addition to the reserve productive capacity represented by this land, food production could also be increased considerably by extending the latest crop production technology to all cropland in the county. This soil survey can greatly facilitate the application of such technology.

Soil erosion and *soil blowing* are the major hazards on almost 36 percent of the cropland, hayland, and pasture in Yankton County. If the slope is more than 2 percent, erosion is a hazard on such soils as Blendon, Clarno, Crofton, Davis, Davis Variant, Egan, Ethan, Nora, Redstoe Variant, Thurman, and Wentworth.

Loss of the surface soil through erosion or soil blowing reduces productivity and results in sedimentation in streams and lakes. Productivity is reduced as the surface layer is lost and part of the subsoil is incorporated into

the plow layer. Loss of the surface layer is especially [illegible]

grass, should not be planted alone if the slope is more than 6 percent.

If the poorly drained soils, such as Baltic, Luton, and Tetonka, are used for pasture, the choice of pasture plants is limited to water-tolerant species, such as Garrison creeping foxtail and reed canarygrass. Tall wheatgrass is best suited to saline soils, such as Salmo.

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. Absence of an estimated yield indicates that the crop is not suited to or not commonly grown on the soil.

The estimated yields were based mainly on the experience and records of farmers, conservationists, and extension agents. Results of field trials and demonstrations and available yield data from nearby counties were also considered.

The yields were estimated assuming that the latest soil and crop management practices were used. Hay and pasture yields were estimated for the most productive varieties of grasses and legumes suited to the climate and the soil. A few farmers may be obtaining average yields higher than those shown in table 5.

The management needed to achieve the indicated yields of the various crops depends on the kind of soil and the crop. Such management provides drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate tillage practices, including time of

Capability classes and subclasses

Capability classes and subclasses show, in a general way, the suitability of soils for most kinds of field crops. The soils are classed according to their limitations when they are used for field crops, the risk of damage when they are used, and the way they respond to treatment. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils; does not take into consideration possible but unlikely major reclamation projects; and does not apply to horticultural crops or other crops that require special management. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for rangeland, for forest trees, or for engineering purposes.

In the capability system, all kinds of soil are grouped at three levels: capability class, subclass, and unit (*11*). These levels are defined in the following paragraphs. A survey area may not have soils of all classes.

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 few limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants, 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 manage-

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, though they have other limitations that restrict their use to pasture, rangeland, woodland, wildlife habitat, or recreation.

The capability unit is identified in the description of each soil mapping unit in the section "Soil maps for detailed planning." Capability units are soil groups within the subclasses. The soils in one capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity. Thus, the capability unit is a convenient grouping for making many statements about management of soils. Capability units are generally designated by adding an Arabic numeral to the subclass symbol, for example, IIe-3 or IIIe-2.

Rangeland

About 16 percent of Yankton County is rangeland, which occurs generally as scattered small tracts throughout the county. The larger tracts are on breaks along the James River. Ethan and Betts soils are dominant on these breaks. Many of the soils on these breaks are too steep for cultivation.

Nearly half of the farm income in the county is derived from livestock, principally cattle. Cow-calf-steer operations are predominant throughout the county. The average size of operating units is about 400 acres.

On many farms, the forage produced on rangeland is supplemented by crop stubble and tame pasture. In winter, the native forage often is supplemented with protein concentrate or alfalfa. Creep feeding of calves and yearlings increases market weight on some operating units.

The native vegetation in many parts of the survey area has been greatly depleted by continued excessive use. Many of the desirable tall grasses have been replaced by short grasses and weeds. As a result, the amount of forage produced may be less than half of that originally

The following are explanations of column headings in table 6.

A *range site* is a distinctive kind of rangeland that differs from other kinds of rangeland in its ability to produce a characteristic natural plant community. Soils that produce a similar kind, amount, and proportion of range plants are grouped into range sites. For those areas where the relationship between soils and vegetation has been established, range sites can be interpreted directly from the soil map. Properties that determine the capacity of the soil to supply moisture 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.

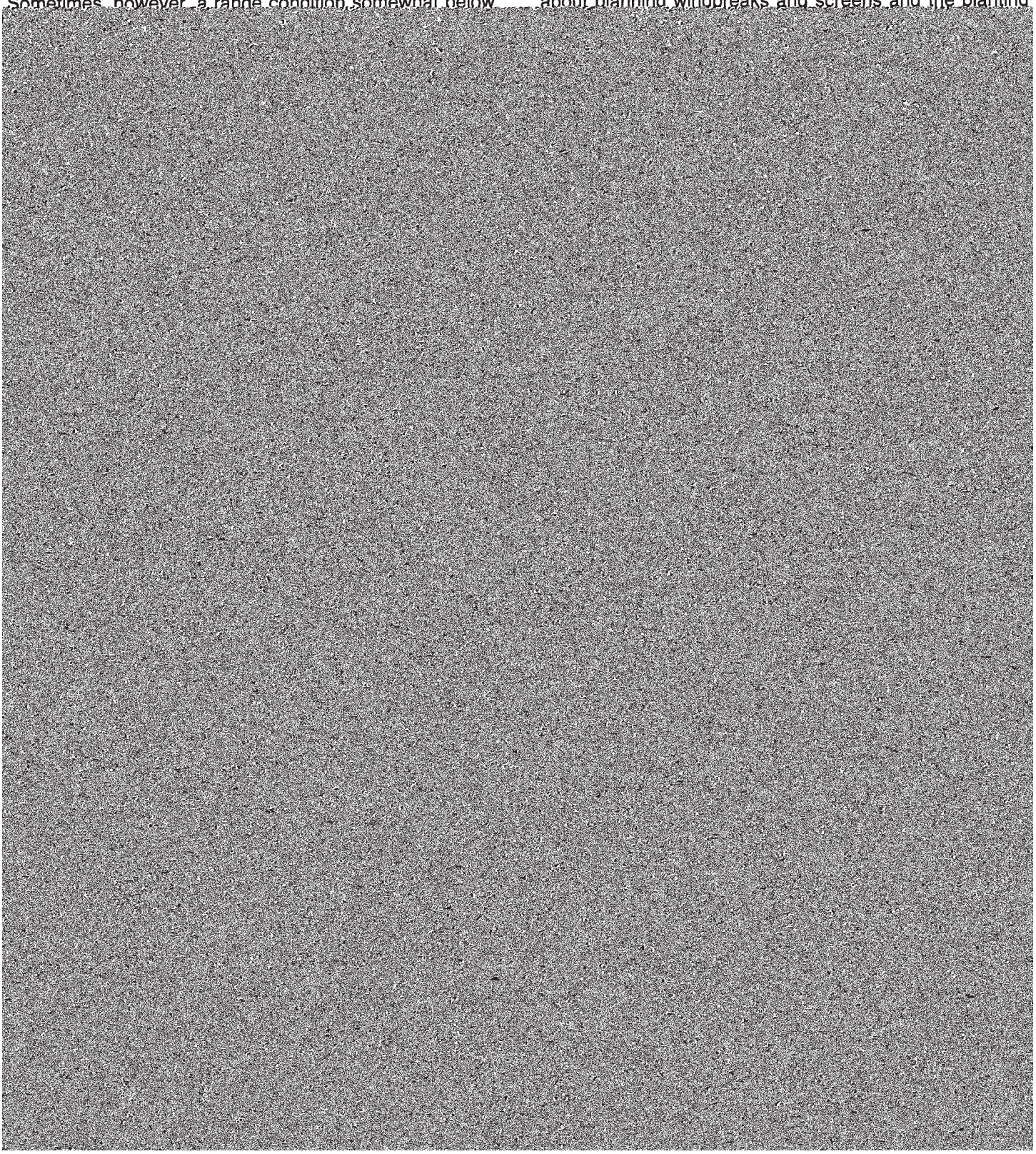
Total production refers to the amount of vegetation that can be expected to grow annually on well managed rangeland that is supporting the potential natural plant community. It is expressed in pounds per acre of air-dry vegetation for favorable, normal, and unfavorable years. In a favorable year the amount and distribution of precipitation and the temperatures are such that growing conditions are substantially better than average; in a normal year these conditions are about average for the area; in an unfavorable year, growing conditions are well below average, generally because of low available soil moisture.

Dry weight refers to the total air-dry vegetation produced per acre each year by the potential natural plant community. Vegetation that is highly palatable to livestock and vegetation that is unpalatable are included. Some of the vegetation can also be grazed extensively by wildlife.

Characteristic species of grasses, grasslike plants, forbs, and shrubs that make up most of the potential natural plant community on each soil are listed by common name. Under *Composition*, the expected proportion of each species is presented as the percentage, in air-dry weight, of the total annual production of herbaceous and woody plants. The amount that can be used as forage depends on the kinds of grazing animals and on the grazing season. Generally all of the vegetation

agement generally results in the maximum production of vegetation, conservation of water, and control of erosion. Sometimes, however, a range condition somewhat below

been given adequate care, can be used as a guide in planning windbreaks and screens. Additional information about planning windbreaks and screens and the planting

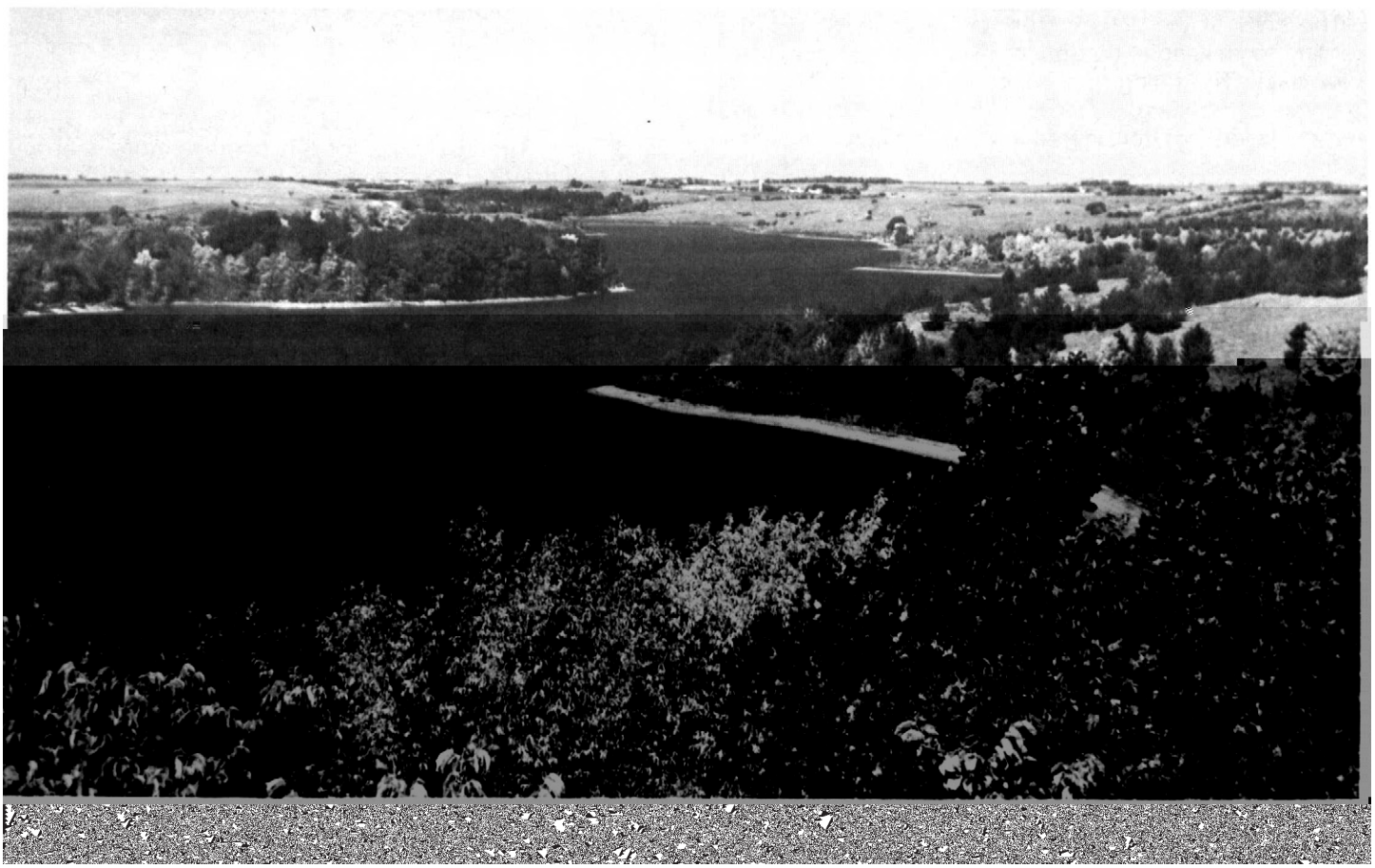


zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are corn, wheat, oats, and barley.

Grasses and legumes are domestic perennial grasses and herbaceous legumes that are planted for wildlife food and cover. Major soil properties 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 consider-

shrubs that provide cover for wildlife and produce nuts or other fruit, buds, catkins, twigs, bark, or foliage that wildlife eat (fig. 11). Major soil properties that affect growth of hardwood trees and shrubs are depth of the root zone, available water capacity, and wetness. Examples of native woody plants are bur oak, cottonwood, chokecherry, green ash, boxelder, hawthorn, silver buffaloberry, American plum, hackberry, and currant. Examples of fruit-producing shrubs and small trees that are commercially available and suitable for planting on soils rated *good* are Russian-olive, honeysuckle, and crabapple.

Wetland plants are annual and perennial wild herbs



shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. The availability of a dependable water supply is important if water areas are to be developed. Examples of shallow water areas are marshes, shallow dugouts, ditches, and ponds.

The kinds of wildlife habitat are briefly described in the following paragraphs.

Openland habitat consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, trees, and shrubs. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous and woody plants. The kinds of wildlife attracted to these areas include bobwhite, ring-necked pheasant, gray partridge, mourning dove, meadowlark, cottontail, raccoon, and red fox.

Wetland habitat consists of open, marshy or swampy, shallow water areas where water-tolerant plants grow. Some of the wildlife attracted to such areas are ducks, geese, herons, shore birds, muskrat, mink, and beaver.

Rangeland habitat consists of areas of wild herbaceous plants and shrubs. Wildlife attracted to rangeland include whitetail deer, jackrabbit, coyote, meadowlark, and lark bunting.

Recreation

The soils of the survey area are rated in table 9 according to limitations that affect their suitability for recreation uses. The ratings are based on such restrictive soil features as flooding, wetness, slope, and texture of the surface layer. Not considered in these ratings, but important in evaluating a site, are location and accessibility of the area, size and shape of the area and its scenic quality, the ability of the soil to support vegetation, access to water, potential water impoundment sites available, and either access to public sewerlines or capacity of the soil to absorb septic tank effluent. Soils subject to flooding are limited, in varying degree, for recreation use by the duration and intensity of flooding and the season when flooding occurs. Onsite assessment of height, duration, intensity, and frequency of flooding is essential in planning recreation facilities.

The degree of the limitation of the soils is expressed as slight, moderate, or severe. *Slight* means that the soil properties are generally favorable and that the limitations are minor and easily overcome. *Moderate* means that the 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 [illegible] out basements and for local roads and streets, given in table 10.

Camp areas require such site preparation as shaping and leveling for 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 for this use 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 camping sites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for use as 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 will 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 or boulders, is firm after rains, and is not dusty when dry. If shaping is required to obtain a uniform grade, the depth of the soil over bedrock or hardpan should be enough to allow necessary grading.

Paths and trails for walking, horseback riding, bicycling, and other uses should require little or no cutting and filling. The best soils for this use are those that are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once during the annual period of use. They have moderate slopes and have few or no stones or boulders on the surface.

Engineering

This section provides information about the use of soils for building sites, sanitary facilities, construction material, and water management. Among those who can benefit from this information are engineers, landowners, community planners, town and city managers, land developers, builders, contractors, and farmers and ranchers.

The ratings in the engineering tables are based on test data and estimated data in the "Soil properties" section. The ratings were determined jointly by soil scientists and engineers of the Soil Conservation Service using known relationships between the soil properties and the behavior of soils in various engineering uses.

Among the soil properties and site conditions identified by a soil survey and used in determining the ratings in [illegible]

wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure or aggregation, in-place soil density, and geologic origin of the soil material. Where pertinent, data about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of absorbed cations were also considered.

On the basis of information assembled about soil properties, ranges of values can be estimated for erodibility, permeability, corrosivity, shrink-swell potential, available

survey, can be used to make additional interpretations and to construct interpretive maps for specific uses of land.

Some of the terms used in this soil survey have a special meaning in soil science. Many of these terms are defined in the Glossary.

Building site development

mining the ratings. Susceptibility to flooding is a serious hazard.

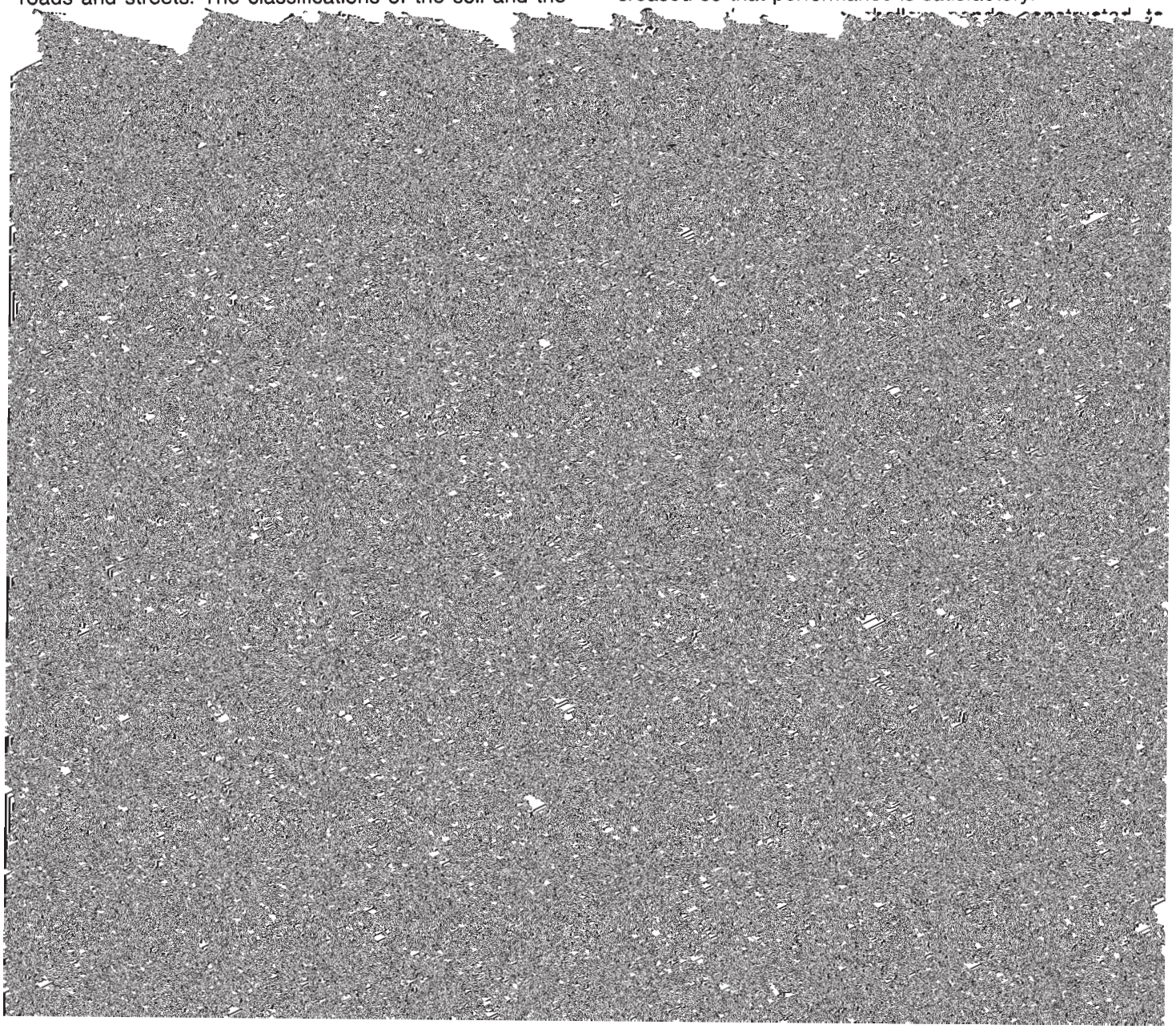
Local roads and streets referred to in table 10 have an all-weather surface that can carry light to medium traffic all year. They consist of a subgrade of the underlying soil material; a base of gravel, crushed rock fragments, or soil material stabilized with lime or cement; and a flexible or rigid surface, commonly asphalt or concrete. The roads are graded with soil material at hand, and most cuts and fills are less than 6 feet deep.

The load supporting capacity and the stability of the soil as well as the quantity and workability of fill material available are important in design and construction of roads and streets. The classifications of the soil and the

Stones, boulders, and shallowness to bedrock interfere with installation. Excessive slope can cause lateral seepage and surfacing of the effluent. Also, soil erosion and soil slippage are hazards if absorption fields are installed on sloping soils.

In some soils, loose sand and gravel or fractured bedrock is less than 4 feet below the tile lines. In these soils the absorption field does not adequately filter the effluent, and ground water in the area may be contaminated.

On many of the soils that have moderate or severe limitations for use as septic tank absorption fields, a system to lower the seasonal water table can be installed or the size of the absorption field can be increased so that performance is satisfactory.



Unless otherwise stated, the limitations in table 11 apply only to the soil material within a depth of about 6 feet. If the trench is deeper, a limitation of slight or moderate may not be valid. Site investigation is needed before a site is selected.

Daily cover for landfill should be soil that is easy to excavate and spread over the compacted fill in wet and cobbles and stones. They are at least moderately well drained and have slopes of 15 percent or less. Soils rated *fair* have a plasticity index of less than 15 and have other limiting features, such as moderate shrink-swell potential, moderately steep slopes, wetness, or many stones. If the thickness of suitable material is less than 3 feet, the entire soil is rated poor.

tent. This horizon is designated as A1 or Ap in the soil series descriptions. The absorption and retention of moisture and nutrients for plant growth are greatly increased by organic matter.

Water management

Many soil properties and site features that affect water management practices have been identified in this soil survey. In table 13, the soil and site features that affect use are indicated for each kind of soil. This information is significant in planning, installing, and maintaining water-control structures.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have a low seepage potential, which is determined by permeability and the depth to fractured or permeable bedrock or other permeable material.

Embankments, dikes, and levees require soil material that is resistant to seepage, erosion, and piping and has favorable stability, shrink-swell potential, shear strength, and compaction characteristics. Large stones and organic matter in a soil downgrade the suitability of a soil for use in embankments, dikes, and levees.

Drainage of soil is affected by such soil properties as permeability; texture; depth to bedrock, hardpan, or other layers that affect the rate of water movement; depth to the water table; slope; stability of ditchbanks; susceptibility to flooding; salinity and alkalinity; and availability of outlets for drainage.

Irrigation is affected by such features as slope, susceptibility to flooding, hazards of water erosion and soil blowing, texture, presence of salts and alkali, depth of root zone, rate of water intake at the surface, permeability of the soil below the surface layer, available water capacity, need for drainage, and depth to the water table.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to intercept runoff. They allow water to soak into the soil or flow slowly to an outlet. Features that affect suitability of a soil for terraces are uniformity and steepness of slope; depth to bedrock, hardpan, or other unfa-

the course of the survey and the laboratory analyses of selected soil samples from typical profiles.

In making soil borings during field mapping, soil scientists identify several important soil properties. They note the seasonal soil moisture condition or the presence of free water and its depth. For each horizon in the profile, they note the thickness and color of the soil material; the texture, or amount of clay, silt, sand, and gravel or other coarse fragments; the structure, or the natural pattern of cracks and pores in the undisturbed soil; and the consistence of the soil material in place under the existing soil moisture conditions. They record the depth of plant roots, determine the pH or reaction of the soil, and identify any free carbonates.

Samples of soil material are analyzed in the laboratory to verify the field estimates of soil properties and to determine all major properties of key soils, especially properties that cannot be estimated accurately by field observation. Laboratory analyses are not conducted for all soil series in the survey area, but laboratory data for many soil series not tested are available from nearby survey areas.

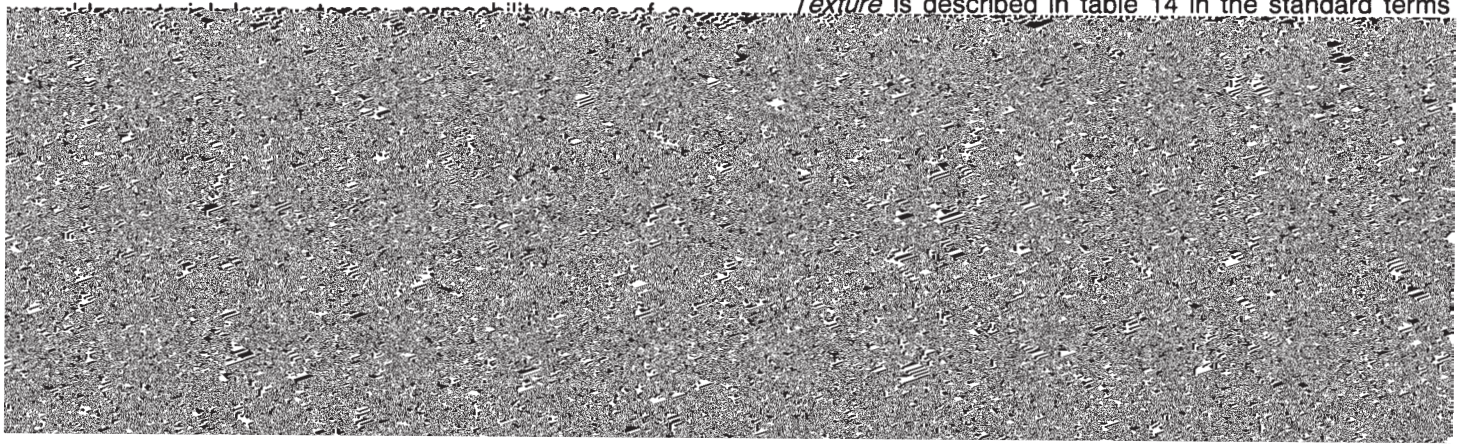
The available field and laboratory data are summarized in tables. The tables give the estimated range of engineering properties, the engineering classifications, and the physical and chemical properties of each major horizon of each soil in the survey area. They also present data about pertinent soil and water features.

Engineering properties

Table 14 gives estimates of engineering properties and classifications for the major horizons of each soil in the survey area.

Most soils have, within the upper 5 or 6 feet, horizons of contrasting properties. Table 14 gives information for each of these contrasting horizons in a typical profile. *Depth* to the upper and lower boundaries of each horizon is indicated. More information about the range in depth and about other properties in each horizon is given for each soil series in the section "Soil series and morphology."

Texture is described in table 14 in the standard terms



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, plasticity index, liquid limit, and organic-matter content. Soils are grouped into 15 classes—eight classes of coarse-grained soils, identified as GW, GP, GM, GC, SW, SP, SM, and SC; six classes of fine-grained soils, identified as ML, CL, OL, MH, CH, and OH; and one class of highly organic soils, identified as Pt. Soils on the borderline between two classes have a dual classification symbol, for example, CL-ML.

The *AASHTO* system classifies soils according to those properties that affect their use in highway construction and maintenance. In this system a mineral soil is classified in one of seven basic groups ranging from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines. At the other extreme, in group A-7, are fine-grained soils. Highly organic soils are classified in group A-8 on the basis of visual inspection.

When laboratory data are available, the A-1, A-2, and A-7 groups are further classified as follows: A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, and A-7-6. As an additional refinement, the desirability of soils as subgrade material can be indicated by a group index number. These numbers range from 0 for the best subgrade material to 20 or higher for the poorest. The estimated classification, without group index numbers, is given in table 14. Also in table 14 the percentage, by weight, of rock fragments more than 3 inches in diameter is estimated for each major horizon. These estimates are determined mainly by observing volume percentage in the field and then converting that, by formula, to weight percentage.

Percentage of the soil material less than 3 inches in diameter that passes each of four sieves (U.S. standard) is estimated for each major horizon. The estimates are based on tests of soils that were sampled in the survey

Physical and chemical properties

Table 15 shows estimated values for several soil characteristics and features that affect behavior of soils in engineering uses. These estimates are given for each major horizon, at the depths indicated, in the typical pedon of each soil. The estimates are based on field observations and on test data for these and similar soils.

Permeability is estimated on the basis of known relationships among the soil characteristics observed in the field—particularly soil structure, porosity, and gradation or texture—that influence the downward movement of water in the soil. The estimates are for vertical water movement when the soil is saturated. Not considered in the estimates is lateral seepage or such transient soil features as plowpans and surface crusts. Permeability of the soil is an important factor to be considered in planning and designing drainage systems, in evaluating the potential of soils for septic tank systems and other waste disposal systems, and in many other aspects of land use and management.

