Use and Management of the Soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help to prevent soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavioral characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as rangeland and woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreational facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

Crops and Pasture

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General management needed for crops and pasture is suggested in this section. The estimated yields of the main crops and pasture plants are listed for each soil, and the system of land capability classification used by the Natural Resources Conservation Service is explained.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under the heading "Detailed Soil Map Units." Specific information can be obtained from the local office of the Natural Resources Conservation Service or the Cooperative Extension Service.

According to Nebraska Agriculture Statistics, about 10 percent of the total land acreage in Sioux County is used as cropland. The largest acreage of the cropland is used for dryland winter wheat and fallow. The rest is used mainly for irrigated field beans or corn. The potential of the soils in the county for increased production of food is good. Soils that are in land capability classes I through IV are suited to dryland and irrigated crops.

Land Capability Classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The criteria used in grouping the soils do not include major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor do they include possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for rangeland, for woodland, and for engineering purposes.

In the capability system, soils are generally grouped at three levels—capability class, subclass, and unit.

Capability classes, the broadest groups, are designated by 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 management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and miscellaneous areas have limitations that nearly preclude their use for commercial crop production.

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

In class I there are no subclasses because the soils of this class have few limitations. Class V contains only the subclasses indicated by *w, s,* or *c* because the soils in class V are subject to little or no erosion. They have other limitations that restrict their use to pasture, rangeland, woodland, wildlife habitat, or recreation.

Capability units are soil groups within a subclass. The soils in a capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity. Capability units are generally designated by adding an Arabic numeral to the subclass symbol, for example, IIe-3 and IIIe-5.

The acreage of soils in each capability class and subclass is shown in table 6. The capability classification of each map unit is given in the section "Detailed Soil Map Units," in the yields table, and in the section "Interpretive Groups," which follows the tables at the back of this publication.

Management for Dryland Crops

Good management practices for dryland crops are those that reduce the runoff rate and the risks of water erosion and soil blowing, conserve soil moisture, and improve tilth. Most of the soils in the county are suitable for crops. In many areas, however, erosion is a severe hazard and should be controlled by suitable conservation practices.

Soil blowing is a hazard on nearly all of the tillable soils, especially during periods when the amount of rainfall is below average. Soil blowing can be controlled by a conservation tillage system, which leaves crop residue on the surface, and by wind stripcropping. Planting row crops on the more productive soils and planting hay, pasture plants, or close-grown crops, such as small grain and alfalfa, on the steeper, more erodible soils help to control both soil blowing and water erosion. In many areas proper use of the land alone can reduce the hazard of erosion.

An insufficient amount of rainfall is the main limitation affecting dryland crops in Sioux County. A cropping system that conserves soil moisture and controls water erosion and soil blowing is needed. A cropping system is the sequence of crops grown on a field and the management needed to conserve soil and water. It should preserve tilth and fertility, maintain a protective plant cover, and control weeds, insects, and disease on soils used for dryland crops. The cropping system selected should be the one best suited to the soil. For example, on Satanta very fine sandy loam, 3 to 6 percent slopes, it should include a conservation tillage system that maintains 1,500 pounds per acre of small grain residue on the surface to protect the soil from water erosion and soil blowing. On Alliance loam, 1 to 3 percent slopes, 1,000 pounds of small grain residue will protect the soil from erosion.

Level terraces, contour farming, grassed waterways, and a conservation tillage system help to control water erosion (fig. 18). Keeping crop residue on the surface or growing a protective plant cover helps to prevent sealing and crusting of the soil during and after heavy rains. The moisture supply is increased in winter because the stubble catches drifting snow.

Preparing a seedbed helps to control weeds and provides a favorable growing medium for plants. If tillage is excessive, however, granular structure in the surface layer breaks down and tilth deteriorates. Tillage should be kept at a minimum. Various methods are used to minimize tillage in the county. Examples of methods that are well suited to all of the commonly grown crops are a fallow system in which weeds are controlled by applications of herbicide rather than by tillage; a system in which the soil is tilled with disks or chisels, which keep tillage to a minimum and keep crop residue on the surface; and a stubble mulching system in which crop residue from winter wheat remains on the surface after the soil is tilled. Grass seed can be drilled into a cover of stubble without further seedbed preparation.