Available water capacity is rated on the basis of soil characteristics that influence the ability of the soil to hold water and make it available to plants. Important characteristics are content of organic matter, soil texture, and soil structure. Shallow-rooted plants are not likely to use the available water from the deeper soil horizons. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design of irrigation systems.

Soil reaction is expressed as a range in pH values. The range in pH of each major horizon is based on many field checks. For many soils, the values have been verified by laboratory analyses. Soil reaction is important in selecting the crops, ornamental plants, or other plants to be grown; in evaluating soil amendments for fertility and stabilization; and in evaluating the corrosivity of soils.

Salinity 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

basement walls, roads, and other structures unless special designs are used. A high shrink-swell potential indicates that special design and added expense may be required if the planned use of the soil will not tolerate large volume changes.

Erosion factors are used to predict the erodibility of a soil and its tolerance to erosion in relation to specific kinds of land use and treatment. The soil erodibility

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, and crops can easily be grown.

8. Stony or gravelly soils and other soils not subject to soil blowing.

on information that relates the position of each soil on the landscape to historic floods.

The generalized description of flood hazards is of value in land-use planning and provides a valid basis for land-use restrictions. The soil data are less specific, however, than those provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table is the highest level of a saturated zone more than 6 inches thick for a continuous period of more than 2 weeks during most years. The depth to a seasonal high water table applies to undrained soils. Estimates are based mainly on the relationship between grayish colors or mottles in the soil and the depth to free water observed in many borings made during the course of the soil survey. Indicated in table 16 are the depth to the seasonal high water table; the kind of water table

steel or concrete. The rate of corrosion of uncoated steel is related to soil moisture, particle-size distribution, total acidity, and electrical conductivity of the soil material. The rate of corrosion of concrete is based mainly on the sulfate content, texture, and acidity of the soil. Protective measures for steel or more resistant concrete help to avoid or minimize damage resulting from corrosion. Uncoated steel intersecting soil boundaries or soil horizons is more susceptible to corrosion than an installation that is entirely within one kind of soil or within one soil horizon.

Soil series and morphology

In this section, each soil series recognized in the survey area is described in detail. The descriptions are

A13—13 to 24 inches; gray (10YR 5/1) silty clay, very dark gray (10YR 3/1) moist; weak medium subangular blocky structure parting to moderate fine and very fine blocky; slightly hard, friable, sticky and plastic; thin shiny films on faces of peds; few medium accumulations of carbonate; strong effervescence; mildly alkaline; clear wavy boundary.

B21g—24 to 29 inches; dark gray (5Y 4/1) silty clay, very dark gray (5Y 3/1) moist; weak medium prismatic structure parting to moderate fine and medium blocky; hard, firm, sticky and plastic; thin films on faces of peds; common medium accumulations of carbonate; strong effervescence; mildly alkaline; clear wavy boundary.

B22g—29 to 36 inches; dark gray (5Y 4/1) silty clay, very dark gray (5Y 3/1) moist; weak medium prismatic structure parting to moderate medium blocky; hard, firm, sticky and plastic; thin shiny films on faces of peds; few medium accumulations of carbonate; slight effervescence; mildly alkaline; clear wavy boundary.

C1g—36 to 46 inches; gray (5Y 5/1) silty clay, very dark gray (5Y 3/1) moist; weak coarse prismatic structure parting to weak medium subangular blocky; hard, firm, sticky and plastic; very thin shiny films on faces of peds; few fine accumulations of carbonate; slight effervescence; mildly alkaline; clear wavy boundary.

C2g—46 to 60 inches; light gray (5Y 6/1) silty clay, dark gray (5Y 4/1) moist; common medium distinct mot-

Typical pedon of Betts loam, in an area of Ethan-Betts loams, 15 to 40 percent slopes, 2,280 feet west and 700 feet south of the northeast corner of sec. 24, T. 94 N., R. 54 W.

A1—0 to 3 inches; grayish brown (10YR 5/2) loam, very dark grayish (10YR 3/2) moist; weak fine and medium granular structure; soft, friable; violent effervescence; mildly alkaline; clear smooth boundary.

AC—3 to 8 inches; pale brown (10YR 6/3) clay loam, dark brown (10YR 4/3) moist; weak medium prismatic structure parting to weak medium subangular blocky; slightly hard, friable, sticky and plastic; few fine accumulations of carbonate; violent effervescence; mildly alkaline; gradual smooth boundary.

C1ca—8 to 18 inches; light brownish gray (2.5Y 6/2) clay loam, light olive brown (2.5Y 5/4) moist; very weak very fine and fine subangular blocky structure; slightly hard, friable, sticky and plastic; common fine accumulations of carbonate; few fragments of chalk rock; violent effervescence; mildly alkaline; gradual smooth boundary.

C2—18 to 32 inches; light gray (2.5Y 7/2) clay loam, light olive brown (2.5Y 5/4) moist; common fine distinct mottles, strong brown (7.5YR 5/8) moist; massive; hard, firm, sticky and plastic; few fragments of chalk rock; common medium accumulations of carbonate; violent effervescence; mildly alkaline; gradual smooth boundary.

Blake soils are similar to Lakeport and Salix soils and commony are adjacent to Forney, Haynie, and Owego soils. Forney and Owego soils are fine textured. Haynie soils are coarse-silty. Lakeport and Salix soils have a thicker mollic epipedon than Blake soils. In addition, Lakeport soils are fine textured.

Typical pedon of Blake silty clay loam, 650 feet south and 1,300 feet east of the northwest corner of sec. 6, T. 93 N., R. 54 W.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silty clay loam, very dark brown (10YR 2/2) moist; weak fine and medium granular structure; soft, friable, slightly sticky and slightly plastic; mildly alkaline; abrupt smooth boundary.

A12—8 to 17 inches; grayish brown (10YR 5/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; thin light gray (10YR 7/2) strata; common fine distinct mottles, yellowish brown (10YR 5/6) moist; weak medium subangular blocky structure; slighty hard, friable, slightly sticky and slightly plastic; mildly alkaline; clear wavy boundary.

C1—17 to 22 inches; pale yellow (2.5Y 7/4) and light [illegible]

Blencoe series

The Blencoe series consists of deep, somewhat poorly drained soils that formed in clayey alluvium over loamy alluvium. Permeability is very slow in the upper part of the soils and moderate in the lower part. These soils are on bottom land. Slopes range from 0 to 2 percent.

The Blencoe soils in Yankton County have a thinner solum and have carbonates closer to the surface than is defined as the range for the series. These differences, however, do not alter the use or behavior of the soils.

Blencoe soils are similar to Onawa soils and commonly are adjacent to Blyburg, Lakeport, Luton, and Salix soils. Blyburg soils are coarse-silty. Lakeport and Luton soils are fine textured and lack very fine sandy loam in the lower part. Onawa soils lack a mollic epipedon. Salix soils are fine-silty.

Typical pedon of Blencoe silty clay, 188 feet north and 115 feet east of the southwest corner of sec. 36, T. 94 N., R. 54 W.

Ap—0 to 8 inches; very dark gray (10YR 3/1) silty clay, black (10YR 2/1) moist; weak coarse and medium

Blendon series

The Blendon series consists of deep, well drained soils that formed in glacial melt water deposits. Permeability is moderately rapid. These soils are on uplands. Slopes range from 0 to 6 percent.

Blendon soils are adjacent to Ethan and Thurman soils. Ethan soils are fine-loamy. Thurman soils have a mollic epipedon less than 20 inches thick.

Typical pedon of Blendon loam, in an area of Blendon-Thurman complex, 0 to 6 percent slopes, 1,800 feet north and 120 feet west of the southeast corner of sec. 36, T. 96 N., R. 57 W.

Ap—0 to 8 inches; dark gray (10YR 4/1) loam, black (10YR 2/1) moist; weak fine and medium granular structure; soft, friable; neutral; abrupt smooth boundary.

B21—8 to 18 inches; dark grayish brown (10YR 4/2) loam, very dark brown (10YR 2/2) moist; weak medium prismatic structure parting to weak medium subangular blocky; soft, very friable; slightly acid; clear smooth boundary.

B22—18 to 26 inches; dark grayish brown (10YR 4/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; very weak medium prismatic structure; soft, very friable; neutral; clear smooth boundary.

B3—26 to 33 inches; brown (10YR 5/3) fine sandy loam, dark brown (10YR 3/3) moist; very weak coarse prismatic structure; loose, very friable; neutral; gradual smooth boundary.

C1—33 to 50 inches; yellowish brown (10YR 5/4) loamy fine sand, dark yellowish brown (10YR 4/4) moist; single grained; loose; neutral; gradual smooth boundary.

C2ca—50 to 60 inches; light yellowish brown (10YR 6/4) loamy fine sand, dark yellowish brown (10YR 4/4) moist; single grained; loose; strong effervescence; neutral.

The thickness of the solum ranges from 28 to 40 inches. The depth to free carbonates is 45 to 55 inches. The thickness of the mollic epipedon ranges from 24 to 38 inches.

Blyburg series

The Blyburg series consists of deep, well drained, moderately permeable soils that formed in silty alluvium. These soils are on bottom land. Slopes range from 0 to 2 percent.

Blyburg soils are similar to the Haynie soils and commonly are adjacent to Blencoe, Lakeport, and Salix soils. Blencoe soils are clayey in the upper part and loamy in the lower part. Haynie soils lack a mollic epipedon. Lakeport soils are fine textured. Salix soils are fine-silty.

Typical pedon of Blyburg silt loam, 1,600 feet south and 110 feet east of the northwest corner of sec. 36, T. 94 N., R. 54 W.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam, very dark brown (10YR 2/2) moist; weak fine granular structure; slightly hard, very friable; neutral; abrupt smooth boundary.

A12—8 to 15 inches; dark grayish brown (10YR 4/2) silt loam, very dark brown (10YR 2/2) moist; weak medium subangular blocky structure; soft, very friable; neutral; clear smooth boundary.

A13—15 to 19 inches; grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure; soft, very friable; neutral; abrupt wavy boundary.

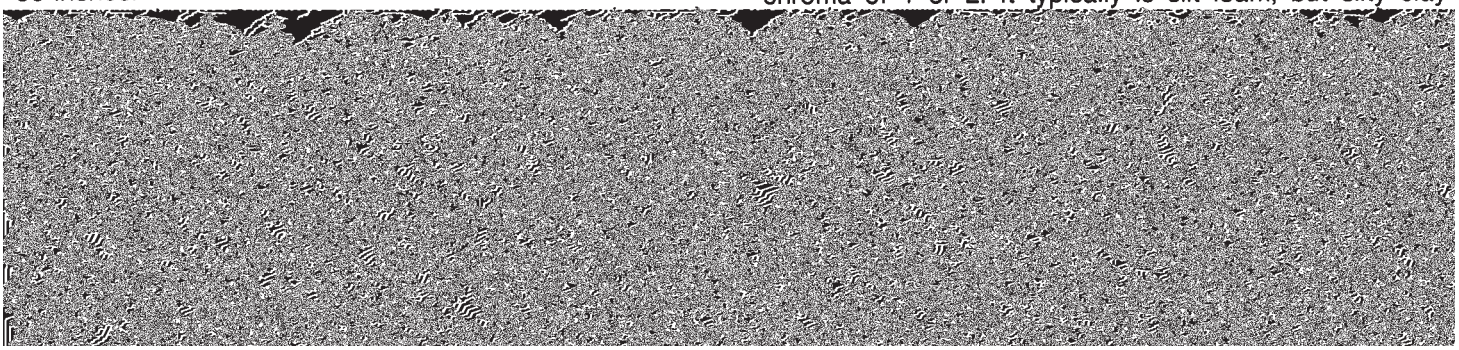
C1—19 to 27 inches; grayish brown (2.5Y 5/2) silt loam, dark grayish brown (2.5Y 4/2) moist; massive; soft, very friable; strong effervescence; mildly alkaline; gradual smooth boundary.

C2—27 to 45 inches; light brownish gray (2.5Y 6/2) silt loam, dark grayish brown (2.5Y 4/2) moist; massive; soft, very friable; strong effervescence; mildly alkaline; gradual smooth boundary.

C3—45 to 60 inches; light gray (2.5Y 7/2) very fine sandy loam, grayish brown (2.5Y 5/2) moist; common medium distinct mottles, yellowish brown (10YR 5/6) moist; massive; soft, very friable; strong effervescence; mildly alkaline.

The thickness of the solum and of the mollic epipedon ranges from 12 to 19 inches. The depth to free carbonates ranges from 8 to 19 inches.

The A horizon has value of 4 or 5 (2 or 3 moist) and chroma of 1 or 2. It typically is silt loam, but silty clay



Roxbury soils are fine-silty. Clarno soils have a mollic epipedon less than 20 inches thick. Davis soils have free carbonates below a depth of 20 inches. They are in

Typical pedon of Bonilla loam, in an area of Clarno-Bonilla loams, 1 to 6 percent slopes, 2,574 feet west and 175 feet south of the northeast corner of sec. 5, T. 94

common or many distinct mottles. Gypsum crystals are in some pedons.

Boyd series

The Boyd series consists of moderately deep, well drained soils that formed in material weathered from the underlying shale. Permeability is slow or very slow. These soils are on uplands. Slopes range from 15 to 40 percent.

Boyd soils are adjacent to Crofton, Ethan, and Betts soils. These adjacent soils contain less clay than Boyd soils and are higher on the landscape. Betts and Ethan soils formed in glacial till. Crofton soils formed in loess.

Typical pedon of Boyd silty clay, in an area of Boyd-Ethan association, 15 to 40 percent slopes, 2,700 feet west and 1,200 feet north of the southeast corner of sec. 16, T. 93 N., R. 57 W.

A1—0 to 3 inches; dark grayish brown (10YR 4/2) silty clay, very dark grayish brown (10YR 3/2) moist; moderate fine and medium granular structure; very hard, very firm, sticky and plastic; neutral; clear wavy

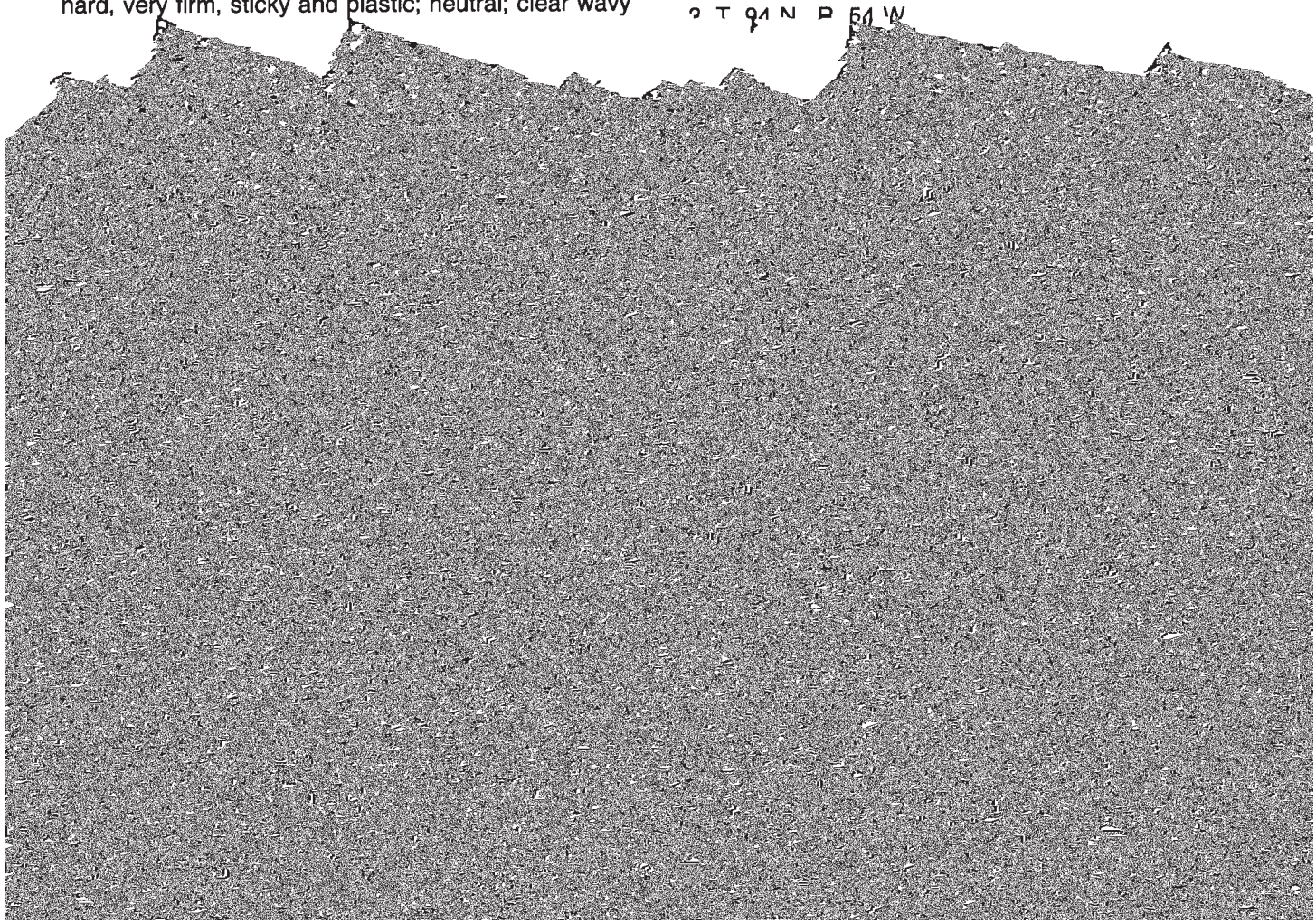
The A horizon has hue of 10YR or 2.5Y and value of 4 or 5 (2 or 3 moist). It is clay in some pedons. The B horizon is clay in some pedons. Tongues of A1 material are common in the B2 horizon, and some extend into the C horizon. The C1 horizon has value of 5 or 6 (4 or 5 moist) and chroma of 2 or 3. The Cr horizon has hue of 2.5Y or 5Y, value of 4 to 6 (4 or 5 moist), and chroma of 2 or 3.

Chancellor series

The Chancellor series consists of deep, somewhat poorly drained, slowly permeable soils that formed in silty alluvium. These soils are in swales and in drainageways on uplands. Slopes are 0 to 1 percent.

Chancellor soils are similar to Crossplain soils and commonly are adjacent to Egan, Wentworth, and Whitewood soils on the landscape. Crossplain soils contain more sand than Chancellor soils. Egan, Wentworth, and Whitewood soils are fine-silty.

Typical pedon of Chancellor silty clay loam, 2,514 feet west and 473 feet south of the northeast corner of sec. 2, T. 94 N., R. 54 W.



peds; few fine concretions of iron and manganese oxide; neutral; clear wavy boundary.

C1gca—37 to 44 inches; light gray (2.5Y 7/2) silty clay loam, grayish brown (2.5Y 5/2) moist; common medium distinct mottles, reddish yellow (7.5YR 6/8) moist; very weak coarse prismatic structure parting to weak medium subangular blocky; hard, friable, slightly sticky and plastic; few fine concretions of iron and manganese oxide; few medium accumulations of carbonate; strong effervescence; mildly alkaline; clear wavy boundary.

C2g—44 to 56 inches; light gray (5Y 7/2) silty clay loam, light olive gray (5Y 6/2) moist; common medium distinct mottles, reddish yellow (7.5YR 6/8) moist; massive; hard, friable, slightly sticky and slightly plastic; few fine concretions of iron and manganese oxide; few medium accumulations of carbonate; violent effervescence; mildly alkaline; clear wavy boundary.

C3g—56 to 60 inches; light gray (2.5Y 7/2) silty clay loam, light brownish gray (2.5Y 6/2) moist; common medium distinct mottles, reddish yellow (7.5YR 6/8) moist; massive; hard, friable, slightly sticky and slightly plastic; few fine concretions of iron and manganese oxide; few medium accumulations of carbonate; violent effervescence; mildly alkaline.

The thickness of the solum and the depth to free carbonates range from 36 to 50 inches. The thickness of the mollic epipedon ranges from 26 to 48 inches.

The A horizon is typically silty clay loam but is silty clay in some pedons. It is slightly acid or neutral. The B horizon has value of 4 to 6 (2 to 4 moist) and chroma of

slightly plastic; mildly alkaline; abrupt smooth boundary.

B2g—7 to 14 inches; dark gray (2.5Y 4/1) silty clay loam, black (2.5Y 2/1) moist; weak coarse subangular blocky structure parting to moderate fine and very fine subangular blocky; hard, firm, slightly sticky and slightly plastic; mildly alkaline; clear smooth boundary.

B3gca—14 to 26 inches; dark gray (2.5Y 4/1) silty clay loam, black (2.5Y 2/1) moist; weak medium prismatic structure parting to moderate fine and medium subangular blocky; hard, firm, slightly sticky and slightly plastic; strong effervescence; mildly alkaline; abrupt smooth boundary.

C1g—26 to 32 inches; gray (5Y 5/1) silty clay loam, dark gray (5Y 4/1) moist; few fine distinct mottles, strong brown (7.5YR 5/6) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; very thin strata; common fine accumulations of carbonate; strong effervescence; mildly alkaline; clear smooth boundary.

C2g—32 to 60 inches; dark gray (5Y 4/1) silty clay loam, very dark gray (5Y 3/1) moist; massive; hard, firm, slightly sticky and slightly plastic; strong effervescence; mildly alkaline.

The thickness of the solum ranges from 24 to 36 inches. The depth to free carbonates ranges from 14 to 24 inches.

The A horizon has hue of 10YR or 2.5Y, value of 3 or 4 (2 or 3 moist), and chroma of 1. It typically is silty clay loam, but silty clay is within the range. The B horizon has hue of 2.5Y or 5Y, value of 4 or 5 (2 or 3 moist), and

Ap—0 to 9 inches; dark gray (10YR 4/1) silty clay loam, black (10YR 2/1) moist; moderate fine and medium granular structure; hard, firm, sticky and plastic; slight effervescence; mildly alkaline; abrupt smooth boundary.

A12—9 to 16 inches; dark gray (10YR 4/1) silty clay loam, black (10YR 2/1) moist; moderate medium subangular blocky structure; hard, firm, sticky and plastic; slight effervescence; mildly alkaline; gradual wavy boundary.

B2—16 to 26 inches; grayish brown (10YR 5/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; many fine distinct mottles, yellowish brown (10YR 5/4) moist; weak medium prismatic structure parting to weak medium subangular blocky; hard, firm, sticky and plastic; strong effervescence; mildly alkaline; clear smooth boundary.

C1—26 to 38 inches; grayish brown (2.5Y 5/2) silt loam, very dark grayish brown (2.5Y 3/2) moist; many fine distinct mottles, yellowish brown (10YR 5/6) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; strong effervescence; mildly alkaline; clear smooth boundary.

C2—38 to 60 inches; gray (5Y 5/1) silt loam, very dark gray (5Y 3/1) moist; many fine and medium distinct mottles, yellowish brown (10YR 5/6) and dark gray (5Y 4/1) moist; massive; soft, very friable, slightly plastic; strong effervescence; mildly alkaline.

The thickness of the solum and of the mollic epipedon ranges from 18 to 30 inches and corresponds to the depth to contrasting underlying material. The depth to free carbonates ranges from 0 to 30 inches.

The A horizon has hue of 10YR or 2.5Y and value of 3 or 4 (2 or 3 moist). It typically is silt loam, but silty clay is within the range. The B horizon has hue of 10YR or 2.5Y, value of 4 or 5 (3 or 4 moist), and chroma of 1 or 2. The C horizon has value of 4 to 6 (3 or 4 moist) and chroma of 1 or 2. It typically is silt loam, but in some pedons it is stratified silt loam, very fine sandy loam, loamy very fine sand, and loam.

Clarno series

The Clarno series consists of deep, well drained soils that formed in clay loam glacial till. Permeability is moderate in the solum and moderately slow in the underlying material. These soils are on uplands. Slopes range from 0 to 6 percent.

Clarno soils commonly are adjacent to Bonilla, Crossplain, Davis, Ethan, Stickney, and Tetonka soils. Bonilla and Davis soils have a mollic epipedon more than 20 inches thick. Crossplain soils are somewhat poorly drained. Ethan soils are not so deep to free carbonates as Clarno soils. Stickney soils have a natric horizon. Tetonka soils are poorly drained and are in depressions. Bonilla, Crossplain, Davis, and Stickney soils are in intermediate positions between the Clarno and Tetonka soils. Ethan soils are on the higher parts of the landscape.

Typical pedon of Clarno loam (fig. 12), in an area of Clarno-Bonilla loams, 1 to 6 percent slopes, 1,840 feet west and 114 feet south of the northeast corner of sec. 5, T. 94 N., R. 54 W.

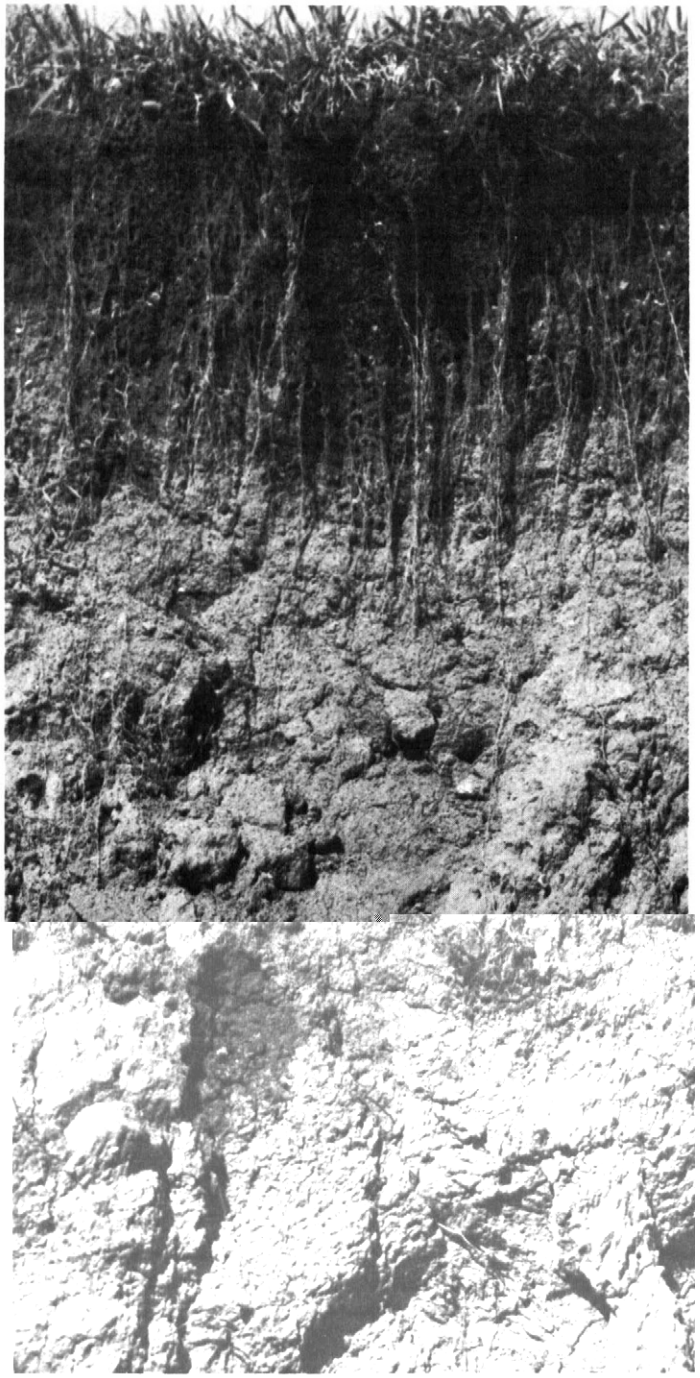


Figure 12.—Typical profile of Clarno loam, in an area of Clarno-Bonilla loams, 1 to 6 percent slopes. The dark surface layer is about 11 inches thick.

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; soft, friable; slightly acid; abrupt smooth boundary.

A12—7 to 11 inches; dark grayish brown (10YR 4/2) loam, very dark brown (10YR 2/2) moist; moderate fine and medium subangular blocky structure; slightly hard, friable; slightly acid; clear smooth boundary.

B21—11 to 16 inches; grayish brown (10YR 5/2) clay loam, very dark grayish brown (10YR 3/2) moist; weak medium prismatic structure parting to moderate medium subangular blocky; slightly hard, friable; neutral; clear smooth boundary.

B22—16 to 23 inches; brown (10YR 5/3) clay loam, brown (10YR 4/3) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; slightly hard, friable; neutral; abrupt smooth boundary.

B3ca—23 to 33 inches; pale brown (10YR 6/3) clay loam, light olive brown (2.5Y 5/4) moist; weak coarse prismatic structure parting to weak fine subangular blocky; hard, friable; common fine and medium accumulations of carbonate; strong effervescence; mildly alkaline; gradual smooth boundary.

C1ca—33 to 43 inches; pale yellow (2.5Y 7/4) clay loam, light olive brown (2.5Y 5/4) moist; common fine distinct mottles, gray (5Y 6/1) and brownish yellow

Crofton series

The Crofton series consists of deep, well drained, moderately permeable soils that formed in loess. These soils are on uplands. Slopes range from 9 to 40 percent.

Crofton soils commonly are adjacent to Boyd, Gavins, Nora, and Talmo soils on the landscape. Boyd soils contain more clay than Crofton soils and formed in clayey shale. Gavins soils are shallow to chalk rock. Nora soils have a mollic epipedon. Talmo soils have a mollic epipedon and are shallow to sand and gravel.

Typical pedon of Crofton silt loam, in an area of Crofton-Nora silt loams, 9 to 25 percent slopes, 330 feet south and 90 feet east of the northwest corner of sec. 18, T. 93 N., R. 56 W.

A1—0 to 4 inches; grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure; hard, friable; slight effervescence; mildly alkaline; clear smooth boundary.

A12—4 to 6 inches; brown (10YR 5/3) silt loam, dark brown (10YR 3/3) moist; weak medium prismatic structure parting to weak fine and very fine subangular blocky; slightly hard, friable; strong effervescence; mildly alkaline; clear smooth boundary.

AC—6 to 12 inches; brown (10YR 5/3) silt loam, dark brown (10YR 4/3) moist; many fine faint mottles, brownish yellow (10YR 6/6) moist; weak coarse prismatic structure; slightly hard, friable; common fine accumulations and streaks of carbonate; strong

Crossplain series

The Crossplain series consists of deep, somewhat poorly drained, slowly permeable soils that formed in clay loam glacial till. These soils are on uplands. Slopes range from 0 to 2 percent.

Crossplain soils are similar to Chancellor soils and commonly are adjacent to Bonilla, Clarno, Stickney, and Totagko soils. Bonilla soils are moderately well drained.

5/1) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few fine concretions of iron and manganese oxide; common fine accumulations of carbonate; strong effervescence; common fine nests of gypsum; mildly alkaline.

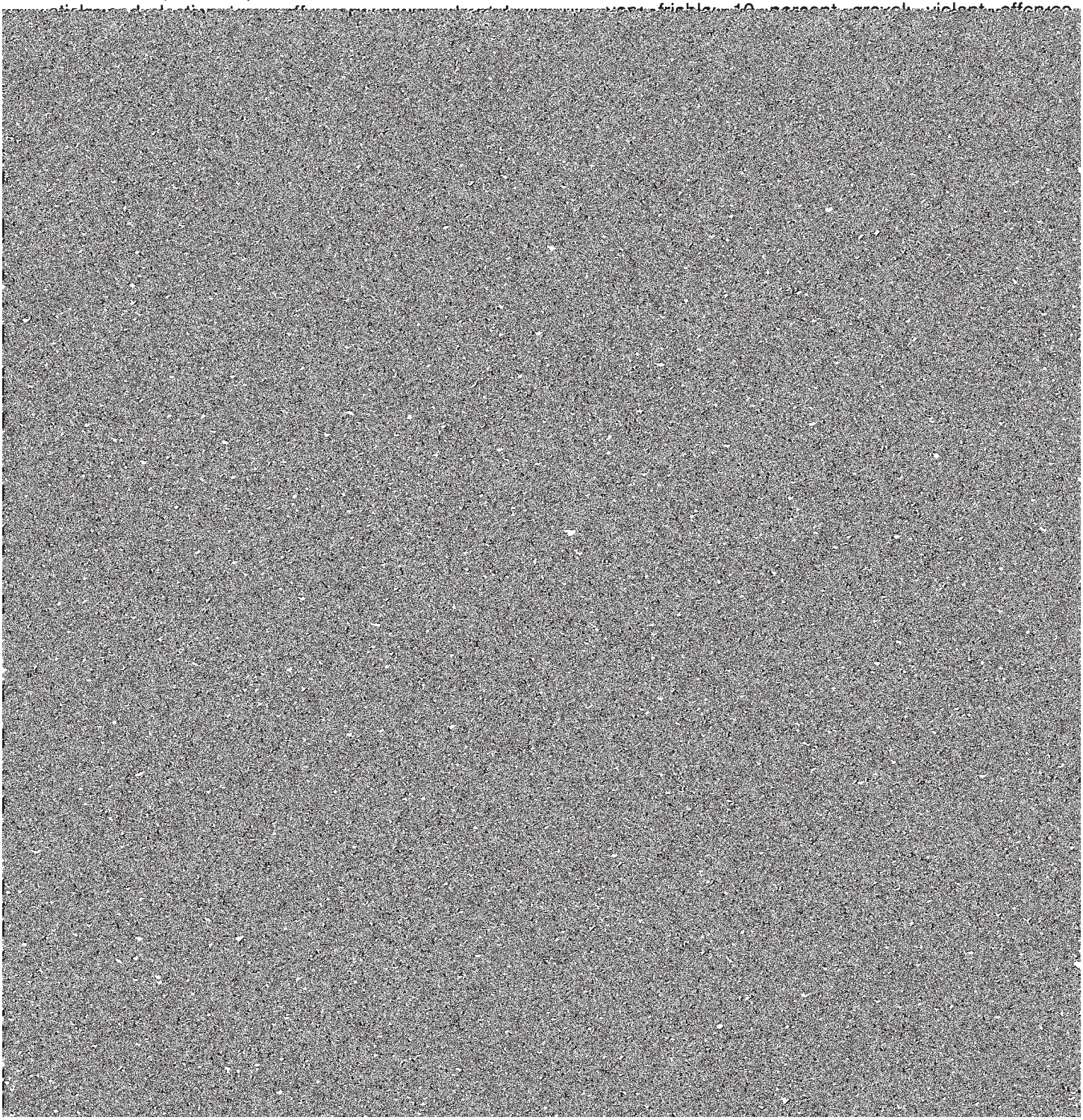
The thickness of the solum ranges from 36 to 50 inches. The depth to free carbonates ranges from 32 to 44 inches. The thickness of the mollic epipedon ranges

able, slightly sticky and slightly plastic; common medium accumulations of carbonate; violent effervescence; moderately alkaline; gradual wavy boundary.

C2—42 to 60 inches; pale brown (10YR 6/3) clay loam, olive brown (2.5Y 4/4) moist; massive; hard, friable,

C2—22 to 30 inches; very pale brown (10YR 7/3) very fine sandy loam, brown (10YR 5/3) moist; massive; soft, very friable; violent effervescence; mildly alkaline; clear wavy boundary.

C3—30 to 38 inches; very pale brown (10YR 7/3) loamy fine sand, brown (10YR 5/3) moist; massive; soft,



IIC2—32 to 60 inches; light yellowish brown (10YR 6/4) sand and gravel, yellowish brown (10YR 5/4) moist; single grained; loose; strong effervescence; mildly alkaline.

The thickness of the solum, the depth to carbonates, and the thickness of the mollic epipedon range from 10 to 20 inches and correspond to the depth to underlying sand and gravel.

The A horizon has value of 3 or 4 (2 or 3 moist) and chroma of 1 or 2. It typically is loam, but fine sandy loam is within the range. The B horizon has value of 3 to 5 (2 or 3 moist) and chroma of 1 or 2.

Egan series

The Egan series consists of deep, well drained soils that formed in silty drift and the underlying glacial till. Permeability is moderate in the solum and moderately slow in the underlying material. These soils are on uplands. Slopes range from 0 to 9 percent.

Egan soils are similar to Wentworth soils and commonly are adjacent to Ethan, Trent, and Wentworth soils. Ethan soils are fine-loamy. Trent and Wentworth soils do not have glacial till within a depth of 20 to 40 inches.

Typical pedon of Egan silty clay loam, in an area of Egan-Ethan-Trent complex, 1 to 6 percent slopes, 2,240 feet west and 110 feet north of the southeast corner of sec. 3, T. 94 N., R. 54 W.

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) silty clay loam, very dark brown (10YR 2/2) moist; weak fine and medium granular structure; soft, friable, slightly sticky and slightly plastic; neutral; abrupt smooth boundary.

B21—7 to 14 inches; brown (10YR 5/3) silty clay loam, dark brown (10YR 3/3) moist; weak medium pris-

(10YR 6/6) moist; massive; hard, firm, sticky and plastic; strong effervescence; mildly alkaline; clear smooth boundary.

IIC2—38 to 60 inches; pale yellow (2.5Y 7/4) clay loam, light olive brown (2.5Y 5/4) moist; many medium distinct mottles, gray (5Y 6/1) and brownish yellow (10YR 6/8) moist; massive; hard, firm, sticky and plastic; strong effervescence; mildly alkaline.

The thickness of the solum ranges from 20 to 30 inches. The depth to free carbonates ranges from 15 to 24 inches. The thickness of the mollic epipedon ranges from 12 to 19 inches. The depth to glacial till ranges from 24 to 36 inches.

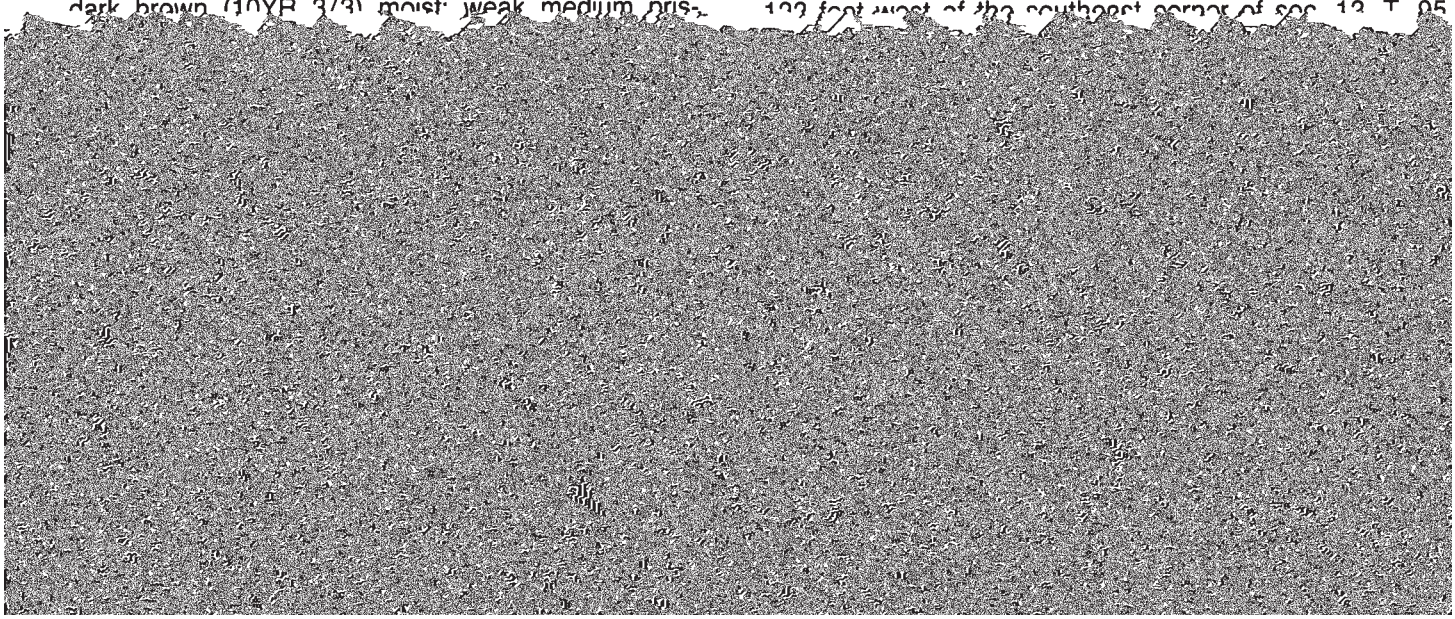
The A horizon has value of 3 or 4 (2 or 3 moist) and chroma of 1 or 2. It typically is silty clay loam, but silt loam is within the range. The B horizon has hue of 10YR or 2.5Y, value of 4 to 6 (3 or 4 moist), and chroma of 2 to 4. The IIC horizon has value of 5 to 7 (5 or 6 moist) and chroma of 3 or 4. It typically is clay loam, but it is loam in some pedons. Mottles and accumulations of carbonate range from few to many.

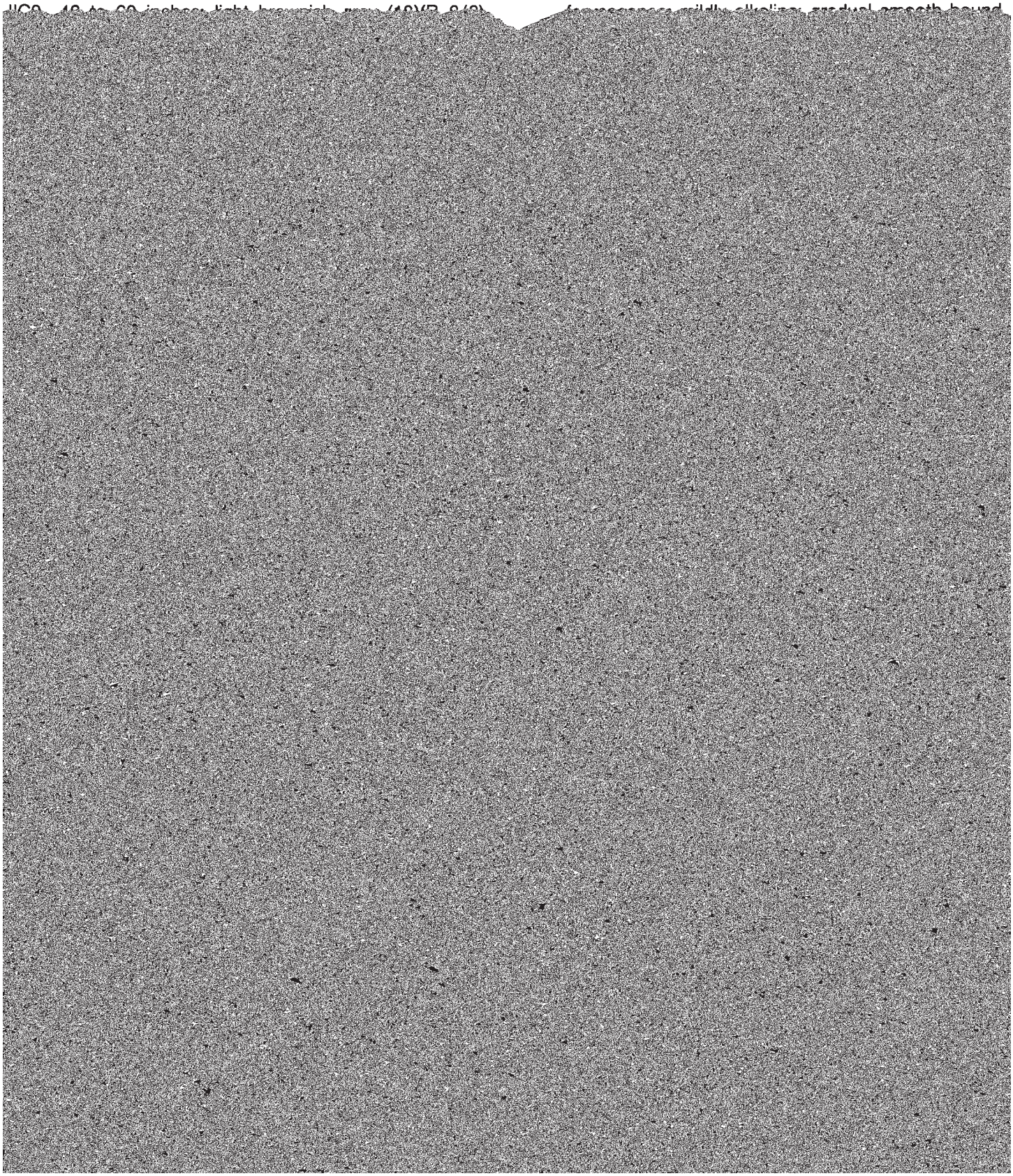
Enet series

The Enet series consists of well drained soils that are moderately deep to sand and gravel. Permeability is moderate in the solum and rapid in the underlying sand and gravel. These soils are on uplands. They formed in glacial outwash. Slopes range from 0 to 9 percent.

Enet soils are similar to Delmont soils and commonly are adjacent to Clarno, Delmont, and Talmo soils. Clarno soils formed in clay loam glacial till. Delmont and Talmo soils have sand and gravel within a depth of 20 inches.

Typical pedon of Enet loam, in an area of Enet-Delmont loams, 0 to 2 percent slopes, 1,195 feet north and





effervescence; mildly alkaline; abrupt smooth boundary.

C1—11 to 16 inches; dark gray (5Y 4/1) silty clay loam, dark grayish brown (2.5Y 4/2) moist; 1-inch light gray (2.5Y 7/2) strata in upper part; common medium distinct mottles, brownish yellow (10YR 6/6) moist; weak medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; slight effervescence; neutral; clear smooth boundary.

IIA1b—16 to 32 inches; dark gray (5Y 4/1) silty clay, very dark gray (5Y 3/1) moist; common fine faint mottles, brownish yellow (10YR 6/6) moist; weak medium prismatic structure parting to weak fine subangular blocky; hard, friable, sticky and plastic; neutral; clear smooth boundary.

IIC1—32 to 40 inches; dark gray (5Y 4/1) and light olive gray (5Y 6/2) silty clay, olive gray (5Y 5/2) and very dark gray (5Y 3/1) moist; common medium distinct mottles, yellowish brown (10YR 5/6) moist; massive; hard, friable, sticky and plastic; slight effervescence; mildly alkaline; clear smooth boundary.

IIC2—40 to 44 inches; light olive gray (5Y 6/2) silty clay loam, olive gray (5Y 5/2) moist; common medium distinct mottles, yellowish brown (10YR 6/8) moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; slight effervescence; mildly alkaline; clear smooth boundary.

IIC3—44 to 60 inches; light gray (5Y 6/1) silty clay, dark gray (5Y 4/1) moist; common coarse distinct mottles, yellowish brown (10YR 5/4) moist; massive; hard, firm, sticky and plastic; slight effervescence; mildly alkaline.

The thickness of the solum ranges from 6 to 11 inches. The depth to carbonates ranges from 0 to 36 inches.

The A horizon has hue of 10YR or 2.5Y, value of 4 or 5 (2 or 3 moist), and chroma of 1 or 2. It typically is silty clay loam but in some pedons is silty clay. The C horizon has hue of 2.5Y or 5Y, value of 4 to 6 (3 to 5 moist), and chroma of 1 or 2.

Gavins series

The Gavins series consists of shallow, excessively drained, moderately permeable soils that formed in residuum weathered from chalk. These soils are on uplands. Slopes range from 15 to 40 percent.

Gavins soils commonly are adjacent to Betts, Boyd, and Redstoe Variant soils. Betts soils formed in glacial till. Boyd soils formed in clayey shale. Redstoe Variant soils are deeper to chalk than Gavins soils.

Typical pedon of Gavins silt loam, in an area of Betts-Gavins complex, 15 to 40 percent slopes, 2,240 feet west and 2,400 feet north of the southeast corner of sec. 35, T. 95 N., R. 54 W.

A1—0 to 4 inches; grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) moist; moderate fine and medium granular structure; soft, very friable; common fine fragments of chalk rock; strong effervescence; mildly alkaline; clear smooth boundary.

AC—4 to 11 inches; light gray (2.5Y 7/2) and grayish brown (10YR 5/2) silt loam, light brownish gray (2.5Y 6/2) and dark grayish brown (10YR 4/2) moist; weak medium subangular blocky structure parting to weak medium granular; soft, very friable; many fine fragments of chalk rock; violent effervescence; mildly alkaline; gradual wavy boundary.

C1—11 to 16 inches; white (2.5Y 8/2) silt loam, pale yellow (2.5Y 7/4) moist; massive; many fragments of chalk rock and evidence of rock structure; violent effervescence; mildly alkaline; gradual wavy boundary.

Cr—16 to 60 inches; white (2.5Y 8/2) soft chalk rock, pale yellow (2.5Y 7/4) moist; violent effervescence; mildly alkaline.

The depth to chalk ranges from 12 to 18 inches. The A1 horizon has value of 4 or 5 (2 or 3 moist) and chroma of 1 or 2. The AC horizon has hue of 10YR or 2.5Y, value of 5 to 7 (4 or 5 moist), and chroma of 2 or 3. The fracture seams in the Cr horizon are filled with gypsum in some pedons.

Gayville series

The Gayville series consists of deep, somewhat poorly drained soils. Permeability is very slow in the solum and moderate below. These soils formed in clayey alluvium that overlies silty alluvium on bottom land. Slopes range from 0 to 2 percent.

Gayville soils commonly are adjacent to Blencoe and Blyburg soils. Blencoe and Blyburg soils lack a natric horizon. In addition, Blyburg soils are coarse-silty.

Typical pedon of Gayville silty clay loam, in an area of Blencoe-Gayville complex, 1,200 feet east and 240 feet north of the southwest corner of sec. 36, T. 94 N., R. 54 W.

Ap—0 to 6 inches; dark grayish brown (10YR 4/2) silty clay loam, very dark brown (10YR 2/2) moist; massive; very hard, firm, sticky and plastic; slight effervescence; neutral; abrupt smooth boundary.

B21t—6 to 14 inches; dark gray (10YR 4/1) silty clay loam, very dark gray (10YR 3/1) moist; strong medium prismatic structure parting to moderate fine and medium blocky; hard, firm, sticky and plastic; gray (10YR 6/1) coatings on top of prisms; slight effervescence; moderately alkaline; clear wavy boundary.

B22t—14 to 22 inches; dark grayish brown (2.5Y 4/2) silty clay loam, very dark grayish brown (2.5Y 3/2) moist; weak medium prismatic structure parting to

moderate fine blocky; hard, firm, sticky and plastic; few fine nests of salt crystals; strong effervescence;

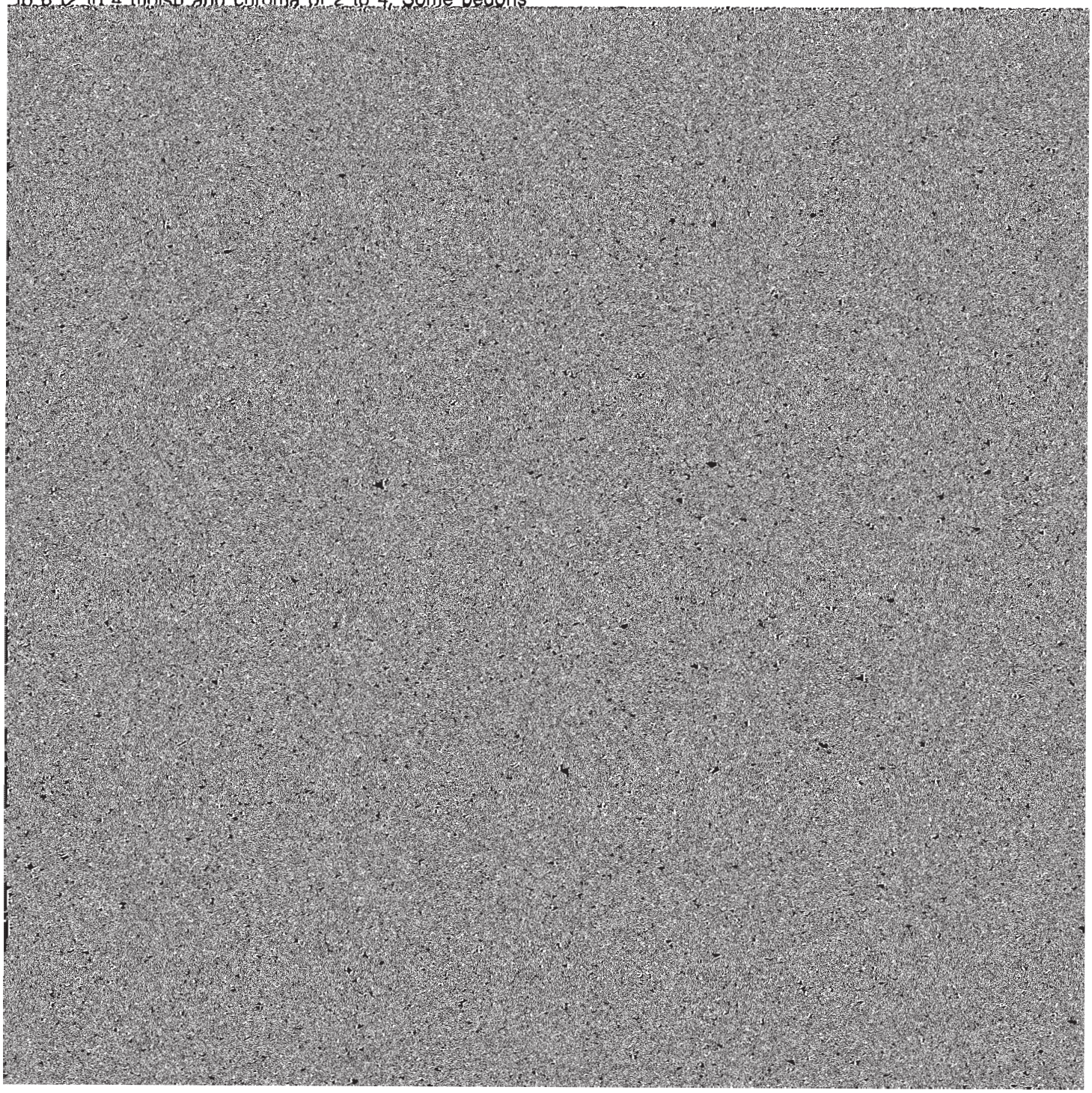
The thickness of the solum ranges from 6 to 10 inches and corresponds to the thickness of the A horizon. This

The thickness of the solum, or the depth to sand and gravel, ranges from 40 to 50 inches. The depth to carbonates ranges from 36 to 46 inches. The mollic epipedon ranges from 24 to 36 inches in thickness.

The A horizon has value of 3 or 4 (2 or 3 moist) and chroma of 1 or 2. It typically is silty clay loam but in some pedons is silt loam. The B2 horizon has value of 4 to 6 (2 to 4 moist) and chroma of 2 to 4. Some pedons

The thickness of the solum ranges from 6 to 10 inches. The A horizon typically is silt loam but is very fine sandy loam in some pedons. The lower part of the A horizon is not mottled in some pedons. The C horizon is very fine sandy loam, silt loam, or silty clay.

James series



The thickness of the solum ranges from 24 to 60 inches. Free carbonates are within 10 inches of the surface. The depth to gypsum ranges from 0 to 10 inches. The mollic epipedon is 24 to 48 inches thick.

The A horizon has hue of 10YR or 2.5Y. It is 8 to 20 inches thick. The C horizon has hue of 2.5Y or 5Y. It is moderately alkaline or strongly alkaline. Typically, all horizons are silty clay loam, but silty clay is within the

plastic; common medium accumulations of carbonate; strong effervescence; mildly alkaline; abrupt smooth boundary.

C—44 to 60 inches; light gray (2.5Y 7/2) silt loam, grayish brown (2.5Y 5/2) moist; many fine mottles, dark brown (7.5YR 3/2), strong brown (7.5YR 5/6), and gray (5Y 5/1) moist; slightly hard, very friable; violent effervescence; moderately alkaline.

moist; massive; hard, very friable; few fine accumulations of carbonate; strong effervescence; mildly alkaline; gradual smooth boundary.

C2—55 to 60 inches; light brownish gray (10YR 6/2) and grayish brown (10YR 5/2) silty clay loam, dark grayish brown (10YR 4/2) and very dark grayish brown (10YR 3/2) moist; massive; very hard, friable, slightly sticky and slightly plastic; strong effervescence; mildly alkaline.

The thickness of the solum and of the mollic epipedon ranges from 24 to 35 inches. The depth to free carbonates is 10 inches or less.

The A horizon has value of 3 to 5 (2 or 3 moist). Typically, it is silty clay loam, but it is silt loam in some pedons. The AC horizon has hue of 10YR or 2.5Y, value of 4 or 5 (2 or 3 moist), and chroma of 1 or 2. The C horizon has hue of 10YR, 2.5Y, or 5Y; value of 5 to 7 (3

careous and has few very fine accumulations of carbonate; mildly alkaline; clear wavy boundary.

B3cag—42 to 50 inches; gray (5Y 6/1) silty clay, dark gray (5Y 4/1) moist; common fine distinct mottles, olive (5Y 5/6) moist; massive; hard, very firm, sticky and plastic; thin shiny films on faces of peds; slight effervescence; few fine accumulations of carbonate; mildly alkaline; clear wavy boundary.

Cg—50 to 60 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; common fine distinct mottles, olive (5Y 5/6) moist, and few fine distinct mottles, dark olive gray (5Y 3/2) moist; massive; hard, very firm, sticky and plastic; violent effervescence; mildly alkaline.

The thickness of the solum ranges from 30 to 60 inches. The mollic epipedon is 24 to 45 inches thick.