Additional nutrients are needed in some of the soils used for dryland crops. The kinds and amounts of fertilizer to be applied should be based on the results of soil tests and on the content of moisture in the soil at the time of application. If the subsoil is dry and the amount of rainfall is low, fertilizer should be applied at a slightly lower rate than that needed when the soil is moist. On all soils used for nonlegume crops, nitrogen fertilizer is beneficial.

Figure 18.—Terraces in an area of Bridget very fine sandy loam, 6 to 9 percent slopes.

Phosphorus and zinc are commonly needed on the more eroded soils and in areas that are cut for terraces or diversions or in land leveling operations. Because the plant population is lower, the amount of fertilizer needed on soils used for dryland crops is smaller than the amount needed on soils used for irrigated crops. All plant nutrients should be applied in a manner that prevents contamination of surface and ground water.

On the soils assigned to capability subclass IIe, such as Alliance loam, 1 to 3 percent slopes, the best management includes a cover of crop residue, wind stripcropping, applications of fertilizer or feedlot manure, selection of suitable crop varieties, and a planned crop rotation. On the soils assigned to capability subclass IIIe, such as Alliance loam, 3 to 6 percent slopes, the best management includes a cover of crop residue throughout the winter, wind stripcropping, terraces, and a conservation tillage system that leaves about 3,000 pounds of corn or sorghum residue per acre or 1,500 pounds of small grain residue per acre on the surface after the crops are planted. If the slope is more than 10 percent, grasses and legumes are needed in the cropping sequence to control water erosion. The conversion of cropland to pasture or hayland is an economic alternative in areas where the soil is assigned to capability class IV.

Some soils are saline or sodic and thus are not suitable for many climatically adapted plants. An example is the Lisco soil in Las Animas-Lisco complex, 0 to 2 percent slopes, occasionally flooded. Saline or sodic (alkali) conditions affect the production of crops and forage plants. Crops and forage plants that have a good degree of salt tolerance can be grown. Barley and winter wheat are more tolerant than field beans or corn. Such forage species as tall wheatgrass and birdsfoot trefoil are more tolerant than alfalfa and orchardgrass. Applications of feedlot manure and commercial fertilizer, particularly phosphorus, help to overcome the low fertility of these soils. Gypsum and sulfur can be applied on a trial basis, but results in the field are commonly disappointing.

Applications of herbicide are effective in controlling weeds. The kind and amount applied, however, should be carefully controlled. The application rate should be determined by the colloidal clay and humus fraction of the soil, which is responsible for most of the chemical activity in the soil. Applications of a large amount of herbicide result in crop damage on sandy soils, which have a low content of colloidal clay, and on soils that have a moderately low or low content of organic matter. Applying herbicides according to the kind of soil can lessen the danger of crop damage. All herbicides should be applied

in a manner that minimizes the risk of contamination of surface and ground water.

Following is a description of the dryland capability units in Sioux County.

CAPABILITY UNIT IIc-1 (DRYLAND)

Suitability:
- The soils in this unit are suited to the crops commonly grown in the county.

Management concerns:
- The main management concern is insufficient rainfall during the growing season.
- Soil blowing is the main hazard where the surface is not adequately protected by a cover of crops or crop residue.

Management practices:
- Planting close-growing crops, leaving crop residue on the surface, and growing winter cover crops help to control soil blowing.
- A cropping system that includes good management of crop residue during fallow periods conserves soil moisture and reduces the hazard of soil blowing.
- Stripcropping, establishing field windbreaks, and returning crop residue to the soil help to control soil blowing and conserve soil moisture.
- Growing alfalfa or other close-grown crops eliminates the need for working the soil in the spring and protects the soil from soil blowing when the surface is dry.
- Crops grown on these soils respond well if adequate fertilizer is applied and adequate moisture is available.

CAPABILITY UNIT IIe-1 (DRYLAND)

Suitability:
- The soils in this unit are suited to the crops commonly grown in the county.

Management concerns:
- Water erosion and soil blowing are hazards where these soils are used for crops.
- Another management concern is insufficient rainfall during the growing season.