The A horizon has value of 2 or 3 when moist and is silty clay loam in some pedons. The B2 horizon has hue

accumulations of carbonate occurring as threads; strong effervescence; mildly alkaline; clear smooth boundary.

C—30 to 60 inches; light yellowish brown (2.5Y 6/4) silt loam, light olive brown (2.5Y 5/4) moist; massive; slightly hard, friable; common fine streaks and accumulations of carbonate in the upper part; strong effervescence; moderately alkaline.

The thickness of the solum ranges from 22 to 32 inches. The depth to free carbonates ranges from 12 to 30 inches. The mollic epipedon is 12 to 20 inches thick.

The A horizon has value of 3 or 4 (2 or 3 moist). It typically is silt loam but is silty clay loam in some pedons. The B horizon has value of 5 or 6 (3 or 4 moist). It is silt loam or silty clay loam. The C horizon has value of 5 or 6 (4 or 5 moist) and chroma of 3 or 4.

Onawa series

The Onawa series consists of deep, somewhat poorly drained soils that formed in clayey over silty alluvium. These soils are slowly permeable in the upper part and moderately permeable in the lower part. They are on bottom land. Slopes are 0 to 2 percent.

Onawa soils are similar to Blencoe soils and commonly are adjacent to Blake, Forney, and Owego soils. Blake soils are fine-silty. Blencoe soils have a mollic epipedon. Forney and Owego soils are fine textured.

Typical pedon of Onawa silty clay, 1,600 feet west and 1,410 feet north of the southeast corner of sec. 12, T. 93 N., R. 55 W.

Ap—0 to 7 inches; grayish brown (2.5Y 5/2) silty clay, very dark grayish brown (2.5Y 3/2) moist; moderate fine and medium granular structure; hard, firm, sticky and plastic; slight effervescence; mildly alkaline; abrupt smooth boundary.

C1—7 to 30 inches; light brownish gray (2.5Y 6/2) and grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; few fine distinct mottles, yellowish brown (10YR 5/6) moist; massive; very hard, firm, sticky and plastic; slight effervescence; mildly alkaline; abrupt smooth boundary.

IIC2—30 to 48 inches; light gray (2.5Y 7/2) silt loam, grayish brown (2.5Y 5/2) moist; common fine distinct mottles, yellowish brown (10YR 5/6) and gray (5Y 5/1) moist; massive; soft, friable; strong effervescence; mildly alkaline; clear smooth boundary.

IIC3—48 to 60 inches; light brownish gray (2.5Y 6/2) loamy very fine sand, dark grayish brown (2.5Y 4/2) moist; single grained; loose; slight effervescence; mildly alkaline.

The thickness of the solum ranges from 4 to 10 inches and corresponds to the thickness of the A horizon. This horizon has hue of 2.5Y or 10YR and chroma of 1 or 2. It typically is silty clay but is silty clay loam or silt loam in some pedons. The C horizon has hue of 2.5Y or 5Y and chroma of 1 or 2. It typically is silty clay but is clay in some pedons. The IIC horizon has hue of 2.5Y or 5Y, value of 5 to 7 (3 to 5 moist), and chroma of 1 or 2.

Owego series

The Owego series consists of deep, somewhat poorly drained, very slowly permeable soils formed in clayey and silty alluvium. These soils are on bottom land. Slopes range from 0 to 2 percent.

The Owego soils in this county have a thicker silt loam subhorizon than is defined as the range for the series. This difference, however, does not alter the use or behavior of the soils.

Owego soils are adjacent to Blake, Forney, and Haynie soils on the landscape. Blake soils are fine-silty. Forney soils lack a thick silty layer. Haynie soils are coarse-silty.

Typical pedon of Owego silty clay loam, 740 feet east and 75 feet north of the southwest corner of sec. 5, T. 93 N., R. 54 W.

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; moderate fine subangular blocky structure parting to moderate medium granular; hard, firm, sticky and plastic; neutral; abrupt smooth boundary.

C1—7 to 16 inches; dark grayish brown (10YR 4/2) and light brownish gray (2.5Y 6/2) silty clay, very dark grayish brown (10YR 3/2) and dark grayish brown (2.5Y 4/2) moist; few fine distinct mottles, yellowish brown (10YR 5/6) moist; weak medium subangular blocky structure parting to moderate fine subangular blocky; slightly hard, firm, sticky and plastic; neutral; clear smooth boundary.

C2g—16 to 36 inches; light gray (2.5Y 7/2) silt loam, grayish brown (2.5Y 5/2) moist; many fine distinct mottles, brownish yellow (10YR 6/6) moist; massive; soft, very friable; strong effervescence; mildly alkaline; clear smooth boundary.

C3g—36 to 60 inches; light olive gray (5Y 6/2) silty clay, olive gray (5Y 4/2) moist; common fine distinct mottles, yellowish brown (10YR 6/6) moist; massive; very hard, very firm, sticky and plastic; very few fine accumulations of carbonate; strong effervescence; mildly alkaline.

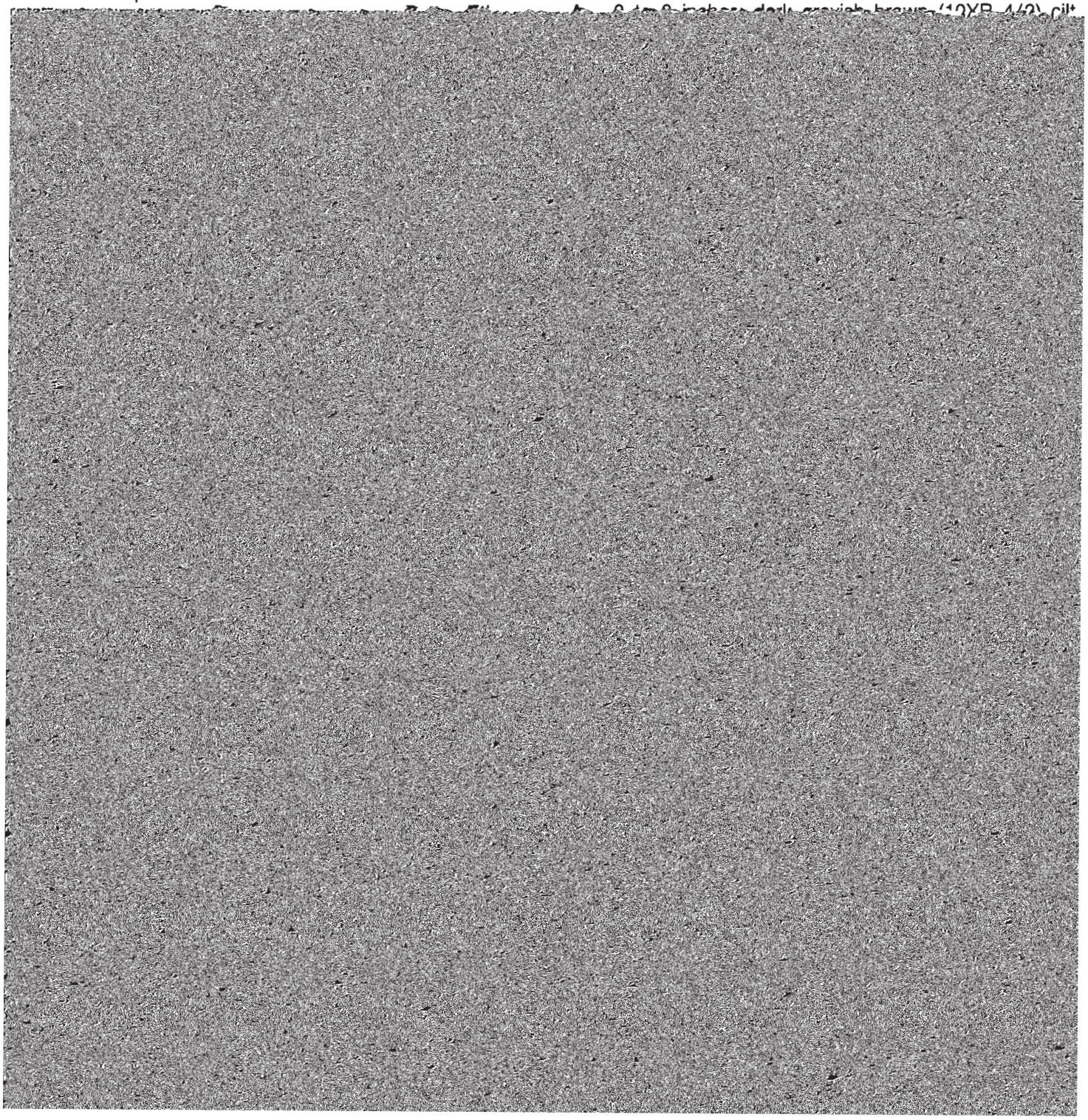
The thickness of the solum ranges from 6 to 18 inches and corresponds to thickness of the A horizon. This horizon has hue of 10YR or 2.5Y. It typically is silty clay loam but is silty clay in some pedons. The C2 horizon typically is silt loam but is very fine sandy loam or loamy very fine sand in some pedons. The C3 horizon is silty clay loam or silty clay.

Redstoe Variant

The Redstoe Variant consists of deep, well drained, moderately permeable soils that formed in silty alluvium and colluvium. These soils are on uplands. Slopes range from 6 to 15 percent.

Roxbury soils are adjacent to Baltic and Bon soils. Bon soils are fine-loamy. Baltic soils are fine textured.

Typical pedon of Roxbury silt loam, 2,490 feet south and 210 feet east of the northwest corner of sec. 15, T. 94 N., R. 54 W.



Luton soils. Blake soils have a thinner mollic epipedon than Salix soils. Blencoe soils are clayey in the upper part and loamy in the lower part. Blyburg soils are coarse-silty. Baltic, Lakeport, and Luton soils are fine textured.

Typical pedon of Salix silty clay loam, 2,240 feet east and 1,700 feet north of the southwest corner of sec. 28, T. 94 N., R. 54 W.

Ap—0 to 7 inches; dark gray (10YR 4/1) silty clay loam, very dark gray (10YR 3/1) moist; weak fine and medium granular structure; slightly hard, friable, slightly sticky and plastic; neutral; abrupt smooth boundary.

A3—7 to 16 inches; dark gray (10YR 4/1) silty clay loam, very dark gray (10YR 3/1) moist; weak coarse subangular blocky structure parting to weak medium subangular blocky; slightly hard, very friable, slightly sticky and plastic; neutral; clear smooth boundary.

B21—16 to 21 inches; dark gray (10YR 4/1) silty clay loam, very dark gray (10YR 3/1) moist; weak medium prismatic structure parting to weak fine subangular blocky; slightly hard, very friable, slightly sticky and plastic; neutral; clear smooth boundary.

B22—21 to 28 inches; dark grayish brown (2.5Y 4/2) silty clay loam, very dark grayish brown (2.5Y 3/2) moist; moderate medium prismatic structure parting to weak medium subangular blocky; slightly hard, very friable, slightly sticky and plastic; neutral; abrupt smooth boundary.

B3—28 to 34 inches; light brownish gray (2.5Y 6/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; weak coarse prismatic structure parting to weak medium subangular blocky; slightly hard, very friable, slightly sticky and plastic; few fine accumulations of carbonate; strong effervescence; mildly alkaline; clear smooth boundary.

C1—34 to 55 inches; light gray (2.5Y 7/2) silt loam, grayish brown (2.5Y 5/2) moist; few fine distinct mottles, yellowish brown (10YR 5/6) moist; massive; slightly hard, very friable; strong effervescence; moderately alkaline; clear smooth boundary.

C2—55 to 60 inches; light gray (2.5Y 7/2) very fine sandy loam, grayish brown (2.5Y 5/2) moist; common medium distinct mottles, yellowish brown (10YR 5/6) moist; massive; soft, very friable; strong effervescence; moderately alkaline.

The thickness of the solum ranges from 24 to 40 inches. The thickness of the mollic epipedon and the depth to carbonates are 20 to 30 inches.

The A horizon has value of 4 or 5 (2 or 3 moist) and chroma of 1 or 2. It typically is silty clay loam but is silt loam in some pedons. The B horizon has value of 4 to 6 (3 to 5 moist) and chroma of 1 or 2. The C horizon is very fine sand, loam, very fine sandy loam, or silt loam.

Salmo series

The Salmo series consists of deep, poorly drained soils that formed in silty and clayey alluvium. Permeability is moderately slow. These soils are on bottom land. Slopes range from 0 to 2 percent.

Salmo soils are similar to James soils and are adjacent to Clamo, Clarno, and Egan soils. Clamo and James soils are fine textured. Their position on the landscape is similar to that of Salmo soils. Clarno and Egan soils are well drained and are on adjacent uplands.

Typical pedon of Salmo silty clay loam, 2,000 feet west and 150 feet north of the southeast corner of sec. 15, T. 96 N., R. 54 W.

A11sa—0 to 3 inches; dark gray (10YR 4/1) silty clay loam, black (10YR 2/1) moist; weak fine and medium granular structure; hard, firm, slightly sticky and plastic; strong effervescence; few fine salt nests; moderately alkaline; abrupt smooth boundary.

A12sa—3 to 20 inches; very dark gray (10YR 3/1) silty clay loam, black (10YR 2/1) moist; weak medium subangular blocky structure; hard, firm, sticky and plastic; slight effervescence; common fine salt nests; moderately alkaline; clear smooth boundary.

C1gsacs—20 to 28 inches; dark gray (2.5Y 4/1) silty clay loam, black (2.5Y 2/1) moist; weak medium and coarse subangular blocky structure; hard, firm, sticky and plastic; strong effervescence; common fine salt and gypsum nests; moderately alkaline; gradual smooth boundary.

C2gsacs—28 to 34 inches; dark gray (5Y 4/1) silty clay loam, black (5Y 2/1) moist; common medium faint mottles, yellowish brown (10YR 5/8) moist; massive; hard, firm, sticky and plastic; strong effervescence; common fine salt and gypsum nests; moderately alkaline; gradual smooth boundary.

C3g—34 to 60 inches; dark gray (5Y 4/1) silty clay, very dark gray (5Y 3/1) moist; common medium faint mottles, yellowish brown (10YR 5/8) moist; massive; hard, very firm, sticky and plastic; slight effervescence; common medium salt nests; mildly alkaline.

The thickness of the solum ranges from 14 to 24 inches. The mollic epipedon ranges from 24 to 40 inches in thickness.

The A horizon has hue of 10YR or 2.5Y. It is silt loam in some pedons. The C horizon has value of 4 or 5 (2 or 3 moist) and chroma of 1 or less. It is silty clay loam, silty clay, or silt loam. Sand and gravel is below a depth of 40 inches in some pedons.

Sarpy series

The Sarpy series consists of deep, excessively drained, rapidly permeable soils that formed in sandy

alluvium. These soils are on bottom land. Slopes range from 0 to 4 percent.

Sarpy soils commonly are near Grable and Haynie soils. Grable soils are coarse-silty in the upper part and sandy-skeletal in the lower part. Haynie soils are coarse-silty.

Typical pedon of Sarpy loamy fine sand, in an area of Sarpy-Grable complex, 0 to 4 percent slopes, 1,200 feet north and 1,300 feet east of the southwest corner of sec. 2, T. 93 N., R. 55 W.

A1—0 to 9 inches; grayish brown (10YR 5/2) loamy fine sand, very dark grayish brown (10YR 3/2) moist; [illegible]

matic structure parting to strong fine blocky; very hard, firm, sticky and plastic; shiny films on faces of peds; neutral; clear smooth boundary.

B22t—18 to 22 inches; grayish brown (2.5Y 5/2) silty clay loam, very dark grayish brown (2.5Y 3/2) moist; moderate medium prismatic structure parting to moderate fine blocky; very hard, firm, sticky and plastic; shiny films on faces of peds; mildly alkaline; abrupt wavy boundary.

B3ca—22 to 26 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; weak coarse prismatic structure; hard, friable, sticky [illegible]

A11—0 to 5 inches; very dark grayish brown (10YR 3/2) loam, black (10YR 2/1) moist; weak medium and fine granular structure; slightly hard, friable; many roots; mildly alkaline; clear wavy boundary.

A12—5 to 9 inches; dark grayish brown (10YR 4/2) gravelly loam, very dark grayish brown (10YR 3/2) moist; single grained; loose, very friable; many roots; violent effervescence; mildly alkaline; clear wavy boundary.

IIC—9 to 60 inches; brown (10YR 5/3) sand and gravel, dark yellowish brown (10YR 4/4) moist; single grained; loose; violent effervescence; moderately alkaline.

The solum and the mollic epipedon are 7 to 10 inches thick. The depth to free carbonates ranges from 0 to 7 inches.

The A horizon has value of 3 to 5 (2 or 3 moist). It is 7 to 10 inches thick. The IIC horizon has hue of 10YR or 2.5Y and value of 5 or 6 (4 or 5 moist). It is mildly alkaline or moderately alkaline.

Tetonka series

The Tetonka series consists of deep, poorly drained soils that formed in local alluvial deposits over glacial till. Permeability is very slow. These soils are in closed depressions in the uplands. Slopes range from 0 to 2 percent.

Tetonka soils are near Chancellor, Clarno, Egan, Trent, and Worthing soils. Chancellor soils lack an A2 horizon and have a thicker mollic epipedon than Tetonka soils. Clarno soils are fine-loamy and are on adjacent uplands. Egan and Trent soils are fine-silty and are on adjacent uplands. Worthing soils lack an A2 horizon and are very poorly drained.

Typical pedon of Tetonka silt loam, 483 feet east and 218 feet south of the northwest corner of sec. 26, T. 95 N., R. 55 W.

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

A2—10 to 17 inches; gray (10YR 6/1) and dark gray (10YR 4/1) silt loam, dark gray (10YR 4/1) and very dark gray (10YR 3/1) moist; common fine mottles, brownish yellow (10YR 6/6) moist; weak and moderate thin platy structure; hard, very friable; slightly acid; clear smooth boundary.

B&A—17 to 21 inches; dark gray (10YR 4/1) silty clay loam (B), very dark gray (10YR 3/1) moist, and gray (10YR 5/1) silt loam (A), very dark gray (10YR 3/1) moist; weak medium prismatic structure parting to weak medium platy; hard, friable, slightly sticky and plastic; common fine iron concretions; slightly acid; clear wavy boundary.

B21t—21 to 33 inches; dark gray (10YR 4/1) silty clay, very dark gray (10YR 3/1) moist; moderate medium prismatic structure parting to weak medium blocky; very hard, firm, sticky and plastic; neutral; gradual smooth boundary.

B22t—33 to 48 inches; gray (10YR 5/1) silty clay, very dark gray (10YR 3/1) moist; moderate medium and coarse prismatic structure parting to moderate fine and medium blocky; hard, firm, slightly sticky and slightly plastic; neutral; gradual smooth boundary.

C—48 to 60 inches; grayish brown (10YR 5/2) silty clay loam, very dark gray (10YR 3/1) moist; common medium distinct mottles, light yellowish brown (2.5Y 6/4) moist; massive; hard, firm, slightly sticky and slightly plastic; mildly alkaline.

The thickness of the solum ranges from 36 to 60 inches. The depth to carbonates ranges from 48 to 60 inches or more.

The Ap horizon has value of 4 or 5 (2 or 3 moist) and chroma of 1 or 2. It ranges from 8 to 12 inches in thickness. The A2 horizon has value of 5 to 7 (3 to 5 moist) and chroma of 1 or 2. It ranges from 4 to 12 inches in thickness. The B&A horizon has colors similar to those of the A2 and B21t horizons. The B2 horizon has hue of 10YR, 2.5Y, or 5Y; value of 4 or 5 (2 to 4 moist); and chroma of 1 or 2. The C horizon has hue of 10YR, 2.5Y, or 5Y. It is neutral or mildly alkaline.

Thurman series

The Thurman series consists of deep, somewhat excessively drained, rapidly permeable soils that formed in sandy and loamy glacial outwash. These soils are on uplands. Slopes range from 2 to 30 percent.

The Thurman soils in this county have a finer textured mollic epipedon than is defined as the range for the series. This difference, however, does not alter the use or behavior of the soils.

Thurman soils are adjacent to Blendon, Ethan, and Talmo soils. Blendon soils have a mollic epipedon that is more than 20 inches thick. Ethan soils are fine-loamy. Talmo soils are shallow to sand and gravel.

Typical pedon of Thurman fine sandy loam, in an area of Blendon-Thurman complex, 0 to 6 percent slopes, 1,910 feet north and 300 feet west of the southeast corner of sec. 36, T. 96 N., R. 57 W.

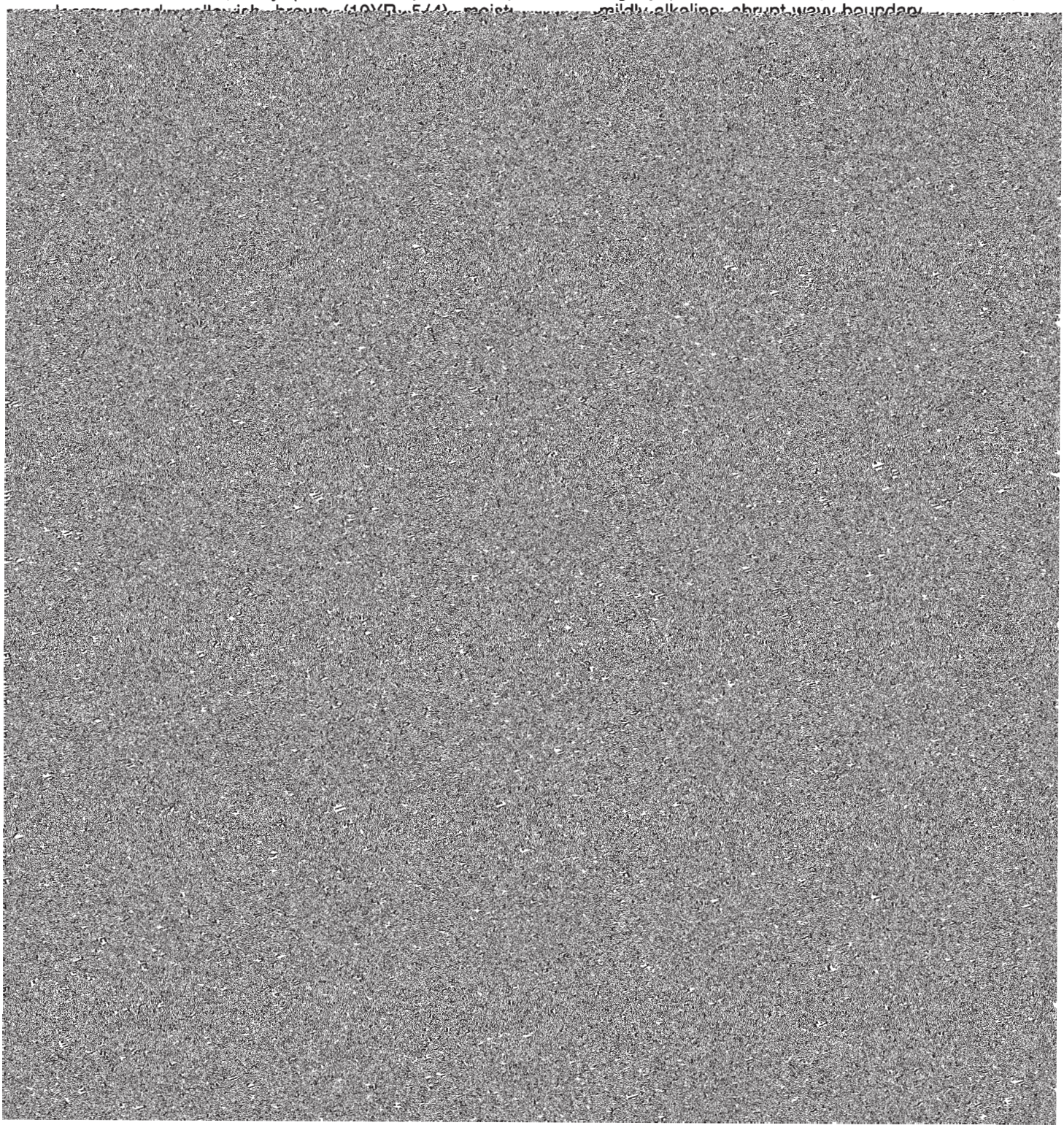
Ap—0 to 10 inches; dark grayish brown (10YR 4/2) fine sandy loam, very dark brown (10YR 2/2) moist; weak fine and medium granular structure; soft, friable; slightly acid; abrupt smooth boundary.

AC1—10 to 18 inches; dark grayish brown (10YR 4/2) sandy loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure;

AC2—18 to 30 inches; brown (10YR 5/3) loamy sand, brown (10YR 4/3) moist; very weak medium and coarse prismatic structure; loose; neutral; gradual smooth boundary.

Cca—30 to 60 inches; very pale brown (10YR 7/4) [illegible]

B22—24 to 34 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; moderate medium prismatic structure parting to moderate medium blocky; hard, friable, slightly sticky and slightly plastic; thin shiny films on faces of peds; [illegible]



weak medium subangular blocky structure; soft, very friable; slight effervescence; mildly alkaline; clear wavy boundary.

A12—6 to 10 inches; dark grayish brown (10YR 4/2) silty clay loam, very dark brown (10YR 2/2) moist; weak coarse prismatic structure parting to moderate

series. These differences, however, do not alter the use or behavior of the soils.

Whitewood soils are adjacent to Chancellor, Egan, Tetonka, and Wentworth soils. Chancellor and Tetonka soils have an argillic horizon. Egan and Wentworth soils are well drained.

Typical pedon of Whitewood silty clay loam, in an area of Egan-Whitewood silty clay loams, 0 to 3 percent slopes, 2,000 feet west and 225 feet north of the southeast corner of sec. 23, T. 94 N., R. 55 W.

Ap—0 to 9 inches; dark grayish brown (10YR 4/2) silty clay loam, very dark brown (10YR 2/2) moist; weak medium subangular blocky structure parting to weak fine granular; hard, friable, slightly sticky and slightly plastic; slightly acid; abrupt smooth boundary.

A12—9 to 19 inches; dark grayish brown (10YR 4/2) silty clay loam, very dark brown (10YR 2/2) moist; weak medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; neutral; gradual smooth boundary.

B21—19 to 30 inches; dark grayish brown (10YR 4/2) silty clay loam, very dark brown (10YR 2/2) moist; weak medium prismatic structure parting to moderate medium subangular blocky; hard, friable, slightly sticky and slightly plastic; mildly alkaline; clear smooth boundary.

B22—30 to 38 inches; very dark grayish brown (10YR 3/2) silty clay loam, very dark brown (10YR 2/2) moist; weak medium prismatic structure parting to moderate medium subangular blocky; very hard, firm, sticky and plastic; mildly alkaline; clear wavy boundary.

B3g—38 to 42 inches; gray (5Y 6/1) and dark grayish brown (10YR 4/2) silty clay loam, dark gray (5Y 4/1) and very dark brown (10YR 2/2) moist; common fine distinct mottles, yellowish brown (10YR 5/6) moist; weak coarse prismatic structure; very hard, firm, sticky and plastic; mildly alkaline; clear wavy boundary.

IIC1—42 to 48 inches; gray (5Y 6/1) clay loam, dark gray (5Y 4/1) moist; common fine prominent mottles, brownish yellow (10YR 6/6) moist; massive; hard, firm, sticky and plastic; mildly alkaline; clear wavy boundary.

IIC2—48 to 60 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; [illegible] mottles, brownish [illegible]

The A horizon has value of 3 or 4 (2 or 3 moist) and chroma of 1 or 2. It typically is silty clay loam but is silt loam in some pedons. The B2 horizon has hue of 10YR or 2.5Y, value of 3 or 4 (2 or 3 moist), and chroma of 1 or 2. The B3 and IIC horizons have hue of 10YR, 2.5Y, or 5Y; value of 6 or 7 (4 or 5 moist); and chroma of 1 or 2.

Worthing series

The Worthing series consists of deep, very poorly drained, slowly permeable soils formed in silty and clayey alluvial sediments. These soils are in enclosed depressions in the uplands. Slopes range from 0 to 2 percent.

Worthing soils commonly are near Clarno, Crossplain, Egan, Ethan, and Trent soils. Clarno and Ethan soils are fine-loamy, are well drained, and are higher on the landscape than Worthing soils. Egan and Trent soils are fine-silty and are better drained than Worthing soils. Crossplain soils are somewhat poorly drained and are in swales.

Typical pedon of Worthing silty clay loam, 195 feet west and 150 feet south of the northeast corner of sec. 32, T. 96 N., R. 54 W.

O—1 inch to 0; partly decomposed organic litter.

A1—0 to 6 inches; very dark gray (10YR 3/1) silty clay loam, black (10YR 2/1) moist; weak fine and very fine granular structure; slightly hard, very friable, slightly sticky and slightly plastic; neutral; clear smooth boundary.

A12—6 to 14 inches; very dark gray (10YR 3/1) silty clay loam, black (10YR 2/1) moist; few fine distinct mottles, light olive brown (2.5Y 5/6) moist; weak medium subangular blocky structure parting to weak fine granular; hard, very friable, slightly sticky and slightly plastic; neutral; clear smooth boundary.

B21t—14 to 22 inches; very dark gray (10YR 3/1) silty clay, black (10YR 2/1) moist; common fine distinct mottles, yellowish brown (10YR 5/6) moist; weak medium prismatic structure parting to moderate medium subangular blocky; hard, friable, slightly sticky and plastic; neutral; clear smooth boundary.

B22t—22 to 44 inches; dark gray (10YR 4/1) silty clay, black (10YR 2/1) moist; common fine distinct mottles, yellowish brown (10YR 5/6) moist; weak medium and coarse prismatic structure parting to

slightly plastic; mildly alkaline; clear smooth boundary.

C—52 to 60 inches; dark gray (5Y 4/1) silty clay loam, black (5Y 2/1) moist; common medium distinct mottles, dark yellowish brown (10YR 4/6) moist; mas-

During the Pleistocene epoch of geologic history, the glacial ice moving into the county from the north carried large amounts of soil and rock material that ranged in size from clay to large boulders. Evidence of this deposition is throughout most parts of the county, especially in

Plant and animal life

Living organisms play an important part in soil formation. These include plants, animals, insects, earthworms, bacteria, and fungi. In Yankton County, the tall and mid prairie grasses have had more influence than other living organisms on soil formation. The organic matter produced by grasses accumulates at the surface, as is evident in the dark surface layers of such soils as Bonilla, Clarno, Crossplain, and Wentworth. Micro-organisms help decompose the plant residue, thus releasing nutrients for plant food. Earthworms, burrowing insects, moles, and other animals that live in the soil mix the soil materials.

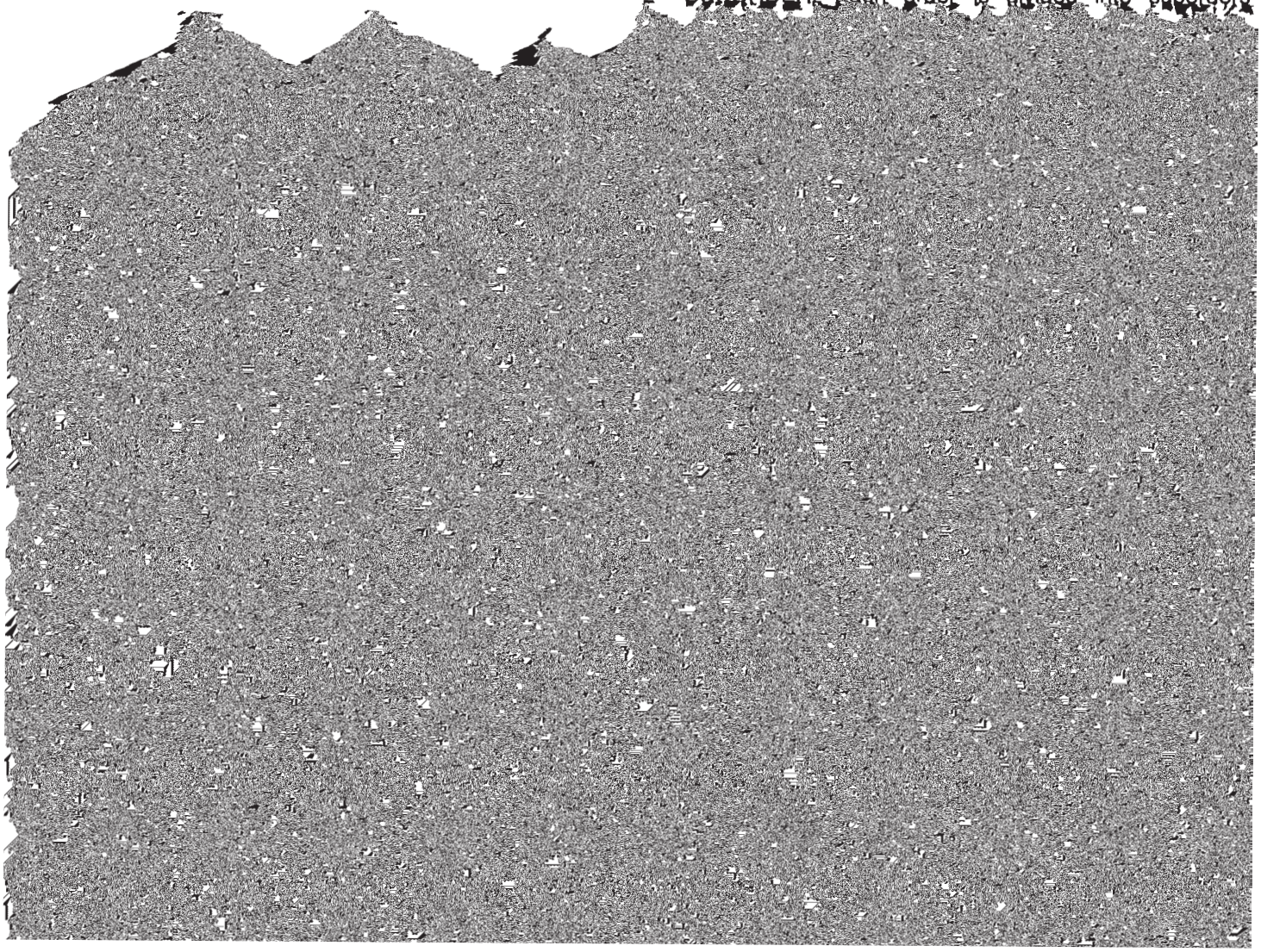
Relief

Relief influences soil formation through its effect on drainage, runoff, erosion, plant cover, and soil temperature. On Betts and Gavins soils, for example, much of

The system of classification has six categories. Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. In this system the classification is based on the different soil properties that can be observed in the field or those that can be inferred either from other properties that are observable in the field or from the combined data of soil science and other disciplines. The properties selected for the higher categories are the result of soil genesis or of factors that affect soil genesis. In table 17, the soils of the survey area are classified according to the system. Categories of the system are discussed in the following paragraphs.

ORDER. Ten soil orders are recognized as classes in the system. The properties used to differentiate among orders are those that reflect the kind and degree of dominant soil-forming processes that have taken place. Each order is identified by a word ending in *sol*. An example is Mollisol.

SUBORDER. Each order is divided into suborders



entiae. An example is fine-loamy, mixed, mesic Typic Haplustolls.

SERIES. The series consists of soils that formed in a particular kind of material and have horizons that, except for texture of the surface soil or of the underlying substratum, are similar in differentiating characteristics and in arrangement in the soil profile. Among these characteristics are color, texture, structure, reaction, consistence, and mineral and chemical composition.

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(8) South Dakota Crop and Livestock Reporting Serv

Glossary

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Area reclaim. 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	More than 9

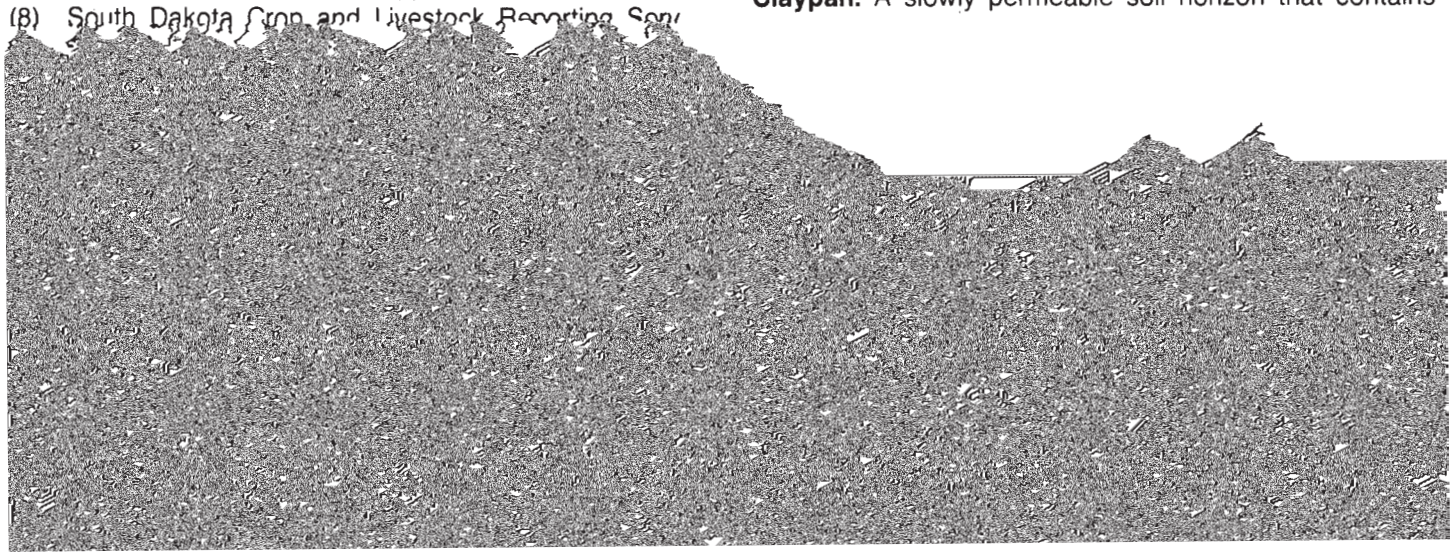
Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bottom land. The normal flood plain of a stream, subject to frequent flooding.

Calcareous soil. A soil containing enough calcium carbonate (commonly with magnesium carbonate) to effervesce (fizz) visibly when treated with cold, dilute hydrochloric acid. A soil having measurable amounts of calcium carbonate or magnesium carbonate.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Claypan. A slowly permeable soil horizon that contains



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 (or contour farming). 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.

Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically for long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.
Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.
Poorly drained.—Water is removed so slowly that

common in regions of limited rainfall where cereal grains are grown. The soil is tilled for at least one growing season for weed control and decomposition

resistant minerals as a result of the loss of silicate clay, iron, aluminum, or a combination of these.

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of change from the

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

to 0.6 inch), *moderate* (0.6 to 2.0 inches), *moderately rapid* (2.0 to 6.0 inches), *rapid* (6.0 to 20 inches), and *very rapid* (more than 20 inches).

Piping. Moving water forms subsurface tunnels or pipe-like cavities in the soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture

TABLES

TABLE 1.--TEMPERATURE AND PRECIPITATION DATA

Month	Temperature*						Precipitation*				
	Average daily maximum	Average daily minimum	Average	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**	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----	26.6	4.7	15.6	56	-24	0	.32	.07	.51	1	5.0
February---	32.6	10.6	21.6	64	-18	0	.69	.17	1.10	2	6.1
March------	41.7	19.9	30.8	77	-7	28	1.26	.38	1.95	4	7.6
April------	59.0	34.2	46.6	88	16	53	2.16	1.24	2.91	5	1.0
May--------	71.7	46.6	59.2	93	28	298	3.63	1.50	5.35	7	.0
June-------	81.1	56.8	69.0	102	41	570	4.13	2.20	5.69	7	.0
July-------	87.1	61.7	74.4	103	45	756	3.14	1.52	4.45	6	.0
August-----	85.4	59.3	72.4	102	45	694	3.06	1.15	4.59	6	.0
September--	74.6	48.3	61.5	98	30	350	2.50	1.25	3.50	5	.0
October----	64.8	37.5	51.2	89	19	136	1.31	.36	2.07	3	.0
November---	46.5	23.4	35.0	76	-2	0	.94	.11	1.56	2	2.0
December---	32.4	11.9	22.2	61	-18	0	.55	.21	.81	2	4.9
Year-----	58.6	34.6	46.6	105	-24	2,885	23.69	18.44	28.61	50	26.6

* Recorded in the period 1951-75 at Yankton, S. Dak.

** 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

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 22	May 2	May 19
2 years in 10 later than--	April 19	April 28	May 14
5 years in 10 later than--	April 12	April 19	May 4
First freezing temperature in fall:			
1 year in 10 earlier than--	October 15	October 4	September 18
2 years in 10 earlier than--	October 20	October 9	September 23
5 years in 10 earlier than--	October 28	October 18	October 4

TABLE 3.--GROWING SEASON LENGTH

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	183	158	130
8 years in 10	189	166	138

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
Ba	Baltic clay loam	945	0.3
Bb	Baltic silty clay	3,625	1.1
Bc	Baltic silty clay, depressional	1,015	0.3
BdE	Betts-Gavins complex, 15 to 40 percent slopes	875	0.3
Be	Blake silty clay loam	3,155	0.9
Bf	Blencoe silty clay	420	0.1
Bg	Blencoe-Gayville complex	415	0.1
[illegible]	[illegible]	1,185	0.4

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE

[Yields are those that can be expected under a high level of management. Only arable soils are listed. Absence of a yield figure 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	Oats	Soybeans	Grain sorghum	Alfalfa hay	Bromegrass-alfalfa
	Bu	Bu	Bu	Bu	Ton	AUM*
Ba---------- Baltic	70	70	29	56	3.4	5.7
Bb---------- Baltic	61	65	23	47	3.0	5.0
Be---------- Blake	84	90	40	82	3.8	6.1
Bf---------- Blencoe	77	74	27	79	3.6	5.7
Bg---------- Blencoe-Gayville	62	59	21	60	2.8	4.5
BhB---------- Blendon-Thurman	55	55	18	63	2.1	3.6
Bk---------- Blyburg	88	80	38	79	4.2	6.9
Bm---------- Bon	90	82	39	73	4.1	6.7
BnA---------- Bonilla-Crossplain	80	79	31	74	3.4	5.7
Ca---------- Chancellor	77	74	29	70	3.4	5.7
Cb---------- Clamo	70	56	29	60	3.7	6.2
Cc---------- Clamo Variant	73	60	31	62	3.7	6.2
CdA---------- Clarno	78	78	30	70	3.5	5.8
CeB---------- Clarno-Bonilla	76	77	28	64	3.4	5.7
ChA---------- Clarno-Crossplain-Stickney	73	74	29	60	3.2	5.4
CkA---------- Clarno-Crossplain-Tetonka	75	74	28	59	3.3	5.5
DaB---------- Davis	82	83	30	75	3.5	5.8
DbB---------- Davis Variant	60	64	22	55	3.0	4.3
EaB---------- Egan-Chancellor	79	78	29	70	3.6	6.0
EbB---------- Egan-Ethan-Trent	78	79	29	67	3.5	5.8
EbC---------- Egan-Ethan-Trent	66	68	26	60	3.2	5.3

See footnotes at end of table.

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Corn	Oats	Soybeans	Grain sorghum	Alfalfa hay	Bromegrass-alfalfa
	Bu	Bu	Bu	Bu	Ton	AUM*
EcA Egan-Wentworth	85	83	32	75	3.8	6.3
EcB Egan-Wentworth	81	81	30	72	3.6	6.0
EdA Egan-Whitewood	83	80	31	70	3.6	6.0
EhA Enet-Delmont	47	54	22	37	2.1	3.6
EhB Enet-Delmont	43	50	19	28	2.0	3.4
EnC Ethan-Bonilla	60	61	22	48	2.8	4.7
Fa Forney	73	64	28	70	3.2	5.3
Ga Grable	70	60	25	65	2.8	4.7
Gb Graceville	82	77	31	80	3.5	5.8
Ha Haynie	82	84	31	85	4.0	6.7
Hb Haynie	78	74	28	80	3.8	6.1
Ja James	30	35	---	30	2.6	4.0
La Lakeport	86	74	29	77	4.0	6.7
Lb Lamo	80	72	28	70	4.0	6.7
Lc Luton	63	60	24	58	3.3	5.5
Oa Onawa	75	63	27	70	3.6	6.0
Ob Owego	80	74	28	78	3.8	6.3
Rc Roxbury	88	82	37	82	4.1	7.0

See footnotes at end of table.

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Corn	Oats	Soybeans	Grain sorghum	Alfalfa hay	Bromegrass-alfalfa
	Bu	Bu	Bu	Bu	Ton	AUM*
Sa** Salix	92	80	36	84	4.3	7.2
Sb Salmo	37	45	---	35	2.6	4.3
SdA Sarpy	45	35	17	37	2.5	4.2
SeA Sarpy-Grable	65	46	21	55	2.8	4.7
Tb Tetonka	61	62	24	47	3.3	5.5
TcC Thurman-Ethan	48	48	18	40	2.0	3.3
TdA Trent	88	91	38	76	4.0	6.7
Wa** Waubonsie	76	70	28	75	3.7	6.1
WbA Wentworth	86	83	33	75	3.8	6.3
WcB Wentworth-Trent	83	83	32	72	3.8	6.3

* Animal-unit-month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.
** Yields are for drained areas.

TABLE 6.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES

[Only the soils that commonly are used as rangeland are listed]

Soil name and map symbol	Range site name	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
BdE*:					
Betts	Thin Upland	Favorable	3,120	Little bluestem	45
		Normal	2,600	Sideoats grama	10
		Unfavorable	1,820	Needleandthread	10
				Prairie dropseed	10
				Big bluestem	5
				Western wheatgrass	5
				Sedge	5
				Leadplant	5
Gavins	Thin Upland	Favorable	3,600	Little bluestem	40
		Normal	3,000	Sideoats grama	15
		Unfavorable	2,100	Prairie dropseed	10
				Big bluestem	5
				Needleandthread	5
				Western wheatgrass	5
				Blue grama	5
				Sedge	5
BhB*:					
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
Thurman	Sandy	Favorable	3,960	Little bluestem	25
		Normal	3,300	Sand bluestem	20
		Unfavorable	2,310	Prairie sandreed	20
				Needlegrass	15
				Switchgrass	5
				Sedge	5
BcE*:					
Boyd	Clayey	Favorable	3,600	Green needlegrass	25
		Normal	3,000	Little bluestem	25
		Unfavorable	2,100	Western wheatgrass	15
				Big bluestem	15
				Sideoats grama	10
				Blue grama	5
Ethan	Silty	Favorable	3,600	Little bluestem	30
		Normal	3,000	Big bluestem	15
		Unfavorable	2,100	Western wheatgrass	15
				Green needlegrass	10
				Needleandthread	10
				Sideoats grama	5
				Blue grama	5
				Sedge	5
CcE*:					
Crofton	Thin Upland	Favorable	3,360	Little bluestem	45
		Normal	2,800	Big bluestem	10
		Unfavorable	1,960	Sideoats grama	10
				Western wheatgrass	10
				Needleandthread	10
				Blue grama	5
				Sedge	5

See footnote at end of table.

TABLE 6.--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
CcE*:					
Boyd	Clayey	Favorable	3,600	Green needlegrass	25
		Normal	3,000	Little bluestem	25
		Unfavorable	2,100	Western wheatgrass	15
				Big bluestem	15
				Sideoats grama	10
				Blue grama	5
CmE*:					
Crofton	Thin Upland	Favorable	3,600	Little bluestem	40
		Normal	3,000	Big bluestem	15
		Unfavorable	2,100	Sideoats grama	10
				Western wheatgrass	10
				Needleandthread	10
				Blue grama	5
				Sedge	5
Nora	Silty	Favorable	3,840	Little bluestem	45
		Normal	3,200	Needlegrass	25

TABLE 6.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil series and [illegible]	Range site name	Total production		Characteristic vegetation	Compo-
		[illegible]	[illegible]		

TABLE 7.--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
Ba, Bb: Baltic	Silver buffaloberry, lilac.	Siberian peashrub, Tatarian honeysuckle.	Common hackberry, blue spruce, ponderosa pine, Siberian crabapple, eastern redcedar.	Golden willow, green ash.	Eastern cottonwood.
Bc. Baltic					
BdE*: Betts.					
Gavins.					
Be: Blake	---	Common chokecherry, Siberian peashrub, American plum, lilac.	Blue spruce, ponderosa pine, Siberian crabapple, eastern redcedar.	Golden willow, green ash, common hackberry.	Eastern cottonwood.
Bf: Blencoe	Lilac, American plum.	Eastern redcedar, common chokecherry, Siberian peashrub.	Common hackberry, blue spruce, green ash, ponderosa pine, Siberian crabapple.	Eastern cottonwood, golden willow.	---
Bg*: Blencoe	Lilac, silver buffaloberry.	Tatarian honeysuckle, Siberian peashrub.	Common hackberry, blue spruce, ponderosa pine, Siberian crabapple, eastern redcedar.	Green ash, golden willow.	Eastern cottonwood.
Gayville.					
BhB*: Blendon	---	Eastern redcedar, Tatarian honeysuckle, Siberian peashrub, lilac, American plum.	Green ash, common hackberry, ponderosa pine, Russian-olive, Siberian crabapple.	Siberian elm, honeylocust.	---
Thurman	---	Eastern redcedar, Tatarian honeysuckle, Siberian peashrub, lilac, American plum.	Green ash, ponderosa pine, Siberian crabapple, Russian-olive, common hackberry.	Siberian elm, honeylocust.	---
Bk: Blyburg	---	Eastern redcedar, Siberian peashrub, American plum, lilac.	Common hackberry, blue spruce, ponderosa pine, Russian-olive, Siberian crabapple.	Honeylocust, green ash.	Siberian elm.
Bm: Bon	---	Siberian peashrub, American plum, lilac.	Ponderosa pine, blue spruce, Siberian crabapple, eastern redcedar.	Golden willow, green ash, common hackberry.	Eastern cottonwood, Siberian elm.

See footnote at end of table.

TABLE 7.--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
BnA*:					
Bonilla----------	---	Siberian peashrub,	Ponderosa pine,	Golden willow,	Eastern

TABLE 7.--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
ChA*:					
Crossplain	Silver buffaloberry, lilac.	Siberian peashrub, Tatarian honeysuckle.	Common hackberry, blue spruce, ponderosa pine, Siberian crabapple, eastern redcedar.	Golden willow, green ash.	Eastern cottonwood.
Stickney	Lilac	Siberian crabapple, Tatarian honeysuckle, American plum, Siberian peashrub.	Honeylocust, ponderosa pine, common hackberry, Russian-olive, eastern redcedar.	Siberian elm, green ash.	---
CkA*:					
Clarno	---	Eastern redcedar, Siberian peashrub, American plum, lilac.	Common hackberry, blue spruce, ponderosa pine, Russian-olive, Siberian crabapple.	Honeylocust, green ash.	Siberian elm.
Crossplain	Silver buffaloberry, lilac.	Siberian peashrub, Tatarian honeysuckle.	Common hackberry, blue spruce, ponderosa pine, Siberian crabapple, eastern redcedar.	Golden willow, green ash.	Eastern cottonwood.
Tetonka.					
CoE*:					
Crofton.					
Boyd.					
CmE*:					
Crofton.					
Nora.					
DaB Davis	---	Siberian peashrub, American plum, lilac.	Ponderosa pine, blue spruce, Siberian crabapple, eastern redcedar.	Golden willow, green ash, common hackberry.	Eastern cottonwood, Siberian elm.
DbB Davis Variant	---	Siberian peashrub, American plum, lilac.	Ponderosa pine, blue spruce, Siberian crabapple, eastern redcedar.	Golden willow, green ash, common hackberry.	Eastern cottonwood, Siberian elm.
EaB*:					
Egan	---	Eastern redcedar, Siberian peashrub, American plum, lilac.	Common hackberry, blue spruce, ponderosa pine, Russian-olive, Siberian crabapple.	Honeylocust, green ash.	Siberian elm.

See footnote at end of table.

TABLE 7.--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
EaB*:					
Chancellor	Silver buffaloberry, lilac.	Siberian peashrub, Tatarian honeysuckle.	Common hackberry, blue spruce, ponderosa pine, Siberian crabapple, eastern redcedar.	Golden willow, green ash.	Eastern cottonwood.
EbB*, EbC*:					
Egan	---	Eastern redcedar, Siberian peashrub, American plum, lilac.	Common hackberry, blue spruce, ponderosa pine, Russian-olive, Siberian crabapple.	Honeylocust, green ash.	Siberian elm.
Ethan	American plum, silver buffaloberry.	Russian-olive, common hackberry, eastern redcedar, Rocky Mt. juniper, Siberian peashrub, Tatarian honeysuckle.	Siberian elm, honeylocust, green ash, ponderosa pine.	---	---
Trent	---	Common chokecherry, Siberian peashrub, American plum, lilac.	Ponderosa pine, blue spruce, Siberian crabapple, eastern redcedar.	Golden willow, green ash, common hackberry.	Eastern cottonwood.
EcA*, EcB*:					
Egan	---	Eastern redcedar, Siberian peashrub, American plum, lilac.	Common hackberry, blue spruce, ponderosa pine, Russian-olive, Siberian crabapple.	Honeylocust, green ash.	Siberian elm.
Wentworth	---	Eastern redcedar, Siberian peashrub, American plum, lilac.	Common hackberry, blue spruce, ponderosa pine, Russian-olive, Siberian crabapple.	Honeylocust, green ash.	Siberian elm.
EdA*:					
Egan	---	Eastern redcedar, Siberian peashrub, American plum, lilac.	Common hackberry, blue spruce, ponderosa pine, Russian-olive, Siberian crabapple.	Honeylocust, green ash.	Siberian elm.
Whitewood	Silver buffaloberry, lilac.	Siberian peashrub, Tatarian honeysuckle.	Common hackberry, blue spruce, ponderosa pine, Siberian crabapple, eastern redcedar.	Golden willow, green ash.	Eastern cottonwood.

TABLE 7.--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
EhA*, EhB*:					
Delmont	Tatarian honeysuckle, Peking cotoneaster, lilac.	Siberian crabapple, eastern redcedar, Rocky Mt. juniper, Siberian peashrub.	Honeylocust, green ash, Russian-olive, ponderosa pine.	Siberian elm	---
EkD.					
Ethan					
EmE*:					
Ethan.					
Betts.					
EnC*:					
Ethan	American plum, silver	Russian-olive, common hackberry,	Siberian elm, honeylocust,	---	---

TABLE 7.--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
La	Lilac, silver	Tatarian	Common hackberry	Golden willow	Eastern

TABLE 7.--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
SeA*:					
Sarpy	---	Ponderosa pine, eastern redcedar, Rocky Mt. juniper.	---	---	---
Grable	Tatarian honeysuckle, Peking	Siberian crabapple, eastern redcedar,	Honeylocust, green ash, Russian-olive, ponderosa	Siberian elm	---

TABLE 7.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

	Trees having predicted 20-year average heights, in feet, of--

TABLE 8.--WILDLIFE HABITAT POTENTIALS

[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	Wetland plants	Shallow water areas	Openland wildlife	Wetland wildlife	Rangeland wildlife
Ba---------- Baltic	Good	Good	Fair	Good	Fair	Fair	Good	Fair	Fair.
Bb---------- Baltic	Fair	Good	Fair	Poor	Fair	Fair	Fair	Fair	Fair.
Bc---------- Baltic	Very poor	Poor	Fair	Poor	Good	Good	Very poor	Good	Fair.
BdE*:									
Betts----------	Very poor	Very poor	Fair	Poor	Very poor	Very poor	Very poor	Very poor	Fair.
Gavins----------	Very poor	Very poor	Fair	Poor	Very poor	Very poor	Very poor	Very poor	Fair.
Be---------- Blake	Good	Good	Good	Good	Poor	Poor	Good	Poor	Good.
Bf---------- Blencoe	Good	Good	Fair	Good	Poor	Poor	Good	Poor	Fair.
Bg*:									
Blencoe----------	Good	Good	Fair	Good	Poor	Poor	Good	Poor	Fair.
Gayville----------	Very poor	Very poor	Fair	Poor	Poor	Poor	Very poor	Poor	Fair.
BhB*:									
Blendon----------	Fair	Fair	Good	Fair	Very poor	Very poor	Fair	Very poor	Good.
Thurman----------	Fair	Fair	Good	Fair	Very poor	Very poor	Fair	Very poor	Good.
Bk---------- Blyburg	Good	Good	Good	Good	Very poor	Very poor	Good	Very poor	Good.
Bm---------- Bon	Good	Good	Fair	Good	Very poor	Very poor	Good	Very poor	Fair.
BnA*:									
Bonilla----------	Good	Good	Fair	Good	Very poor	Very poor	Good	Very poor	Fair.
Crossplain--------	Good	Good	Fair	Good	Poor	Poor	Good	Poor	Fair.
BoE*:									
Boyd----------	Very poor	Poor	Good	Poor	Very poor	Very poor	Very poor	Very poor	Good.
Ethan----------	Very poor	Poor	Good	Poor	Very poor	Very poor	Very poor	Very poor	Good.
Ca---------- Chancellor	Good	Good	Fair	Good	Poor	Poor	Good	Poor	Fair.
Cb---------- Clamo	Good	Good	Fair	Good	Poor	Poor	Good	Poor	Fair.
Cc---------- Clamo Variant	Good	Good	Fair	Good	Poor	Poor	Good	Poor	Fair.
CdA---------- Clarno	Good	Good	Good	Good	Very poor	Very poor	Good	Very poor	Good.
CeB*:									
Clarno----------	Good	Good	Good	Good	Very poor	Very poor	Good	Very poor	Good.
Bonilla----------	Good	Good	Fair	Good	Very poor	Very poor	Good	Very poor	Fair.