Management practices:
- Water erosion can be controlled by terraces, contour farming, grassed waterways, and a system of residue management that leaves most of the crop residue on the surface.
- Planting close-growing crops, leaving crop residue on the surface, and growing winter cover crops help to control soil blowing.
- A cropping system that includes good management of crop residue during fallow periods conserves soil moisture and reduces the hazard of soil blowing.
- Stripcropping, establishing field windbreaks, and returning crop residue to the soil help to control soil blowing and conserve soil moisture.
- Growing alfalfa or other close-grown crops eliminates the need for working the soil in the spring and protects the soil from soil blowing when the surface is dry.
- Crops grown on these soils respond well to fertilizer if adequate moisture is available.

CAPABILITY UNIT IIe-3 (DRYLAND)

Suitability:
- The soils in this unit are suited to the crops commonly grown in the county.

Management concerns:
- The main management concern is insufficient rainfall during the growing season.
- Water erosion and soil blowing are hazards where these soils are used for crops.

Management practices:
- Water erosion can be controlled by terraces, contour farming, grassed waterways, and a system of residue management that leaves most of the crop residue on the surface.
- Planting close-growing crops, leaving crop residue on the surface, and growing winter cover crops help to control soil blowing.
- A cropping system that includes good management of crop residue during fallow periods conserves soil moisture and reduces the hazard of soil blowing.
- Stripcropping, establishing field windbreaks, and returning crop residue to the soil help to control soil blowing and conserve soil moisture.
- Growing alfalfa or other close-grown crops eliminates the need for working the soil in the spring and protects the soil from soil blowing when the surface is dry.
- Crops grown on these soils respond well if adequate fertilizer is applied and adequate moisture is available.

CAPABILITY UNIT IIe-9 (DRYLAND)

Suitability:
- The soils in this unit are suited to the crops commonly grown in the county.

Management concerns:
- The main management concern is insufficient rainfall during the growing season.
- Soil blowing and water erosion are hazards where these soils are used for crops.

Management practices:
- Water erosion can be controlled by terraces, contour farming, grassed waterways, and a system of residue management that leaves most of the crop residue on the surface.

• Planting close-growing crops, leaving crop residue on the surface, and growing winter cover crops help to control soil blowing.
• A cropping system that includes good management of crop residue during fallow periods conserves soil moisture and reduces the hazard of soil blowing.
• Stripcropping, establishing field windbreaks, and returning crop residue to the soil help to control soil blowing and conserve soil moisture.
• Growing alfalfa or other close-grown crops eliminates the need for working the soil in the spring and protects the soil from soil blowing when the surface is dry.
• Crops grown on these soils respond well if adequate fertilizer is applied and adequate moisture is available.

CAPABILITY UNIT IIw-3 (DRYLAND)

Suitability:
• The soils in this unit are best suited to alfalfa and grasses.

Management concerns:
• Because these soils are occasionally flooded for brief periods, crops can be damaged by scouring, standing water, or sedimentation.
• A management concern is insufficient rainfall during the growing season.
• Soil blowing is a hazard where these soils are used for crops.

Management practices:
• Leaving the maximum amount of crop residue on the surface helps to control soil blowing and conserves soil moisture.
• Terraces and other erosion-control practices on the adjacent uplands reduce the runoff rate and the hazard of flooding.

CAPABILITY UNIT IIIc-1 (DRYLAND)

Suitability:
• The soils in this unit are suited to the crops commonly grown in the county.

Management concerns:
• The main management concern is insufficient rainfall during the growing season.
• Soil blowing is the main hazard where these soils are used for crops.

Management practices:
• Leaving the maximum amount of crop residue on the surface helps to control soil blowing and conserves soil moisture.
• A cropping system that includes good management of crop residue during fallow periods conserves soil moisture and reduces the hazard of soil blowing.
• Including close-grown crops, such as alfalfa and grasses, in the cropping sequence helps to control soil blowing.
• Stripcropping, establishing field windbreaks, and returning crop residue to the soil help to control soil blowing and conserve soil moisture.
• Crops grown on these soils respond well to fertilizer if adequate moisture is available.

CAPABILITY UNIT IIIe-1 (DRYLAND)

Suitability:
• The soils in this unit are suited to the crops commonly grown in the county.

Management concerns:
• The main management concern is insufficient rainfall during the growing season.
• Water erosion and soil blowing are hazards.