See footnote at end of table.

TABLE 8.--WILDLIFE HABITAT POTENTIALS--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	Wetland plants	Shallow water areas	Openland wildlife	Wetland wildlife	Rangeland wildlife
ChA*:									
Clarno	Good	Good	Good	Good	Very poor	Very poor	Good	Very poor	Good.
Crossplain	Good	Good	Fair	Good	Poor	Poor	Good	Poor	Fair.
Stickney	Good	Fair	Good	Fair	Very poor	Very poor	Good	Very poor	Good.
CkA*:									
Clarno	Good	Good	Good	Good	Very poor	Very poor	Good	Very poor	Good.
Crossplain	Good	Good	Fair	Good	Poor	Poor	Good	Poor	Fair.
Tetonka	Poor	Poor	Fair	Poor	Fair	Fair	Poor	Fair	Fair.
CoE*:									
Crofton	Very poor	Very poor	Fair	Poor	Very poor	Very poor	Very poor	Very poor	Fair.
Boyd	Very poor	Very poor	Good	Poor	Very poor	Very poor	Very poor	Very poor	Good.
CmE*:									
Crofton	Very Poor	Fair	Fair	Poor	Very poor	Very poor	Very poor	Very poor	Fair.
Nora	Very poor	Good	Good	Poor	Very poor	Very poor	Poor	Very poor	Good.
DaB Davis	Good	Good	Good	Good	Very poor	Very poor	Good	Very poor	Good.
DbB Davis Variant	Good	Good	Good	Good	Very poor	Very poor	Good	Very poor	Good.
EaB*:									
Egan	Good	Good	Good	Good	Very poor	Very poor	Good	Very poor	Good.
Chancellor	Good	Good	Fair	Good	Poor	Poor	Good	Poor	Fair.
EbB*:									
Egan	Good	Good	Good	Good	Very poor	Very poor	Good	Very poor	Good.
Ethan	Fair	Fair	Good	Poor	Very poor	Very poor	Fair	Very poor	Good.
Trent	Good	Good	Fair	Good	Very poor	Very poor	Good	Very poor	Fair.
EbC*:									
Egan	Fair	Good	Good	Good	Very poor	Very poor	Good	Very poor	Good.
Ethan	Poor	Fair	Good	Poor	Very poor	Very poor	Poor	Very poor	Good.
Trent	Good	Good	Fair	Good	Very poor	Very poor	Good	Very poor	Fair.
EcA*, EcB*:									
Egan	Good	Good	Good	Good	Very poor	Very poor	Good	Very poor	Good.
Wentworth	Good	Good	Good	Good	Very poor	Very poor	Good	Very poor	Good.
EdA*:									
Egan	Good	Good	Good	Good	Very poor	Very poor	Good	Very poor	Good.
Whitewood	Good	Fair	Fair	Good	Poor	Poor	Good	Poor	Fair.
EhA*:									
Enet	Good	Fair	Good	Poor	Very poor	Very poor	Fair	Very poor	Good.
Delmont	Fair	Fair	Poor	Poor	Very poor	Very poor	Fair	Very poor	Poor.
EhB*:									
Enet	Fair	Fair	Good	Poor	Very poor	Very poor	Fair	Very poor	Good.

See footnote at end of table.

TABLE 8.--WILDLIFE HABITAT POTENTIALS--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	Wetland plants	Shallow water areas	Openland wildlife	Wetland wildlife	Rangeland wildlife
EhB*:									
Delmont	Poor	Fair	Poor	Poor	Very poor	Very poor	Poor	Very poor	Poor.
EkD Ethan	Very poor	Very poor	Good	Very poor	Very poor	Very poor	Very poor	Very poor	Good.
EmE*:									
Ethan	Very poor	Very poor	Good	Poor	Very poor	Very poor	Very poor	Very poor	Good.
Betts	Very poor	Very poor	Fair	Poor	Very poor	Very poor	Very poor	Very poor	Fair.
EnC*:									
Ethan	Poor	Fair	Good	Poor	Very poor	Very poor	Poor	Very poor	Good.
Bonilla	Good	Good	Fair	Good	Very poor	Very poor	Good	Very poor	Fair.
EoD*:									
Ethan	Very poor	Fair	Good	Poor	Very poor	Very poor	Very poor	Very poor	Good.
Davis	Fair	Good	Good	Good	Very poor	Very poor	Good	Very poor	Good.
EpD*:									
Ethan	Very poor	Fair	Good	Poor	Very poor	Very poor	Very poor	Very poor	Good.
Talmo	Very poor	Very poor	Poor	Poor	Very poor	Very poor	Very poor	Very poor	Poor.
Fa Forney	Fair	Good	Good	Good	Fair	Fair	Good	Fair	Fair.
Ga Grable	Good	Fair	Good	Poor	Very poor	Very poor	Good	Very poor	Good.
Gb Graceville	Good	Good	Fair	Good	Very poor	Very poor	Good	Very poor	Fair.
Ha, Hb Haynie	Good	Good	Fair	Good	Very poor	Very poor	Good	Poor	Fair.
Ja James	Poor	Poor	Fair	Poor	Fair	Fair	Poor	Fair	Fair.
La Lakeport	Good	Good	Good	Good	Poor	Poor	Good	Poor	Good.
Lb Lamo	Good	Good	Fair	Good	Fair	Fair	Good	Fair	Fair.
Lc Luton	Fair	Good	Fair	Good	Fair	Fair	Good	Fair	Fair.
Ld Luton	Very poor	Poor	Fair	Poor	Good	Good	Very poor	Good	Fair.
Oa Onawa	Good	Good	Good	Good	Poor	Poor	Good	Poor	Good.
Ob Owego	Fair	Good	Fair	Good	Poor	Poor	Good	Poor	Fair.
Pa. Pits, gravel									
Ra Redstoe Variant	Poor	Fair	Fair	Poor	Very poor	Very poor	Poor	Very poor	Fair.
Rb Roxbury	Very poor	Good	Fair	Poor	Poor	Very poor	Poor	Very poor	Fair.
Rc Roxbury	Good	Good	Good	Good	Very poor	Very poor	Good	Very poor	Good.

See footnote at end of table.

TABLE 8.--WILDLIFE HABITAT POTENTIALS--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	Wetland plants	Shallow water areas	Openland wildlife	Wetland wildlife	Rangeland wildlife
Sa---------- Salix	Good	Good	Good	Good	Very poor	Very poor	Good	Very poor	Good.
Sb---------- Salmo	Poor	Poor	Fair	Poor	Fair	Fair	Poor	Fair	Fair.
SdA---------- Sarpy	Poor	Fair	Fair	Poor	Very poor	Very poor	Poor	Very poor	Fair.
SeA*:									
Sarpy----------	Poor	Fair	Fair	Poor	Very poor	Very poor	Poor	Very poor	Fair.
Grable----------	Good	Fair	Good	Poor	Very poor	Very poor	Good	Very poor	Good.
TaE*:									
Talmo----------	Very poor	Very poor	Poor	Poor	Very poor	Very poor	Very poor	Very poor	Poor.
Thurman----------	Poor	Poor	Good	Fair	Very poor	Very poor	Poor	Very poor	Good.
Tb---------- Tetonka	Poor	Poor	Fair	Poor	Fair	Fair	Poor	Fair	Fair.
TcC*:									
Thurman----------	Poor	Good	Good	Fair	Very poor	Very poor	Fair	Very poor	Good.
Ethan----------	Poor	Fair	Good	Poor	Very poor	Very poor	Poor	Very poor	Good.
TdA---------- Trent	Good	Good	Fair	Good	Very poor	Very poor	Good	Very poor	Fair.
Wa---------- Waubonsie	Good	Good	Good	Good	Very poor	Poor	Good	Very poor	Good.
WbA---------- Wentworth	Good	Good	Good	Good	Very poor	Very poor	Good	Very poor	Good.
WcB*:									
Wentworth---------	Good	Good	Good	Good	Very poor	Very poor	Good	Very poor	Good.
Trent----------	Good	Good	Fair	Good	Very poor	Very poor	Good	Very poor	Fair.
Wd---------- Worthing	Poor	Poor	Fair	Poor	Good	Good	Poor	Good	Fair.
We---------- Worthing	Very poor	Very poor	Very poor	Very poor	Good	Good	Very poor	Good	Very poor.

* 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]

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
BoE*:				
Ethan	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Ca Chancellor	Severe: floods, wetness.	Moderate: floods, wetness, too clayey.	Severe: wetness.	Moderate: wetness, too clayey.
Cb Clamo	Severe: floods, wetness.	Severe: wetness.	Severe: wetness, floods.	Severe: wetness.
Cc Clamo Variant	Severe: floods.	Moderate: floods.	Severe: floods.	Moderate: floods.
CdA Clarno	Slight	Slight	Slight	Slight.
CeB*:				
Clarno	Slight	Slight	Moderate: slope.	Slight.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
DbB Davis Variant	Severe: floods.	Moderate: floods.	Severe: floods.	Moderate: floods.
EaB*:				
Egan	Slight	Slight	Moderate: slope, too clayey.	Slight.
Chancellor	Severe: floods, wetness.	Moderate: floods, wetness, too clayey.	Severe: wetness.	Moderate: wetness, too clayey.
EbB*:				
Egan	Slight	Slight	Moderate: slope, too clayey.	Slight.
Ethan	Slight	Slight	Moderate: slope.	Slight.
Trent	Severe: floods.	Slight	Moderate: floods.	Slight.
EbC*:				
Egan	Slight	Slight	Severe: slope.	Slight.
Ethan	Slight	Slight	Severe: slope.	Slight.
Trent	Severe: floods.	Slight	Moderate: floods.	Slight.
EcA*:				
Egan	Slight	Slight	Moderate: too clayey.	Slight.
Wentworth	Slight	Slight	Moderate: too clayey.	Slight.
EcB*:				
Egan	Slight	Slight	Moderate: slope, too clayey.	Slight.
Wentworth	Slight	Slight	Moderate: slope, too clayey.	Slight.
EdA*:				
Egan	Slight	Slight	Moderate: too clayey.	Slight.
Whitewood	Severe: floods, wetness.	Severe: wetness.	Severe: floods, wetness.	Severe: wetness.
EhA*:				
Enet	Slight	Slight	Slight	Slight.
Delmont	Slight	Slight	Slight	Slight.
EhB*:				
Enet	Slight	Slight	Moderate: slope.	Slight.

See footnote at end of table.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
EhB*:				
Delmont	Slight	Slight	Moderate: slope.	Slight.
EkD Ethan	Severe: slope.	Severe: slope.	Severe: slope, large stones.	Moderate: slope, large stones.
EmE*:				
Ethan	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Betts	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
EnC*:				
Ethan	Slight	Slight	Severe: slope.	Slight.
Bonilla	Severe: floods.	Moderate: floods.	Severe: floods.	Moderate: floods.
EoD*:				
Ethan	Moderate:	Moderate:	Severe:	Slight

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
Lc, Ld---------- Luton	Severe: floods, wetness, percs slowly.	Severe: wetness, too clayey.	Severe: wetness, floods, too clayey.	Severe: wetness, too clayey.
Oa---------- Onawa	Severe: floods, too clayey.	Severe: too clayey.	Severe: too clayey.	Severe: too clayey.
Ob---------- Owego	Severe: wetness, too clayey, percs slowly.	Severe: wetness, too clayey, floods.	Severe: wetness, too clayey, percs slowly.	Severe: wetness, too clayey.
Pa. Pits, gravel				
Ra---------- Redstoe Variant	Moderate: slope, dusty.	Moderate: slope, dusty.	Severe: slope.	Moderate: dusty.
Rb---------- Roxbury	Severe: floods.	Moderate: floods.	Severe: floods.	Moderate: floods.
Rc---------- Roxbury	Severe: floods.	Slight----------	Moderate: floods.	Slight.
Sa---------- Salix	Moderate: too clayey.	Moderate: too clayey.	Moderate: too clayey.	Moderate: too clayey.
Sb---------- Salmo	Severe: floods, wetness.	Severe: wetness.	Severe: floods, wetness.	Severe: wetness.
SdA---------- Sarpy	Severe: floods.	Moderate: too sandy.	Severe: floods.	Moderate: too sandy.
SeA*:				
Sarpy----------	Severe: floods.	Moderate: too sandy.	Severe: floods.	Moderate: too sandy.
Grable----------	Severe: floods.	Moderate: floods.	Severe: floods.	Moderate: floods.
TaE*:				
Talmo----------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Thurman----------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Tb---------- Tetonka	Severe: floods, wetness, percs slowly.	Severe: wetness.	Severe: wetness, floods.	Severe: wetness.
TcC*:				
Thurman----------	Slight----------	Slight----------	Moderate: slope.	Slight.
Ethan----------	Slight----------	Slight----------	Moderate: slope.	Slight.
TdA---------- Trent	Severe: floods.	Slight----------	Moderate: floods.	Slight.
Wa---------- Waubonsie	Slight----------	Slight----------	Slight----------	Slight.

See footnote at end of table.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
WbA: Wentworth	Slight	Slight	Moderate: too clayey.	Slight.
WcB*:				
Wentworth	Slight	Slight	Moderate: slope, too clayey.	Slight.
Trent	Severe: floods.	Slight	Moderate: floods.	Slight.
Wd: Worthing	Severe: wetness, floods.	Severe: wetness.	Severe: wetness, floods.	Severe: wetness.
We: Worthing	Severe: floods, wetness.	Severe: wetness.	Severe: wetness, floods.	Severe: wetness.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 10.--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
Ba, Bb, Bc: Baltic	Severe: floods, wetness.	Severe: shrink-swell, floods, wetness.	Severe: shrink-swell, floods, wetness.	Severe: shrink-swell, floods, wetness.	Severe: wetness, low strength, floods.
BdE*:					
Betts	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.
Gavins	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, low strength.
Be: Blake	Severe: cutbanks cave, wetness.	Severe: floods.	Severe: floods, wetness.	Severe: floods.	Severe: frost action, low strength.
Bf: Blencoe	Severe: wetness.	Severe: wetness, floods, shrink-swell.	Severe: wetness, floods, shrink-swell.	Severe: wetness, floods, shrink-swell.	Severe: wetness, floods, low strength.
Bg*:					
Blencoe	Severe: wetness.	Severe: wetness, floods, shrink-swell.	Severe: wetness, floods, shrink-swell.	Severe: wetness, floods, shrink-swell.	Severe: wetness, floods, low strength.
Gayville	Severe: wetness, floods.	Severe: floods.	Severe: floods, wetness.	Severe: floods.	Severe: floods.
BhB*:					
Blendon	Severe: cutbanks cave.	Slight	Slight	Slight	Moderate: frost action.
Thurman	Severe: cutbanks cave.	Slight	Slight	Slight	Slight.
Bk: Blyburg	Moderate: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: frost action.
Bm: Bon	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.
BnA*:					
Bonilla	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods, low strength.
Crossplain	Severe: wetness, floods.	Severe: wetness, floods, shrink-swell.	Severe: wetness, floods, shrink-swell.	Severe: wetness, floods, shrink-swell.	Severe: frost action, shrink-swell, low strength.
BoE*:					
Boyd	Severe: slope.	Severe: slope, shrink-swell, low strength.	Severe: slope, shrink-swell, low strength.	Severe: slope, shrink-swell, low strength.	Severe: slope, shrink-swell, low strength.

See footnote at end of table.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
BoE*:					
Ethan	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.
Ca Chancellor	Severe: wetness, floods.	Severe: shrink-swell, floods, low strength.	Severe: shrink-swell, floods, wetness.	Severe: shrink-swell, floods, low strength.	Severe: floods, shrink-swell, low strength.
Cb Clamo	Severe: floods, wetness.	Severe: floods, shrink-swell, wetness.	Severe: floods, shrink-swell, wetness.	Severe: floods, shrink-swell, wetness.	Severe: low strength, wetness, floods.
Cc Clamo Variant	Severe: floods, wetness.	Severe: floods, wetness, low strength.	Severe: floods, wetness, low strength.	Severe: floods, wetness, low strength.	Severe: floods, frost action, low strength.
CdA Clarno	Slight	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength.	Severe: low strength.
CeB*:					
Clarno	Slight	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength.	Moderate: slope, shrink-swell, low strength.	Severe: low strength.
Bonilla	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods, low strength.
ChA*:					
Clarno	Slight	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength.	Severe: low strength.
Crossplain	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
CoE*:					
Boyd	Severe: slope.	Severe: slope, shrink-swell, low strength.	Severe: slope, shrink-swell, low strength.	Severe: slope, shrink-swell, low strength.	Severe: slope, shrink-swell, low strength.
CmE*:					
Crofton	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
EdA*:					
Egan	Slight	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength.	Severe: frost action, low strength.
Whitewood	Severe: wetness, floods.	Severe: floods, wetness, low strength.	Severe: wetness, floods, low strength.	Severe: floods, wetness, low strength.	Severe: floods, low strength, wetness.
EhA*:					
Enet	Severe: cutbanks cave.	Slight	Slight	Slight	Slight.
Delmont	Severe: cutbanks cave.	Slight	Slight	Slight	Slight.
EhB*:					
Enet	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight.
Delmont	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight.
EkD Ethan	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.
EmE*:					
Ethan	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.
Betts	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.
EnC*:					
Ethan	Slight	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength.	Moderate: slope, shrink-swell, low strength.	Severe: low strength.
Bonilla	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods, low strength.
EoD*:					
Ethan	Moderate: slope.	Moderate: shrink-swell, slope, low strength.	Moderate: shrink-swell, slope, low strength.	Severe: slope.	Severe: low strength.
Davis	Moderate:	Moderate:	Moderate:	Severe:	Severe:

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Fa---------- Forney	Severe: wetness.	Severe: wetness, low strength, shrink-swell.	Severe: wetness, low strength, shrink-swell.	Severe: wetness, low strength, shrink-swell.	Severe: low strength, shrink-swell.
Ga---------- Grable	Severe: cutbanks cave, floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.
Gb---------- Graceville	Moderate: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: frost action, low strength.
Ha---------- Haynie	Moderate: too clayey.	Slight----------	Moderate: wetness.	Slight----------	Severe: frost action.
Hb---------- Haynie	Moderate: too clayey, floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: frost action.
Ja---------- James	Severe: floods, wetness.	Severe: floods, wetness, shrink-swell.	Severe: floods, wetness, shrink-swell.	Severe: floods, wetness, shrink-swell.	Severe: frost action, low strength, shrink-swell.
La---------- Lakeport	Severe: wetness.	Severe: shrink-swell, low strength, floods.	Severe: wetness, shrink-swell, floods.	Severe: shrink-swell, low strength, floods.	Severe: low strength, frost action, shrink-swell.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
SdA---------- Sarpy	Severe: cutbanks cave, floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.
SeA*:					
Sarpy----------	Severe: cutbanks cave, floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.
Grable----------	Severe: cutbanks cave, floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.
TaE*:					
Talmo----------	Severe: slope, cutbanks cave.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Thurman----------	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Tb---------- Tetonka	Severe: wetness, floods.	Severe: floods, wetness, shrink-swell.	Severe: floods, shrink-swell, wetness.	Severe: floods, wetness, shrink-swell.	Severe: floods, low strength, wetness.
TcC*:					
Thurman----------	Severe: cutbanks cave.	Slight----------	Slight----------	Moderate: slope.	Slight.
Ethan----------	Slight----------	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength.	Moderate: slope, shrink-swell, low strength.	Severe: low strength.
TdA---------- Trent	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: low strength, frost action, floods.
Wa---------- Waubonsie	Severe: wetness, floods, too clayey.	Severe: wetness, floods, shrink-swell.	Severe: wetness, floods, shrink-swell.	Severe: wetness, floods, shrink-swell.	Severe: wetness, floods, shrink-swell.
WbA---------- Wentworth	Slight----------	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength.	Severe: low strength, frost action.
WcB*:					
Wentworth--------	Slight----------	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength.	Moderate: slope, shrink-swell, low strength.	Severe: low strength, frost action.
Trent----------	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: low strength, frost action, floods.
Wd---------- Worthing	Severe: wetness, floods.	Severe: wetness, floods, shrink-swell.	Severe: wetness, floods, shrink-swell.	Severe: wetness, floods, shrink-swell.	Severe: wetness, floods, low strength.
We---------- Worthing	Severe: wetness, floods.	Severe: floods, wetness, shrink-swell.	Severe: floods, wetness, shrink-swell.	Severe: floods, wetness, shrink-swell.	Severe: low strength, wetness, floods.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 11.--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

TABLE 11.--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
BoE*:					
Boyd	Severe: slope, depth to rock, percs slowly.	Severe: slope, depth to rock.	Severe: depth to rock, too clayey.	Severe: slope.	Poor: slope, too clayey, area reclaim.
Ethan	Severe: slope, percs slowly.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Ca Chancellor	Severe: percs slowly, floods, wetness.	Slight	Severe: floods, wetness.	Severe: floods, wetness.	Fair: too clayey, hard to pack.
Cb Clamo	Severe: floods, percs slowly, wetness.	Severe: floods.	Severe: floods, wetness, too clayey.	Severe: floods, wetness.	Poor: too clayey, wetness.
Cc Clamo Variant	Severe: floods, wetness.	Severe: floods.	Severe: floods, wetness.	Severe: floods, wetness.	Poor: wetness.
CdA Clarno	Severe: percs slowly.	Slight	Moderate: too clayey.	Slight	Fair: too clayey.
CeB*:					
Clarno	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
Bonilla	Severe: floods, percs slowly, wetness.	Slight	Severe: floods, wetness.	Severe: floods.	Fair: too clayey.
ChA*:					
Clarno	Severe: percs slowly.	Slight	Moderate: too clayey.	Slight	Fair: too clayey.
Crossplain	Severe: percs slowly, wetness, floods.	Slight	Severe: wetness, floods.	Severe: wetness, floods.	Poor: wetness.
Stickney	Severe: percs slowly.	Slight	Moderate: too clayey.	Slight	Fair: too clayey.
CkA*:					
Clarno	Severe: percs slowly.	Slight	Moderate: too clayey.	Slight	Fair: too clayey.
Crossplain	Severe: percs slowly, wetness, floods.	Slight	Severe: wetness, floods.	Severe: wetness, floods.	Poor: wetness.
Tetonka	Severe: floods, percs slowly, wetness.	Slight	Severe: floods, wetness, too clayey.	Severe: floods, wetness.	Poor: wetness, too clayey.
CoE*:					
Crofton	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.

See footnote at end of table.

TABLE 11.--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
CoE*:					
Boyd	Severe: slope, depth to rock, percs slowly.	Severe: slope, depth to rock.	Severe: depth to rock, too clayey.	Severe: slope.	Poor: slope, too clayey, area reclaim.
CmE*:					
Crofton	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.	Poor: slope.
Nora	Severe: slope.	Severe: slope.	Moderate: slope, too clayey.	Severe: slope.	Poor: slope.
DaB Davis	Moderate: percs slowly.	Moderate: slope, seepage.	Slight	Slight	Good.
DbB Davis Variant	Severe: floods.	Severe: seepage.	Severe: floods, seepage.	Severe: floods, seepage.	Good.
EaB*:					
Egan	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
Chancellor	Severe: percs slowly, floods, wetness.	Slight	Severe: floods, wetness.	Severe: floods, wetness.	Fair: too clayey, hard to pack.
EbB*:					
Egan	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
Ethan	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
Trent	Severe: floods, percs slowly.	Moderate: seepage.	Severe: floods.	Severe: floods.	Fair: too clayey.
EbC*:					
Egan	Severe: percs slowly.	Severe: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
Ethan	Severe: percs slowly.	Severe: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
Trent	Severe: floods, percs slowly.	Moderate: seepage.	Severe: floods.	Severe: floods.	Fair: too clayey.
EcA*:					
Egan	Severe: percs slowly.	Slight	Moderate: too clayey.	Slight	Fair: too clayey.
Wentworth	Moderate: percs slowly.	Moderate: seepage.	Moderate: too clayey.	Slight	Fair: too clayey.
EcB*:					
Egan	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
Wentworth	Moderate: percs slowly.	Moderate: slope, seepage.	Moderate: too clayey.	Slight	Fair: too clayey.

See footnote at end of table.

TABLE 11.--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
EdA*:					
Egan	Severe: percs slowly.	Slight	Moderate: too clayey.	Slight	Fair: too clayey.
Whitewood	Severe: percs slowly, wetness, floods.	Slight	Severe: floods, wetness.	Severe: floods, wetness.	Poor: wetness.
EhA*, EhB*:					
Enet	Slight	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: small stones.
Delmont	Slight	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: small stones.
EkD Ethan	Severe: slope, percs slowly.	Severe: slope.	Moderate: slope, too clayey, large stones.	Severe: slope.	Poor. slope.
EmE*:					
Ethan	Severe: slope, percs slowly.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Betts	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
EnC*:					
Ethan	Severe: percs slowly.	Severe: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
Bonilla	Severe: floods, percs slowly, wetness.	Moderate: seepage.	Severe: floods, wetness.	Severe: floods.	Fair: too clayey.
EoD*:					
Ethan	Severe: percs slowly.	Severe: slope.	Moderate: too clayey.	Moderate: slope.	Fair: too clayey, slope.
Davis	Moderate: slope, percs slowly.	Severe: slope.	Slight	Moderate: slope.	Fair: slope.
EpD*:					
Ethan	Severe: percs slowly.	Severe: slope.	Moderate: too clayey.	Moderate: slope.	Fair: too clayey, slope.
Talmo	Moderate: slope.	Severe: slope, seepage.	Severe: seepage.	Severe: seepage.	Poor: small stones.
Fa Forney	Severe: percs slowly, wetness.	Slight	Severe: wetness, too clayey.	Severe: wetness, too clayey, floods.	Poor: wetness, too clayey.
Ga Grable	Severe: floods.	Severe: seepage.	Severe: seepage, floods.	Severe: floods, seepage.	Poor: too sandy, seepage.
Gb Graceville	Slight	Severe: seepage.	Severe: seepage.	Severe: seepage.	Fair: too clayey.

See footnote at end of table.

TABLE 11.--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
Ha---------- Haynie	Severe: percs slowly.	Moderate: seepage, wetness.	Slight----------	Slight----------	Good.
Hb---------- Haynie	Moderate: floods, wetness.	Moderate: seepage, wetness.	Moderate: floods.	Moderate: floods.	Good.
Ja---------- James	Severe: floods, percs slowly, wetness.	Severe: floods.	Severe: floods, wetness, too clayey.	Severe: floods, wetness.	Poor: too clayey, wetness.
La---------- Lakeport	Severe: wetness, percs slowly.	Slight----------	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
Lb---------- Lamo	Severe: percs slowly, wetness, floods.	Severe: floods.	Severe: wetness, floods.	Severe: wetness, floods.	Fair: too clayey.
Lc, Ld---------- Luton	Severe: percs slowly, wetness, floods.	Slight----------	Severe: wetness, too clayey, floods.	Severe: wetness, floods.	Poor: wetness, too clayey.
Oa---------- Onawa	Severe: wetness, floods.	Severe: seepage.	Severe: wetness, floods, seepage.	Severe: wetness, floods, seepage.	Fair: wetness.
Ob---------- Owego	Severe: percs slowly, wetness, floods.	Slight----------	Severe: wetness, too clayey floods.	Severe: wetness, floods.	Poor: wetness, too clayey.
Pa. Pits, gravel					
Ra---------- Redstoe Variant	Moderate: slope, percs slowly.	Severe: slope.	Moderate: too clayey.	Moderate: slope.	Fair: slope, too clayey, hard to pack.
Rb, Rc---------- Roxbury	Severe: floods.	Moderate: seepage.	Severe: floods.	Severe: floods.	Good.
Sa---------- Salix	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: wetness.
Sb---------- Salmo	Severe: percs slowly, floods, wetness.	Severe: floods.	Severe: floods, wetness.	Severe: floods, wetness.	Poor: wetness.
SdA---------- Sarpy	Severe: floods.	Severe: seepage.	Severe: seepage, floods.	Severe: seepage, floods.	Poor: too sandy, seepage.
SeA*:					
Sarpy----------	Severe: floods.	Severe: seepage.	Severe: seepage, floods.	Severe: seepage, floods.	Poor: too sandy, seepage.
Grable----------	Severe: floods.	Severe: seepage.	Severe: seepage, floods.	Severe: floods, seepage.	Poor: too sandy, seepage.

See footnote at end of table.

TABLE 11.--SANITARY FACILITIES--Continued

Soil name and	Septic tank	Sewage lagoon	Trench	Area	Daily cover

TABLE 12.--CONSTRUCTION MATERIALS

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," and "poor." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Ba: Baltic	Poor: shrink-swell, low strength, wetness.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: wetness.
Bb, Bc: Baltic	Poor: shrink-swell, low strength, wetness.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey, wetness.
BdE*:				
Betts	Poor: low strength, slope.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
Gavins	Poor: slope, low strength, thin layer.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope, thin layer, area reclaim.
Be: Blake	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: too clayey.
Bf: Blencoe	Poor: wetness, shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey.
Bg*:				
Blencoe	Poor: wetness, shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey.
Gayville	Fair: low strength, wetness.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: thin layer, excess sodium, excess salt.
BhB*:				
Blendon	Good	Fair: excess fines.	Unsuited: excess fines.	Good.
Thurman	Good	Fair: excess fines.	Unsuited: excess fines.	Fair: thin layer.
Bk: Blyburg	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
Bm: Bon	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
BnA*:				
Bonilla	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
Crossplain	Poor: wetness, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer, too clayey.
BoE*:				
Boyd	Poor: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope, too clayey.

See footnote at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
BoE*:				
Ethan	Poor: low strength, slope.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
Ca Chancellor	Poor: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: too clayey.
Cb Clamo	Poor: wetness, shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: wetness.
Cc Clamo Variant	Poor: wetness.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: wetness.
CdA Clarno	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
CeB*:				
Clarno	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
Bonilla	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
ChA*:				
Clarno	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
Crossplain	Poor: wetness, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer, too clayey.
Stickney	Poor: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: excess salt, excess sodium.
CkA*:				
Clarno	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
Crossplain	Poor: wetness, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer, too clayey.
Tetonka	Poor: low strength, shrink-swell, wetness.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: wetness.
CoE*:				
Crofton	Poor: slope, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
Boyd	Poor: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope, too clayey.
CmE*:				
Crofton	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
Nora	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.

See footnote at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
DaB---------- Davis	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
DbB---------- Davis Variant	Fair: low strength.	Poor: excess fines.	Unsuited: excess fines.	Fair: thin layer.
EaB*:				
Egan----------	Poor:	Unsuited:	Unsuited:	Fair:

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
EoD*:				
Ethan	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: slope, thin layer.
Davis	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: slope.
EpD*:				
Ethan	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: slope, thin layer.
Talmo	Good	Good	Good	Poor: small stones, area reclaim.
Fa Forney	Poor: wetness, low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: too clayey.
Ga Grable	Good	Fair: excess fines.	Unsuited: excess fines.	Good.
Gb Graceville	Good	Fair: excess fines.	Fair: excess fines.	Fair: too clayey.
Ha Haynie	Fair: low strength, thin layer.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
Hb Haynie	Fair: low strength, thin layer.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: too clayey.
Ja James	Poor: low strength, shrink-swell, wetness.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: excess salt, wetness.
La Lakeport	Poor: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: too clayey.
Lb Lamo	Poor: shrink-swell, frost action, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: too clayey.
Lc, Ld Luton	Poor: wetness,	Unsuited:	Unsuited:	Poor:

TABLE 13.--WATER MANAGEMENT

[Some terms that describe restrictive soil features are defined in the Glossary. Absence of an entry indicates that the soil was not evaluated]

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
Ba, Bb, Bc: Baltic	Favorable	Wetness, hard to pack.	Percs slowly, frost action, floods.	Percs slowly, slow intake, wetness.	Not needed	Wetness, percs slowly.
BdE*:						
Betts	Slope	Favorable	Not needed	Slope, erodes easily.	Slope	Slope, erodes easily.
Gavins	Slope, seepage, depth to rock.	Thin layer	Not needed	Slope, rooting depth, erodes easily.	Slope, depth to rock, erodes easily.	Rooting depth, slope, erodes easily.
Be: Blake	Seepage	Wetness, piping.	Frost action	Wetness	Not needed	Favorable.
Bf: Blencoe	Seepage	Hard to pack, wetness.	Percs slowly, frost action.	Wetness, slow intake, percs slowly.	Not needed	Wetness, percs slowly.
Bg*:						
Blencoe	Seepage	Hard to pack, wetness.	Percs slowly, frost action.	Wetness, slow intake, percs slowly.	Not needed	Wetness, percs slowly.
Gayville	Seepage	Wetness, excess salt, piping.	Percs slowly, excess salt, excess sodium.	Wetness, percs slowly, excess sodium.	Not needed	Excess salt, excess sodium, erodes easily.
BhB*:						
Blendon	Seepage	Seepage, piping.	Not needed	Favorable	Too sandy	Favorable.
Thurman	Seepage	Seepage, piping.	Not needed	Fast intake, soil blowing, droughty.	Too sandy, soil blowing.	Droughty.
Bk: Blyburg	Seepage	Piping	Not needed	Favorable	Not needed	Erodes easily.
Bm: Bon	Seepage	Piping	Not needed	Floods	Not needed	Favorable.
BnA*:						
Bonilla	Seepage	Favorable	Not needed	Floods	Not needed	Erodes easily.
Crossplain	Favorable	Wetness	Percs slowly, frost action, floods.	Slow intake, wetness, percs slowly.	Not needed	Percs slowly, wetness.
BoE*:						
Boyd	Slope, depth to rock.	Hard to pack, thin layer.	Not needed	Slow intake, percs slowly, rooting depth.	Slope, depth to rock, percs slowly.	Slope, depth to rock, percs slowly.
Ethan	Slope	Favorable	Not needed	Slope	Slope	Slope, erodes easily.
Ca: Chancellor	Favorable	Hard to pack, wetness.	Percs slowly, floods.	Wetness, percs slowly, floods.	Not needed	Favorable.
Cb: Clamo	Favorable	Wetness, hard to pack.	Percs slowly, frost action, floods.	Percs slowly, wetness.	Not needed	Wetness, percs slowly.

See footnote at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
Cc:						
Clamo Variant	Seepage	Piping, wetness.	Floods, frost action.	Wetness, percs slowly.	Not needed	Wetness, percs slowly.
CdA:						
Clarno	Favorable	Favorable	Not needed	Favorable	Not needed	Erodes easily.
CeB*:						
Clarno	Favorable	Favorable	Not needed	Favorable	Favorable	Erodes easily.
[illegible]	[illegible]	[illegible]	Not needed	Floods	Not needed	Erodes easily.

TABLE 13.--WATER MANAGEMENT--Continued

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
EbC*:						
Egan	Slope	Hard to pack	Not needed	Slope, percs slowly.	Erodes easily	Erodes easily.
Ethan	Slope	Favorable	Not needed	Slope	Favorable	Erodes easily.
Trent	Seepage	Favorable	Not needed	Floods	Not needed	Erodes easily.
EcA*:						
Egan	Favorable	Hard to pack	Not needed	Percs slowly	Not needed	Erodes easily.
Wentworth	Seepage	Favorable	Not needed	Favorable	Not needed	Erodes easily.
EcB*:						
Egan	Favorable	Hard to pack	Not needed	Percs slowly	Erodes easily	Erodes easily.
Wentworth	Seepage	Favorable	Not needed	Favorable	Erodes easily	Erodes easily.
EdA*:						
Egan	Favorable	Hard to pack	Not needed	Percs slowly	Not needed	Erodes easily.
Whitewood	Favorable	Wetness, hard to pack.	Floods, frost action.	Wetness, floods.	Not needed	Wetness, erodes easily.
EhA*:						
Enet	Seepage	Seepage	Not needed	Favorable	Not needed	Favorable.
Delmont	Seepage	Seepage	Not needed	Droughty	Not needed	Droughty.
EhB*:						
Enet	Seepage	Seepage	Not needed	Favorable	Too sandy	Favorable.
Delmont	Seepage	Seepage	Not needed	Droughty	Too sandy	Droughty.
FkD[illegible]	Slope	Large stones	Not needed	Slope,	Slope,	Slope,

TABLE 13.--WATER MANAGEMENT--Continued

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
Gb---------- Graceville	Seepage--------	Seepage--------	Not needed-----	Favorable------	Not needed-----	Favorable.

TABLE 13.--WATER MANAGEMENT--Continued

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
TcC*:						
Thurman	Seepage	Seepage, piping.	Not needed	Fast intake, soil blowing, droughty.	Too sandy, soil blowing.	Droughty.
Ethan	Favorable	Favorable	Not needed	Favorable	Favorable	Erodes easily.
TdA Trent	Seepage	Favorable	Not needed	Floods	Not needed	Erodes easily.
Wa Waubonsie	Favorable	Wetness, hard to pack.	Frost action, percs slowly, floods.	Wetness, floods, soil blowing.	Not needed	Wetness.
WbA Wentworth	Seepage	Favorable	Not needed	Favorable	Not needed	Erodes easily.
WcB*:						
Wentworth	Seepage	Favorable	Not needed	Favorable	Erodes easily	Erodes easily.
Trent	Seepage	Favorable	Not needed	Floods	Erodes easily	Erodes easily.
Wd Worthing	Favorable	Hard to pack, wetness.	Floods, frost action, percs slowly.	Floods, wetness, percs slowly.	Not needed	Wetness, percs slowly.
We Worthing	Favorable	Hard to pack, wetness.	Percs slowly, floods, frost action.	Wetness, percs slowly.	Not needed	Wetness, percs slowly.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS

[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	Frag- ments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
Ba---------- Baltic	0-16	Clay loam-------	CL, ML	A-4, A-6	0	100	95-100	90-100	70-85	30-40	5-15
	16-36	Silty clay, clay	CH, MH	A-7	0	100	95-100	90-100	85-100	50-70	20-40
	36-60	Silty clay, silty clay loam, clay loam.	CL, CH, MH	A-6, A-7	0	100	95-100	80-100	65-95	35-70	15-35
Bb, Bc---------- Baltic	0-24	Silty clay------	CH, MH	A-7	0	100	100	90-100	85-100	50-65	20-35
	24-36	Silty clay, clay	CH, MH	A-7	0	100	95-100	90-100	85-100	50-70	20-40
	36-60	Silty clay, silty clay loam, clay loam.	CL, CH, MH	A-6, A-7	0	100	95-100	80-100	65-95	35-70	15-35
BdE*:											
Betts----------	0-3	Loam----------	CL, CL-ML	A-4, A-6	0-5	90-100	80-100	75-100	60-75	20-38	5-15
	3-32	Loam, clay loam	CL	A-6, A-7	0-5	90-100	85-100	75-100	50-85	30-45	10-25
	32-60	Clay loam, loam	CL	A-6, A-7	0-5	90-100	85-100	75-100	50-85	30-45	10-25
Gavins----------	0-4	Silt loam-------	ML, MH	A-7	0	100	100	90-100	85-100	40-55	15-25
	4-16	Silt loam, silty clay, loam.	ML, MH	A-7	0	100	95-100	90-100	85-100	40-60	15-28
	16-60	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Be---------- Blake	0-17	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	85-100	30-50	10-25
	17-53	Silt loam, silty clay loam.	ML, CL	A-4, A-6, A-7	0	100	100	90-100	85-100	30-45	5-20
	53-60	Loamy very fine sand.	SM, ML, SM-SC, CL-ML	A-4	0	100	100	85-95	40-65	<25	NP-5
Bf---------- Blencoe	0-21	Silty clay------	CH	A-7	0	100	100	95-100	95-100	60-85	30-50
	21-27	Silty clay loam	CL, CH	A-7	0	100	100	95-100	90-100	41-60	20-30
	27-60	Very fine sandy loam.	ML, CL, CL-ML	A-4, A-6	0	100	100	95-100	70-85	30-40	5-15
Bg*:											
Blencoe----------	0-21	Silty clay------	CH	A-7	0	100	100	95-100	95-100	60-85	30-50
	21-27	Silty clay loam	CL, CH	A-7	0	100	100	95-100	90-100	41-60	20-30
	27-60	Very fine sandy loam.	ML, CL, CL-ML	A-4, A-6	0	100	100	95-100	70-85	30-40	5-15
Gayville----------	0-6	Silty clay loam	CL, ML	A-4, A-6, A-7	0	100	100	95-100	85-100	30-45	5-20
	6-14	Silty clay loam, silty clay.	CL	A-6, A-7	0	100	100	95-100	85-100	35-50	12-25
	14-22	Silty clay loam	CL	A-4, A-6, A-7	0	100	100	95-100	85-100	30-45	8-20
	22-60	Very fine sandy loam, silt loam.	ML, CL-ML	A-4	0	100	100	95-100	70-85	<25	NP-7
BhB*:											
Blendon----------	0-8	Loam----------	ML, CL	A-4, A-6	0	100	100	85-100	60-75	25-40	3-15
	8-33	Fine sandy loam, sandy loam, loam.	SM, SC, ML, CL	A-4	0	100	100	60-100	35-60	20-33	NP-10
	33-60	Fine sandy loam, loamy fine sand, loamy sand.	SM, SP-SM, SC, SM-SC	A-2, A-4	0	100	90-100	50-100	10-45	<30	NP-5

See footnote at end of table.

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--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	
BhB*:											
Thurman	0-18	Fine sandy loam	SM	A-4	0	100	100	70-85	35-50	---	NP
	18-60	Loamy sand, fine sand, very fine sand.	SM, SP-SM	A-2, A-3	0	100	100	85-100	5-25	---	NP
Bk Blyburg	0-19	Silt loam	ML, CL, CL-ML	A-4, A-6	0	100	100	90-100	70-95	22-40	3-20
	19-60	Silt loam, very fine sandy loam.	ML, CL, CL-ML	A-4, A-6	0	100	100	85-100	50-90	22-35	3-12
Bm Bon	0-36	Loam	CL-ML, CL	A-4, A-6	0	100	95-100	80-95	60-85	25-40	5-15
	36-50	Stratified silt loam to fine sandy loam.	CL, ML	A-4, A-6	0	100	95-100	80-95	60-85	30-40	5-15
	50-60	Stratified silt loam to loamy sand.	CL-ML, ML, SM, SM-SC	A-4	0	95-100	95-100	75-95	35-75	<30	NP-7
BnA*:											
Bonilla	0-7	Loam	CL-ML, CL	A-4, A-6	0	100	95-100	75-100	50-90	25-35	5-15
	7-40	Loam, clay loam	CL	A-6	0	100	95-100	85-100	60-90	30-40	10-20
	40-60	Loam, clay loam	CL	A-6	0-5	95-100	95-100	85-100	60-90	30-40	10-20
Crossplain	0-14	Clay loam	CL	A-4, A-6	0	100	100	90-100	70-80	30-40	9-19
	14-32	Clay loam, clay	CL, CH	A-7	0	100	95-100	90-100	70-85	40-55	15-30
	32-60	Clay loam, loam	CL	A-6, A-7	0	95-100	95-100	85-100	60-80	30-45	10-25
BoE*:											
Boyd	0-30	Silty clay	CH, MH	A-7	0	100	95-100	95-100	90-100	65-90	30-55
	30-60	Weathered bedrock.	CH, MH	A-7	0	100	95-100	95-100	90-100	65-90	30-55
Ethan	0-4	Loam	CL, CL-ML	A-4, A-6	0	95-100	90-100	80-95	55-80	30-40	8-15
	4-16	Loam, clay loam	CL	A-6, A-7	0-5	95-100	95-100	85-100	55-80	30-45	10-25
	16-60	Loam, clay loam	CL	A-4, A-6, A-7	0-5	90-100	85-100	75-100	50-95	28-45	8-20
Ca Chancellor	0-19	Silty clay loam	CL, CH, MH	A-6, A-7	0	100	100	95-100	85-95	35-55	15-25
	19-37	Silty clay, silty clay loam.	CL, CH, MH	A-7	0	100	100	95-100	85-100	40-60	15-30
	37-60	Silty clay loam, clay loam, loam.	CL, CH	A-6, A-7	0	100	100	85-95	70-85	35-55	15-25
Cb Clamo	0-7	Silty clay loam	CL, CH, MH	A-7	0	100	95-100	90-100	85-100	40-60	15-28
	7-60	Silty clay loam, silty clay.	CL, CH, MH	A-7	0	100	95-100	90-100	85-100	45-75	20-40
Cc Clamo Variant	0-16	Silty clay loam	CL, CH, MH	A-7	0	100	100	95-100	85-100	40-65	15-28
	16-26	Silty clay loam, silt loam.	CL, CH, MH	A-6, A-7	0	100	100	95-100	85-100	35-55	11-25
	26-60	Silt loam, very fine sandy loam.	ML, CL	A-4, A-6	0	100	100	90-100	75-100	30-40	5-15
CdA Clarno	0-11	Loam	CL, ML, CL-ML	A-4, A-6	0	100	95-100	85-100	55-90	25-40	5-15
	11-33	Loam, clay loam	CL	A-6, A-7	0-5	95-100	90-100	80-100	55-85	30-45	10-20
	33-60	Loam, clay loam	CL	A-6, A-7	0-5	90-100	90-100	80-100	50-80	30-45	10-20

See footnote at end of table.

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
CeB*:											
[illegible]	0-11	[illegible]	CL, ML	A-4, A-6	0	100	95-100	85-100	55-90	25-40	5-15

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--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	
DaB---------- Davis	0-9	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	90-100	80-100	60-85	25-40	5-20
	9-30	Loam, silt loam, clay loam.	CL, CL-ML	A-4, A-6	0	100	90-100	80-100	60-85	25-40	5-20
	30-60	Loam, clay loam, silt loam.	CL, CL-ML	A-4, A-6	0	100	95-100	85-100	55-90	25-40	5-20
DbB---------- Davis Variant	0-12	Loam----------	ML, CL	A-4, A-6	0	100	95-100	95-100	60-75	30-40	5-15
	12-30	Stratified gravelly sandy loam to very fine sandy loam.	SM, SC, ML, CL-ML	A-4	0	95-100	75-100	60-90	35-65	20-30	3-10
	30-60	Stratified gravelly loamy fine sand to loamy fine sand.	SM	A-2	0	95-100	70-100	55-90	15-35	<25	NP
EaB*:											
Egan----------	0-7	Silty clay loam	CL, ML	A-6, A-7	0	100	100	95-100	85-100	35-50	10-25
	7-28	Silty clay loam	CL, CH	A-6, A-7	0	100	100	90-100	80-100	35-55	15-35
	28-60	Clay loam, loam	CL, CH, ML	A-6, A-7	0	95-100	80-100	70-100	60-85	30-55	10-35
Chancellor--------	0-19	Silty clay loam	CL, CH, MH	A-6, A-7	0	100	100	95-100	85-95	35-55	15-25
	19-37	Silty clay, silty clay loam.	CL, CH, MH	A-7	0	100	100	95-100	85-100	40-60	15-30
	37-60	Silty clay loam, clay loam, loam.	CL, CH	A-6, A-7	0	100	100	85-95	70-85	35-55	15-25
EbB*:											
Egan----------	0-7	Silty clay loam	CL, ML	A-6, A-7	0	100	100	95-100	85-100	35-50	10-25
	7-28	Silty clay loam	CL, CH	A-6, A-7	0	100	100	90-100	80-100	35-55	15-35
	28-60	Clay loam, loam	CL, CH, ML	A-6, A-7	0	95-100	80-100	70-100	60-85	30-55	10-35
Ethan----------	0-8	Loam----------	CL, CL-ML	A-4, A-6	0	95-100	90-100	80-95	55-80	30-40	8-15
	8-16	Loam, clay loam	CL	A-6, A-7	0-5	95-100	95-100	85-100	55-80	30-45	10-25
	16-60	Loam, clay loam	CL	A-4, A-6, A-7	0-5	90-100	85-100	75-100	50-95	28-45	8-20
Trent----------	0-13	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	90-100	35-50	11-25
	13-34	Silty clay loam	CL	A-6, A-7	0	100	100	90-100	85-100	35-50	11-25
	34-45	Silt loam, silty clay loam.	CL	A-6, A-7	0	100	95-100	90-100	70-100	35-50	11-25
	45-60	Clay loam, loam	CL	A-6, A-7	<5	100	95-100	85-100	70-85	35-50	11-25
EbC*:											
Egan----------	0-7	Silty clay loam	CL, ML	A-6, A-7	0	100	100	95-100	85-100	35-50	10-25
	7-28	Silty clay loam	CL, CH	A-6, A-7	0	100	100	90-100	80-100	35-55	15-35
	28-60	Clay loam, loam	CL, CH, ML	A-6, A-7	0	95-100	80-100	70-100	60-85	30-55	10-35
Ethan----------	0-8	Loam----------	CL, CL-ML	A-4, A-6	0	95-100	90-100	80-95	55-80	30-40	8-15
	8-16	Loam, clay loam	CL	A-6, A-7	0-5	95-100	95-100	85-100	55-80	30-45	10-25

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--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	
EcA*, EcB*:											
Egan	0-7	Silty clay loam	CL, ML	A-6, A-7	0	100	100	95-100	85-100	35-50	10-25
	7-28	Silty clay loam	CL, CH	A-6, A-7	0	100	100	90-100	80-100	35-55	15-35
	28-60	Clay loam, loam	CL, CH, ML	A-6, A-7	0	95-100	80-100	70-100	60-85	30-55	10-35
Wentworth	0-10	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	85-100	35-50	11-25
	10-32	Silty clay loam, silt loam.	CL, CH	A-6, A-7	0	100	100	95-100	80-100	35-55	15-30
	32-60	Stratified silty clay loam to silt loam.	CL, ML	A-4, A-6, A-7	0	100	95-100	85-100	60-100	30-50	5-25
EdA*:											
Egan	0-7	Silty clay loam	CL, ML	A-6, A-7	0	100	100	95-100	85-100	35-50	10-25
	7-28	Silty clay loam	CL, CH	A-6, A-7	0	100	100	90-100	80-100	35-55	15-35
	28-60	Clay loam, loam	CL, CH, ML	A-6, A-7	0	95-100	80-100	70-100	60-85	30-55	10-35
Whitewood	0-19	Silty clay loam	CL, CH	A-6, A-7	0	100	100	95-100	80-95	35-55	15-30
	19-42	Silty clay loam	CL, CH	A-6, A-7	0	100	100	95-100	80-95	35-55	15-30
	42-60	Silty clay loam, clay loam.	CL, CH	A-6, A-7	0	100	95-100	90-100	75-95	35-55	15-30
EhA*, EhB*:											
[illegible]	0-8	[illegible]	ML, CL	A-4, A-6	0	90-100	85-100	70-95	55-80	30-40	5-15

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
EnC*:											
Bonilla	0-7	Loam	CL-ML, CL	A-4, A-6	0	100	95-100	75-100	50-90	25-35	5-15
	7-40	Loam, clay loam	CL	A-6	0	100	95-100	85-100	60-90	30-40	10-20
	40-60	Stratified clay	CL-ML,	A-4, A-6	0-5	95-100	85-100	70-95	40-90	20-35	5-15

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--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	
Ja---------- James	0-4	Silty clay loam	CL, CH, MH	A-7	0	100	100	90-100	85-100	40-65	15-30
	4-60	Silty clay, clay, silty clay loam.	CL, CH, MH	A-7	0	100	100	90-100	85-100	45-80	20-40
La---------- Lakeport	0-19	Silty clay loam	CL, CH	A-7	0	100	100	95-100	90-100	41-60	20-35
	19-44	Silty clay, silty clay loam.	CL, CH	A-7	0	100	100	95-100	90-100	41-60	20-35
	44-60	Silt loam, loam, clay loam.	CL	A-6	0	100	100	90-100	85-95	25-40	11-20
Lb---------- Lamo	0-16	Silty clay loam	CL, CH, ML, MH	A-7	0	100	100	95-100	85-95	40-65	14-35
	16-60	Silty clay loam, silt loam, silty clay.	CL, CH, ML, MH	A-7, A-6	0	100	100	95-100	85-95	35-60	10-35
Lc, Ld---------- Luton	0-16	Silty clay------	CH	A-7	0	100	100	95-100	95-100	60-85	35-60
	16-24	Silty clay, clay	CH	A-7	0	100	100	95-100	95-100	60-85	35-60
	24-60	Silty clay------	CH	A-7	0	100	100	95-100	95-100	60-85	35-60
Oa---------- Onawa	0-7	Silty clay------	CH	A-7	0	100	100	95-100	95-100	60-85	40-60
	7-30	Silty clay------	CH	A-7	0	100	100	95-100	95-100	60-85	40-60
	30-60	Silt loam, loamy very fine sand, loam.	CL, CL-ML, SM	A-4, A-6	0	100	100	95-100	40-85	20-40	5-20
Ob---------- Owego	0-16	Silty clay, silty clay loam	CH, CL, ML, MH	A-7	0	100	100	95-100	85-95	40-65	14-35
	16-36	Silt loam-------	CL, ML	A-4, A-6	0	100	100	95-100	90-100	30-40	5-15
	36-60	Silty clay, clay	CH	A-7	0	100	100	95-100	95-100	60-85	30-55
Pa. Pits, gravel											
Ra---------- Redstoe Variant	0-12	Silt loam-------	ML, MH	A-6, A-7	0	100	95-100	95-100	85-100	35-55	10-20
	12-60	Silt loam, silty clay loam.	ML, MH	A-6, A-7	0	100	100	95-100	85-100	40-55	10-20
Rb---------- Roxbury	0-12	Loam----------	CL	A-4, A-6, A-7-6	0	100	100	96-100	65-98	30-45	8-20
	12-42	Silt loam, silty clay loam.	CL	A-4, A-6, A-7-6	0	100	100	96-100	80-98	30-50	8-25
	42-60	Silt loam, silty clay loam, loam.	ML, CL	A-4, A-6, A-7-6	0	100	100	96-100	65-98	30-50	7-25
Rc---------- Roxbury	0-12	Silt loam-------	CL	A-4, A-6, A-7-6	0	100	100	96-100	65-98	30-45	8-20
	12-42	Silt loam, silty clay loam.	CL	A-4, A-6, A-7-6	0	100	100	96-100	80-98	30-50	8-25
	42-60	Silt loam, silty clay loam, loam.	ML, CL	A-4, A-6, A-7-6	0	100	100	96-100	65-98	30-50	7-25
Sa---------- Salix	0-16	Silty clay loam	CL, CH	A-7	0	100	100	95-100	95-100	41-60	20-35
	16-34	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	95-100	35-50	20-30
	34-60	Silt loam, loam, very fine sandy loam.	CL, ML	A-4, A-6	0	100	100	95-100	90-100	30-40	5-15
Sb---------- Salmo	0-20	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	85-95	30-45	10-20
	20-34	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	95-100	85-95	30-45	10-20
	34-60	Silty clay loam, silty clay.	CL, ML	A-6, A-7	0	100	100	95-100	85-95	35-50	10-25

See footnote at end of table.