Management practices:
• Water erosion can be controlled by terraces, contour farming, grassed waterways, and a system of residue management that leaves most of the crop residue on the surface.
• Leaving the maximum amount of crop residue on the surface helps to control soil blowing and conserves soil moisture.
• A cropping system that includes good management of crop residue during fallow periods conserves soil moisture and reduces the hazard of soil blowing.
• Including close-grown crops, such as alfalfa and grasses, in the cropping sequence helps to control soil blowing.
• Stripcropping, establishing field windbreaks, and returning crop residue to the soil help to control soil blowing and conserve soil moisture.
• Crops grown on these soils respond well to fertilizer if adequate moisture is available.

CAPABILITY UNIT IIIe-3 (DRYLAND)

Suitability:
• The soils in this unit are suited to the crops commonly grown in the county.

Management concerns:
• The main management concern is insufficient rainfall during the growing season.
• Water erosion and soil blowing are hazards where these soils are used as cropland.

Management practices:
• Water erosion can be controlled by terraces, contour farming, grassed waterways, and a system of residue management that leaves most of the crop residue on the surface.

- Leaving the maximum amount of crop residue on the surface helps to control soil blowing and conserves soil moisture.
- A cropping system that includes good management of crop residue during fallow periods conserves soil moisture and reduces the hazard of soil blowing.
- Including close-grown crops, such as alfalfa and grasses, in the cropping sequence helps to control soil blowing.
- Stripcropping, establishing field windbreaks, and returning crop residue to the soil help to control soil blowing and conserve soil moisture.
- Crops grown on these soils respond well to fertilizer if adequate moisture is available.

CAPABILITY UNIT IIIe-5 (DRYLAND)

Suitability:
- The soils in this unit are suited to the crops commonly grown in the county.

Management concerns:
- The main management concern is insufficient rainfall during the growing season.
- Soil blowing is the main hazard where these soils are used for crops.

Management practices:
- Leaving the maximum amount of crop residue on the surface helps to control soil blowing and conserves soil moisture.
- Planting close-growing crops, leaving crop residue on the surface, and growing winter cover crops help to control soil blowing.
- Crops grown on these soils respond well to fertilizer if adequate moisture is available.

CAPABILITY UNIT IIIe-9 (DRYLAND)

Suitability:
- The soils in this unit are suited to the crops commonly grown in the county.

Management concerns:
- The main management concern is insufficient rainfall during the growing season.
- Water erosion and soil blowing are hazards where these soils are used for crops.

Management practices:
- Water erosion can be controlled by terraces, contour farming, grassed waterways, and a system of residue management that leaves most of the crop residue on the surface.
- Leaving the maximum amount of crop residue on the surface helps to control soil blowing and conserves soil moisture.
- A cropping system that includes good management of crop residue during fallow periods conserves soil moisture and reduces the hazard of soil blowing.
- Including close-grown crops, such as alfalfa and grasses, in the cropping sequence helps to control soil blowing.
- Stripcropping, establishing field windbreaks, and returning crop residue to the soil help to control soil blowing and conserve soil moisture.
- Crops grown on these soils respond well to fertilizer if adequate moisture is available.

CAPABILITY UNIT IIIs-2 (DRYLAND)

Suitability:
- The soils in this unit are poorly suited to row crops. They are best suited to close-growing crops, such as alfalfa, grasses, and small grain.

Management concerns:
- The main management concern is insufficient rainfall during the growing season.
- Soil blowing is a hazard where these soils are used for crops.

Management practices:
- Leaving the maximum amount of crop residue on the surface helps to control soil blowing and conserves soil moisture.
- Including close-grown crops, such as alfalfa and grasses, in the cropping sequence helps to control soil blowing.
- Stripcropping, establishing field windbreaks, and returning crop residue to the soil help to control soil blowing and conserve soil moisture.
- Crops grown on these soils respond well to fertilizer if adequate moisture is available.

CAPABILITY UNIT IIIw-2 (DRYLAND)

Suitability:
- The soils in this unit are best suited to alfalfa and grasses.

Management concerns:
- The main management concern is insufficient rainfall during the growing season.
- Soil blowing is a hazard where these soils are used for crops.
- Because these soils are occasionally flooded for brief periods, crops can be damaged by scouring, standing water, or sedimentation.

Management practices:
- Leaving the maximum amount of crop residue on the surface helps to control soil blowing and conserves soil moisture.