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--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	
SdA---------- Sarpy	0-9	Loamy fine sand	SM	A-2	0	100	100	60-80	15-35	---	NP
	9-60	Loamy fine sand, fine sand.	SM	A-2	0	100	100	60-80	15-35	---	NP
SeA*:											
Sarpy----------	0-9	Loamy fine sand	SM	A-2	0	100	100	60-80	15-35	---	NP
	9-60	Loamy fine sand, fine sand.	SM	A-2	0	100	100	60-80	15-35	---	NP
Grable----------	0-7	Silt loam--------	CL	A-4, A-6	0	100	100	80-95	50-75	25-40	8-20
	7-28	Silt loam, very fine sandy loam.	CL	A-4, A-6	0	100	100	80-95	50-75	25-40	8-20
	28-60	Fine sand, loamy sand, sand.	SM, SM-SC, SP-SM	A-2, A-3	0	100	100	65-80	5-35	<20	NP-5
TaE*:											
Talmo----------	0-9	Loam----------	CL, SC, SM-SC, CL-ML	A-4, A-6	0-5	80-100	70-100	55-95	40-75	20-35	5-15
	9-60	Sand and gravel	GW, GM, SW, SM	A-1	0-5	40-95	30-65	15-35	0-15	<20	NP-5
Thurman----------	0-18	Fine sandy loam	SM, SP-SM	A-2, A-3	0	100	100	90-100	5-30	---	NP
	18-60	Loamy fine sand, fine sand, very fine sand.	SM, SP-SM	A-2, A-3	0	100	100	85-100	5-25	---	NP
Tb----------	0-17	Silt loam--------	ML, CL	A-4, A-6	0	100	100	95-100	80-100	27-40	5-15
Tetonka	17-21	Silty clay loam	CL	A-6, A-7	0	100	100	90-100	80-100	30-50	10-25

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
WcB*:											
Wentworth	0-10	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	85-100	35-50	11-25
	10-32	Silty clay loam, silt loam.	CL, CH	A-6, A-7	0	100	100	95-100	80-100	35-55	15-30
	32-60	Stratified silty clay loam to silt loam.	CL, ML	A-4, A-6, A-7	0	100	95-100	85-100	60-100	30-50	5-25
Trent	0-13	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	90-100	35-50	11-25
	13-34	Silty clay loam	CL	A-6, A-7	0	100	100	90-100	85-100	35-50	11-25
	34-60	Silt loam, silty clay loam.	CL	A-6, A-7	0	100	95-100	90-100	70-100	35-50	11-25
Wd Worthing	0-14	Silty clay loam	CL	A-7	0	100	100	95-100	85-95	42-50	17-22
	14-44	Silty clay, silty clay loam.	CH, MH	A-7	0	100	100	95-100	85-100	50-70	22-35
	44-60	Silty clay, silty clay loam, clay loam.	CL, CH	A-6, A-7	0	100	95-100	90-100	70-95	35-60	20-35
[illegible]	0-14	Silty clay loam	CL	A-7	0	100	100	95-100	85-95	40-50	15-25

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS

[illegible]

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group
	In	In/hr	In/in	pH	Mmhos/cm				
BoE*:									
Ethan----------	0-4	0.6-2.0	0.18-0.20	6.1-7.8	<2	Moderate	0.28	5	6
	4-16	0.6-2.0	0.16-0.20	7.4-8.4	<2	Moderate	0.37		
	16-60	0.2-2.0	0.16-0.20	7.4-9.0	2-8	Moderate	0.37		
Ca---------- Chancellor	0-19	0.06-0.6	0.13-0.19	6.1-7.3	<2	High------	0.28	5	7
	19-37	0.06-0.2	0.11-0.19	6.1-7.3	<2	High------	0.28		
	37-60	0.06-0.6	0.14-0.20	7.4-8.4	<2	High------	0.28		
Cb---------- Clamo	0-7	0.06-0.2	0.16-0.19	6.6-7.8	<2	High------	0.28	5	7
	7-60	0.06-0.2	0.13-0.18	6.6-8.4	2-8	High------	0.28		
Cc----------	0-16	0.06-0.2	0.14-0.18	6.6-7.8	<2	High------	0.28	5	7

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group
	In	In/hr	In/in	pH	Mmhos/cm				
CmE*:									
Nora	0-7	0.6-2.0	0.19-0.22	6.1-7.3	<2	Moderate	0.32	5	6
	7-30	0.6-2.0	0.17-0.20	6.6-7.8	<2	Moderate	0.43		
	30-60	0.6-2.0	0.17-0.20	6.6-8.4	<2	Moderate	0.43		
DaB Davis	0-9	0.6-2.0	0.18-0.22	6.1-7.3	<2	Moderate	0.28	5	6
	9-30	0.6-2.0	0.18-0.22	6.1-7.8	<2	Moderate	0.28		
	30-60	0.6-2.0	0.18-0.20	6.6-8.4	<2	Moderate	0.28		
DbB Davis Variant	0-12	0.6-2.0	0.18-0.20	6.6-7.8	<2	Low	0.20	5	6
	12-30	2.0-6.0	0.12-0.15	6.6-7.8	<2	Low	0.20		
	30-60	2.0-20	0.09-0.13	7.4-8.4	<2	Low	0.20		
EaB*:									
Egan	0-7	0.6-2.0	0.19-0.22	6.1-7.3	<2	Moderate	0.32	5	7
	7-28	0.6-2.0	0.17-0.20	6.6-8.4	<2	Moderate	0.43		
	28-60	0.06-0.6	0.17-0.20	7.4-9.0	2-8	Moderate	0.43		
Chancellor	0-19	0.06-0.6	0.13-0.19	6.1-7.3	<2	High	0.28	5	7
	19-37	0.06-0.2	0.11-0.19	6.1-7.3	<2	High	0.28		
	37-60	0.06-0.6	0.14-0.20	7.4-8.4	<2	High	0.28		
EbB*:									
Egan	0-7	0.6-2.0	0.19-0.22	6.1-7.3	<2	Moderate	0.32	5	7
	7-28	0.6-2.0	0.17-0.20	6.6-8.4	<2	Moderate	0.43		
	28-60	0.06-0.6	0.17-0.20	7.4-9.0	2-8	Moderate	0.43		
Ethan	0-8	0.6-2.0	0.18-0.20	6.1-7.8	<2	Moderate	0.28	5	6
	8-16	0.6-2.0	0.16-0.20	7.4-8.4	<2	Moderate	0.37		
	16-60	0.2-2.0	0.16-0.20	7.4-9.0	2-8	Moderate	0.37		
Trent	0-13	0.6-2.0	0.19-0.22	6.1-7.3	<2	Moderate	0.28	5	7
	13-34	0.6-2.0	0.17-0.20	6.1-7.8	<2	Moderate	0.43		
	34-45	0.6-2.0	0.17-0.20	6.6-8.4	<2	Moderate	0.43		
	45-60	0.2-0.6	0.16-0.20	7.4-8.4	<2	Moderate	0.43		
EbC*:									
Egan	0-7	0.6-2.0	0.19-0.22	6.1-7.3	<2	Moderate	0.32	5	7
	7-28	0.6-2.0	0.17-0.20	6.6-8.4	<2	Moderate	0.43		
	28-60	0.06-0.6	0.17-0.20	7.4-9.0	2-8	Moderate	0.43		
Ethan	0-8	0.6-2.0	0.18-0.20	6.1-7.8	<2	Moderate	0.28	5	6
	8-16	0.6-2.0	0.16-0.20	7.4-8.4	<2	Moderate	0.37		
	16-60	0.2-2.0	0.16-0.20	7.4-9.0	2-8	Moderate	0.37		
Trent	0-13	0.6-2.0	0.19-0.22	6.1-7.3	<2	Moderate	0.28	5	7
	13-34	0.6-2.0	0.17-0.20	6.1-7.8	<2	Moderate	0.43		
	34-45	0.6-2.0	0.17-0.20	6.6-8.4	<2	Moderate	0.43		
	45-60	0.2-0.6	0.16-0.20	7.4-8.4	<2	Moderate	0.43		
EcA*, EcB*:									
Egan	0-7	0.6-2.0	0.19-0.22	6.1-7.3	<2	Moderate	0.32	5	7
	7-28	0.6-2.0	0.17-0.20	6.6-8.4	<2	Moderate	0.43		
	28-60	0.06-0.6	0.17-0.20	7.4-9.0	2-8	Moderate	0.43		
Wentworth	0-10	0.6-2.0	0.19-0.22	5.6-7.3	<2	Moderate	0.32	5	7
	10-32	0.6-2.0	0.18-0.21	6.1-7.3	<2	Moderate	0.43		
	32-60	0.6-2.0	0.17-0.20	7.4-8.4	2-8	Moderate	0.43		
EdA*:									
Egan	0-7	0.6-2.0	0.19-0.22	6.1-7.3	<2	Moderate	0.32	5	7
	7-28	0.6-2.0	0.17-0.20	6.6-8.4	<2	Moderate	0.43		
	28-60	0.06-0.6	0.17-0.20	7.4-9.0	2-8	Moderate	0.43		

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group
	In	In/hr	In/in	pH	Mmhos/cm				
EhA*, EhB*:									
Enet	0-8	0.6-2.0	0.18-0.20	5.6-7.3	<2	Low	0.28	4	6
	8-25	0.6-2.0	0.18-0.22	6.6-7.8	<2	Low	0.28		
	25-34	0.6-6.0	0.11-0.20	6.6-7.8	<2	Low	0.28		
	34-60	6.0-20	0.03-0.06	7.4-8.4	<2	Low	0.10		
Delmont	0-7	0.6-2.0	0.18-0.20	6.6-7.8	<2	Low	0.28	3	6
	7-18	0.6-6.0	0.12-0.18	6.6-7.8	<2	Low	0.28		
	18-60	6.0-20	0.03-0.06	7.4-8.4	<2	Low	0.10		
EkD Ethan	0-4	0.6-2.0	0.11-0.15	6.1-7.8	<2	Moderate	0.28	5	6
	4-16	0.6-2.0	0.16-0.20	7.4-8.4	<2	Moderate	0.37		
	16-60	0.2-0.6	0.16-0.20	7.4-9.0	2-8	Moderate	0.37		
EmE*:									
Ethan	0-4	0.6-2.0	0.18-0.20	6.1-7.8	<2	Moderate	0.28	5	6
	4-16	0.6-2.0	0.16-0.20	7.4-8.4	<2	Moderate	0.37		
	16-60	0.2-2.0	0.16-0.20	7.4-9.0	2-8	Moderate	0.37		
Betts	0-3	0.6-2.0	0.16-0.18	6.6-8.4	<2	Moderate	0.28	5	4L
	3-32	0.6-2.0	0.17-0.20	7.4-8.4	<2	Moderate	0.37		
	32-60	0.2-0.6	0.17-0.20	7.4-8.4	2-8	Moderate	0.37		
EnC*:									
Ethan	0-8	0.6-2.0	0.18-0.20	6.1-7.8	<2	Moderate	0.28	5	6
	8-16	0.6-2.0	0.16-0.20	7.4-8.4	<2	Moderate	0.37		
	16-60	0.2-2.0	0.16-0.20	7.4-9.0	2-8	Moderate	0.37		
Bonilla	0-7	0.6-2.0	0.18-0.20	5.6-7.3	<2	Low	0.24	5	6
	7-40	0.6-2.0	0.18-0.22	6.1-7.8	<2	Moderate	0.24		
	40-60	0.2-2.0	0.12-0.18	7.4-8.4	2-8	Moderate	0.43		
EoD*:									
Ethan	0-4	0.6-2.0	0.18-0.20	6.1-7.8	<2	Moderate	0.28	5	6
	4-16	0.6-2.0	0.16-0.20	7.4-8.4	<2	Moderate	0.37		
	16-60	0.2-2.0	0.16-0.20	7.4-9.0	2-8	Moderate	0.37		
Davis	0-9	0.6-2.0	0.18-0.22	6.1-7.3	<2	Moderate	0.28	5	6
	9-30	0.6-2.0	0.18-0.22	6.1-7.8	<2	Moderate	0.28		
	30-60	0.6-2.0	0.18-0.20	6.6-8.4	<2	Moderate	0.28		
EpD*:									
Ethan	0-4	0.6-2.0	0.18-0.20	6.1-7.8	<2	Moderate	0.28	5	6
	4-16	0.6-2.0	0.16-0.20	7.4-8.4	<2	Moderate	0.37		
	16-60	0.2-2.0	0.16-0.20	7.4-9.0	2-8	Moderate	0.37		
Talmo	0-9	0.6-2.0	0.11-0.20	6.6-7.8	<2	Low	0.20	2	6
	9-60	6.0-20	0.03-0.06	7.4-8.4	<2	Low	0.10		
Fa Forney	0-16	<0.06	0.11-0.13	6.1-7.8	<2	High	0.28	5	4
	16-60	<0.06	0.11-0.13	6.1-7.8	<2	High	0.28		
Ga Grable	0-7	0.6-2.0	0.22-0.24	7.4-8.4	<2	Low	0.32	4	4L
	7-28	0.6-2.0	0.20-0.22	7.4-8.4	<2	Low	0.43		
	28-60	>6.0	0.02-0.07	7.4-8.4	<2	Low	0.15		
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	<2	Moderate	0.32	5	7

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group
	In	In/hr	In/in	pH	Mmhos/cm				
Ja---------- James	0-4	0.2-0.6	0.13-0.16	7.4-9.0	>2	High-------	0.28	5	4
	4-60	<0.2	0.09-0.14	7.4-9.0	>4	High-------	0.28		
La---------- Lakeport	0-19	0.2-2.0	0.18-0.20	6.1-7.3	<2	High-------	0.28	5	4
	19-44	0.2-0.6	0.17-0.19	6.6-7.8	<2	High-------	0.28		
	44-60	0.6-2.0	0.17-0.19	7.4-8.4	<2	Moderate	0.43		
Lb---------- Lamo	0-16	0.2-0.6	0.21-0.23	7.4-8.4	<2	High-------	0.20	5	7
	16-60	0.2-0.6	0.18-0.20	7.4-8.4	<2	High-------	0.28		
Lc, Ld---------- Luton	0-16	<0.06	0.12-0.14	6.6-7.8	<2	High-------	0.28	5	4
	16-24	<0.06	0.12-0.14	6.6-7.8	<2	High-------	0.28		
	24-60	<0.06	0.11-0.13	6.6-8.4	<2	High-------	0.28		
Oa---------- Onawa	0-7	0.06-0.2	0.12-0.14	7.4-8.4	<2	High-------	0.32	5	4
	7-30	0.06-0.2	0.12-0.14	7.4-8.4	<2	High-------	0.32		
	30-60	0.6-6.0	0.20-0.22	7.4-8.4	<2	Moderate	0.43		
Ob---------- Owego	0-16	<0.06	0.12-0.14	6.1-7.3	<2	High-------	0.32	5	4
	16-36	0.6-2.0	0.20-0.22	7.4-8.4	<2	Moderate	0.32		
	36-60	<0.06	0.11-0.13	7.4-8.4	<2	High-------	0.32		
Pa. Pits, gravel									
Ra---------- Redstoe Variant	0-12	0.6-2.0	0.15-0.19	6.6-8.4	<2	Low--------	0.28	4	4L
	12-60	0.6-2.0	0.13-0.17	7.4-8.4	<2	Low--------	0.43		
Rb, Rc---------- Roxbury	0-12	0.6-2.0	0.22-0.24	6.6-8.4	<2	Moderate	0.32	5	4L
	12-42	0.6-2.0	0.17-0.22	7.4-8.4	<2	Moderate	0.43		
	42-60	0.6-2.0	0.17-0.22	7.4-8.4	<2	Moderate	0.43		
Sa---------- Salix	0-16	0.6-2.0	0.21-0.23	6.6-7.8	<2	Moderate	0.28	5	6
	16-34	0.6-2.0	0.18-0.20	6.6-7.8	<2	Moderate	0.43		
	34-60	0.6-2.0	0.20-0.22	7.4-8.4	<2	Moderate	0.43		
Sb---------- Salmo	0-20	0.2-0.6	0.19-0.24	6.6-8.4	4-16	Moderate	0.28	5	7
	20-34	0.2-0.6	0.17-0.20	7.4-8.4	4-16	Moderate	0.28		
	34-60	0.2-0.6	0.11-0.20	7.4-8.4	4-16	Moderate	0.28		
SdA---------- Sarpy	0-9	>6.0	0.05-0.09	6.6-8.4	<2	Low--------	0.15	5	1
	9-60	>6.0	0.05-0.09	7.4-8.4	<2	Low--------	0.15		
SeA*:									
Sarpy----------	0-9	>6.0	0.05-0.09	6.6-8.4	<2	Low--------	0.15	5	1
	9-60	>6.0	0.05-0.09	7.4-8.4	<2	Low--------	0.15		
Grable----------	0-7	0.6-2.0	0.22-0.24	7.4-8.4	<2	Low--------	0.32	4	4L
	7-28	0.6-2.0	0.20-0.22	7.4-8.4	<2	Low--------	0.43		
	28-60	>6.0	0.02-0.07	7.4-8.4	<2	Low--------	0.15		
TaE*:									
Talmo----------	0-9	0.6-2.0	0.11-0.20	6.6-7.8	<2	Low--------	0.20	2	6
	9-60	6.0-20	0.03-0.06	7.4-8.4	<2	Low--------	0.10		
Thurman----------	0-18	6.0-20	0.10-0.12	6.1-7.3	<2	Low--------	0.17	5	2
	18-60	6.0-20	0.06-0.11	6.1-7.3	<2	Low--------	0.17		
Tb---------- Tetonka	0-17	0.6-2.0	0.19-0.22	5.6-7.3	<2	Moderate	0.24	3	6
	17-21	0.2-0.6	0.19-0.22	5.6-7.3	<2	Moderate	0.32		
	21-48	<0.06	0.13-0.19	6.1-7.3	<2	High-------	0.32		
	48-60	0.06-0.6	0.11-0.17	7.4-8.4	2-8	High-------	0.32		
TcC*:									
Thurman----------	0-18	6.0-20	0.10-0.12	6.1-7.3	<2	Low--------	0.17	5	2
	18-60	6.0-20	0.06-0.11	6.1-7.3	<2	Low--------	0.17		

See footnote at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group
	In	In/hr	In/in	pH	Mmhos/cm				
TcC*:									
Ethan	0-4	0.6-2.0	0.18-0.20	6.1-7.8	<2	Moderate	0.28	5	6
	4-16	0.6-2.0	0.16-0.20	7.4-8.4	<2	Moderate	0.37		
	16-60	0.2-2.0	0.16-0.20	7.4-9.0	2-8	Moderate	0.37		
TdA Trent	0-13	0.6-2.0	0.19-0.22	6.1-7.3	<2	Moderate	0.28	5	7
	13-34	0.6-2.0	0.17-0.20	6.1-7.8	<2	Moderate	0.43		
	34-60	0.6-2.0	0.17-0.20	6.6-8.4	<2	Moderate	0.43		
Wa Waubonsie	0-26	2.0-6.0	0.16-0.18	7.4-8.4	<2	Low	0.24	5	4L
	26-60	<0.2	0.11-0.13	7.4-8.4	<2	High	0.24		
WbA Wentworth	0-10	0.6-2.0	0.19-0.22	5.6-7.3	<2	Moderate	0.32	5	7
	10-32	0.6-2.0	0.18-0.21	6.1-7.3	<2	Moderate	0.43		
	32-60	0.6-2.0	0.17-0.20	7.4-8.4	2-8	Moderate	0.43		
WcB*:									
Wentworth	0-10	0.6-2.0	0.19-0.22	5.6-7.3	<2	Moderate	0.32	5	7
	10-32	0.6-2.0	0.18-0.21	6.1-7.3	<2	Moderate	0.43		
	32-60	0.6-2.0	0.17-0.20	7.4-8.4	2-8	Moderate	0.43		
Trent	0-13	0.6-2.0	0.19-0.22	6.1-7.3	<2	Moderate	0.28	5	7
	13-34	0.6-2.0	0.17-0.20	6.1-7.8	<2	Moderate	0.43		
	34-60	0.6-2.0	0.17-0.20	6.6-8.4	<2	Moderate	0.43		
Wd Worthing	0-14	0.2-0.6	0.19-0.22	5.6-7.3	<2	Moderate	0.28	5	7
	14-44	0.06-0.2	0.13-0.18	6.1-7.3	<2	High	0.28		
	44-60	0.2-0.6	0.11-0.17	7.4-8.4	2-8	High	0.28		
We Worthing	0-14	0.2-0.6	0.19-0.22	5.6-7.3	<2	High	0.28	5	7
	14-44	0.06-0.2	0.13-0.18	6.1-7.3	<2	High	0.28		
	44-60	0.2-0.6	0.11-0.17	7.4-8.4	2-8	High	0.28		

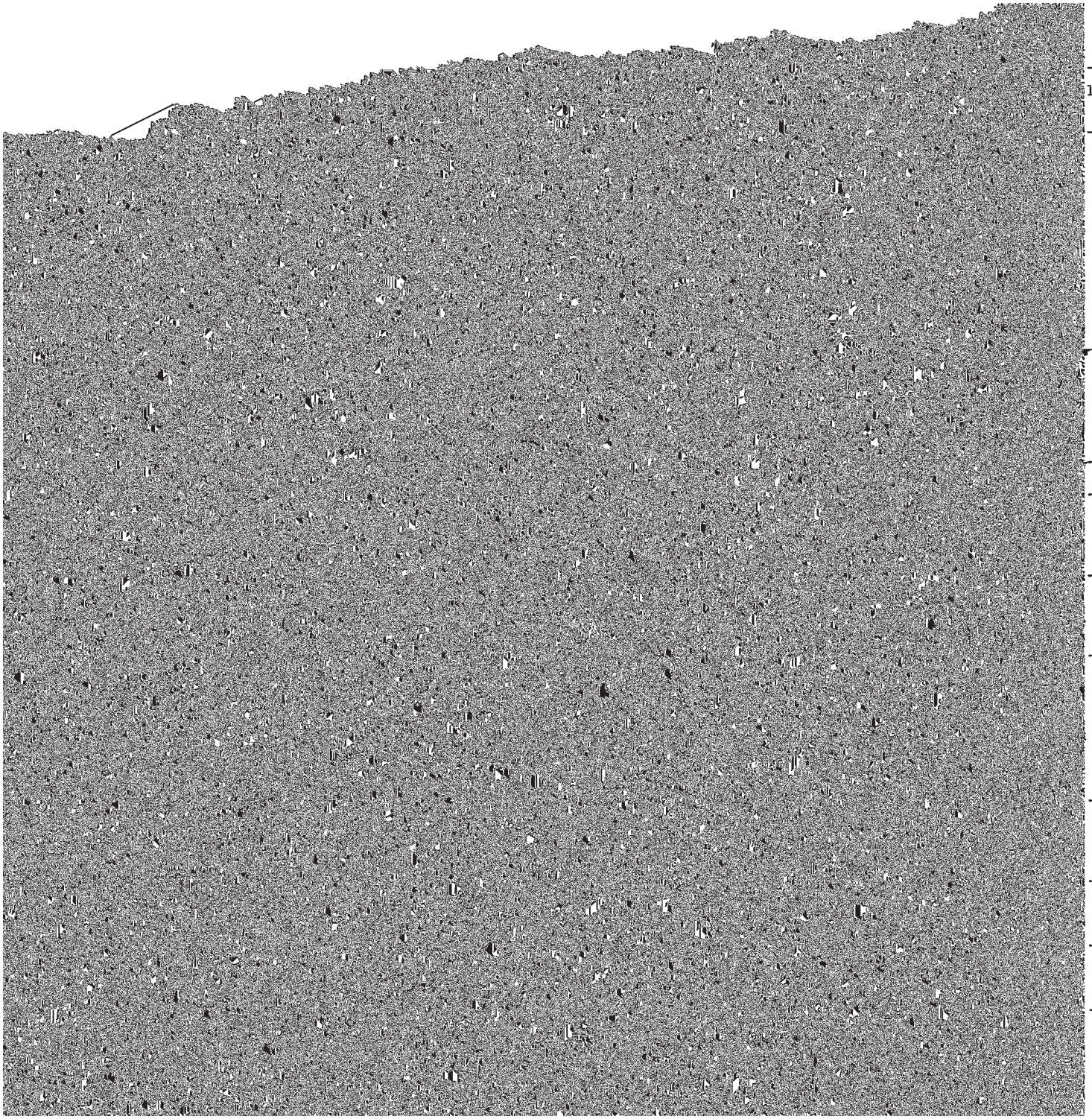
* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 16.--SOIL AND WATER FEATURES

g" and "water table" in the Glossary explain terms such as "rare," "brief," "apparent," and "perched." than; > means more than. Absence of an entry indicates that the feature is not a concern]

Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
requency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
			Ft			In				
mmon-------	Brief-----	Mar-Oct	0-5.0	Apparent	Jan-Dec	>60	---	High-----	High-----	Moderate.
equent----	Long------	Nov-Jun	+1-5.0	Apparent	Jan-Dec	>60	---	High-----	High-----	Moderate.
ne--------	---	---	>6.0	---	---	>60	---	Moderate	High-----	Moderate.
ne--------	---	---	>6.0	---	---	10-20	Rippable	Moderate	Moderate	High.
re--------	---	---	2.0-4.0	Apparent	Nov-Jun	>60	---	High-----	High-----	Low.
re--------	---	---	1.0-3.0	Apparent	Nov-May	>60	---	High-----	High-----	Low.
re--------	---	---	1.0-3.0	Apparent	Nov-May	>60	---	High-----	High-----	Low.
mmon-------	Brief-----	Mar-Oct	2.0-3.0	Apparent	Oct-Jun	>60	---	Moderate	High-----	Moderate.
ne--------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Low.
ne--------	---	---	>6.0	---	---	>60	---	Low------	Low------	Low.
re--------	---	---	>6.0	---	---	>60	---	High-----	Low------	Low.
mmon-------	Brief-----	Apr-Oct	>6.0	---	---	>60	---	Moderate	Moderate	Low.
mmon-------	Very brief	Apr-Oct	3.0-6.0	Perched	Oct-Jun	>60	---	Moderate	High-----	Moderate.
mmon-------	Brief-----	Sep-Jun	1.0-4.0	Perched	Sep-Jun	>60	---	High-----	High-----	Moderate.
ne--------	---	---	>6.0	---	---	20-40	Rippable	Low------	High-----	Moderate.
ne--------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
equent----	Brief-----	Sep-Jun	1.5-3.0	Perched	Sep-Jun	>60	---	---	High-----	Moderate.
mmon-------	Long------	Mar-Oct	0-3.0	Apparent	Oct-Jun	>60	---	High-----	High-----	High.
equent----	Long------	Mar-Oct	0-1.0	Apparent	Oct-Jun	>60	---	High-----	High-----	Moderate.

table.



Risk of corrosion	
Uncoated steel	Concrete
High-----	Moderate.
High-----	Moderate.
High-----	Moderate.
High-----	Moderate.
High-----	Moderate.
High-----	High.
High-----	Moderate.
High-----	Moderate.
High-----	Moderate.
Low------	Low.
High-----	Moderate.
Low------	Low.
Moderate	Low.
Moderate	Low.
High-----	Low.
High-----	Moderate.
High-----	Moderate.
High-----	Moderate.
Moderate	Moderate.
High-----	Moderate.
High-----	Moderate.

Risk of corrosion	
Uncoated steel	Concrete
High------	Low.
High------	Moderate.
High------	Low.
Moderate	Low.
Moderate	Low.
High------	Moderate.
Moderate	Moderate.
High------	Moderate.
Moderate	Moderate.
High------	Moderate.
Moderate	Moderate.
Moderate	Low.
Moderate	Moderate.
Moderate	Low.
High------	Low.
Low-------	Low.
Moderate	Low.
Low-------	Low.
High------	High.
High------	Low.

TABLE 16.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
Lb: Lamo	C	Occasional	Brief	Mar-Aug	2.0-3.0	Apparent	Nov-May	>60	---	High	High	Low.
Lc, Ld: Luton	D	Common	Brief	Mar-Jun	0-1.0	Apparent	Nov-May	>60	---	Moderate	High	Low.
Oa: Onawa	D	Common	Brief	Mar-Jun	2.0-4.0	Apparent	Nov-May	>60	---	High	High	Low.
Ob: Owego	D	Common	Brief	Mar-Jun	1.0-3.0	Apparent	Nov-May	>60	---	Moderate	High	Low.
Pa. Pits, gravel												
Ra: Redstoe Variant	B	None	---	---	>6.0	---	---	>60	---	Moderate	High	Low.
Rb, Rc: Roxbury	B	Common	Very brief	Apr-Sep	>6.0	---	---	>60	---	Moderate	Low	Low.
Sa: Salix	B	Rare	---	---	3.0-5.0	Apparent	Nov-May	>60	---	High	Moderate	Low.
Sb: Salmo	C/D	Common	Brief	Mar-Oct	0-2.5	Apparent	Sep-Jun	>60	---	High	High	High.
SdA: Sarpy	A	Frequent	Brief to long.	Nov-Jun	>6.0	---	---	>60	---	Low	Low	Low.
SeA**:												
Sarpy	A	Frequent	Brief to long.	Nov-Jun	>6.0	---	---	>60	---	Low	Low	Low.
Grable	B	Common	Very brief	Mar-Jun	>6.0	---	---	>60	---	Low	Low	Low.
TaE**:												
Talmo	A	None	---	---	>6.0	---	---	>60	---	Low	Moderate	Low.
Thurman	A	None	---	---	>6.0	---	---	>60	---	Low	Low	Low.
Tb: Tetonka*	C/D	Common	Very long	Jan-Dec	+1-1.0	Perched	Jan-Dec	>60	---	High	High	Moderate.
TcC**:												
Thurman	A	None	---	---	>6.0	---	---	>60	---	Low	Low	Low.
Ethan	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
TdA: Trent	B	Rare to common.	Very brief	Apr-Oct	4.0-6.0	Perched	Oct-Jun	>60	---	High	High	Moderate.
Wa: Waubonsie	B	Common	Very brief	Mar-Jun	1.0-3.0	Apparent	Nov-Jun	>60	---	High	High	Low.

See footnotes at end of table.

TABLE 16.--SOIL AND WATER FEATURES--Continued

Ponding		High water table			Bedrock		Potential frost action	Risk of corrosion	
Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
		Ft			In				
---	---	>6.0	---	---	>60	---	High-----	High-----	Low.
---	---	>6.0	---	---	>60	---	High-----	High-----	Low.
ery brief	Apr-Oct	4.0-6.0	Perched	Oct-Jun	>60	---	High-----	High-----	Moderate.
ery long	Jan-Dec	0-1.0	Perched	Jan-Dec	>60	---	High-----	High-----	Moderate.
ery long	Jan-Dec	+3-0.5	Perched	Jan-Dec	>60	---	High-----	High-----	High.

depth to the water table indicates that the water table can be the specified number of feet
e first number in the range.
r composition and behavior characteristics of the map unit.

TABLE 17.--CLASSIFICATION OF THE SOILS

Soil name	Family or higher taxonomic class
Baltic	Fine, montmorillonitic (calcareous), mesic Cumulic Haplaquolls
Betts	Fine-loamy, mixed (calcareous), mesic Typic Ustorthents
*Blake	Fine-silty, mixed (calcareous), mesic Aquic Udifluvents
*Blencoe	Clayey over loamy, montmorillonitic, mesic Aquic Hapludolls
Blonder	Coarse-loamy, mixed, mesic Pachic Haplustolls

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