• Terraces and other erosion-control practices on the adjacent uplands reduce the runoff rate and the hazard of flooding.

CAPABILITY UNIT IIIw-6 (DRYLAND)

Suitability:
• The soils in this unit are best suited to alfalfa and grasses.
• Alfalfa production on these soils varies because in some areas the root zone is restricted by the water table and in other areas production is improved by subirrigation.

Management concerns:
• The wetness caused by a seasonal high water table that fluctuates between depths of 1.5 and 3.0 feet is the main limitation.
• Because these soils are occasionally flooded for brief periods, crops can be damaged by scouring, standing water, or sedimentation.
• Soil blowing is a hazard in cultivated areas.

Management practices:
• Spring planting may be delayed because of the high water table.
• Leaving the maximum amount of crop residue on the surface helps to control soil blowing and conserves soil moisture.

CAPABILITY UNIT IVe-1 (DRYLAND)

Suitability:
• The soils in this unit are best suited to alfalfa, grasses, and small grain.

Management concerns:
• The main management concern is insufficient rainfall during the growing season.
• Water erosion and soil blowing are the main hazards.

Management practices:
• Water erosion can be controlled by terraces, contour farming, grassed waterways, and a system of residue management that leaves most of the crop residue on the surface.
• Leaving the maximum amount of crop residue on the surface helps to control soil blowing and conserves soil moisture.
• A cropping system that includes good management of crop residue during fallow periods conserves soil moisture and reduces the hazard of soil blowing.
• A cropping system that includes grasses and legumes helps to control erosion, increases the content of organic matter, and improves tilth.

CAPABILITY UNIT IVe-3 (DRYLAND)

Suitability:
• The soils in this unit are best suited to alfalfa, grasses, and small grain.

Management concerns:
• The main management concern is insufficient rainfall during the growing season.
• Soil blowing and water erosion are the main hazards.

Management practices:
• A system of conservation tillage, such as disking and chiseling, keeps crop residue on the surface and thus helps to control soil blowing and conserves soil moisture.
• The hazard of soil blowing can be reduced by stripcropping and a cropping system that keeps crop residue on the surface.
• A cropping system that includes grasses and legumes helps to control erosion, increases the content of organic matter, and improves tilth.
• Terraces, contour farming, stripcropping, and grassed waterways help to control water erosion.

CAPABILITY UNIT IVe-4 (DRYLAND)

Suitability:
• The soils in this unit are best suited to alfalfa, grasses, and small grain.

Management concerns:
• The main management concern is insufficient rainfall during the growing season.
• Water erosion is the main hazard.
• These soils are difficult to till. They are high in content of clay and are firm when moist and very hard and cloddy when dry.
• These soils are droughty because of a low available water capacity.

Management practices:
• Water erosion can be controlled by terraces, contour farming, grassed waterways, and a system of residue management that leaves most of the crop residue on the surface.
• A cropping system that includes grasses and legumes helps to control erosion, increases the content of organic matter, helps to maintain fertility, and improves tilth.
• Delaying tillage when these soils are wet helps to prevent the formation of extremely hard clods.

CAPABILITY UNIT IVe-5 (DRYLAND)

Suitability:
• The soils in this unit are best suited to alfalfa, grasses, and small grain.

Management concerns:
- The main management concern is insufficient rainfall during the growing season.
- Soil blowing is the main hazard where the surface is not adequately protected by a cover of crops or crop residue.
- Water erosion is a hazard in cultivated areas.

Management practices:
- A system of conservation tillage, such as disking and chiseling, keeps crop residue on the surface and thus helps to control soil blowing and conserves soil moisture.
- A cropping system that includes grasses and legumes helps to control erosion, increases the content of organic matter, and improves tilth.

CAPABILITY UNIT IVe-9 (DRYLAND)

Suitability:
- The soils in this unit are best suited to alfalfa, grasses, and small grain.

Management concerns:
- The main management concern is insufficient rainfall during the growing season.
- Water erosion is the main hazard in cultivated areas.

Management practices:
- Water erosion can be controlled by terraces, contour farming, grassed waterways, and a system of residue management that leaves most of the crop residue on the surface.
- Leaving the maximum amount of crop residue on the surface helps to control soil blowing and conserves soil moisture.
- Including close-grown crops, such as alfalfa and grasses, in the cropping sequence helps to control soil blowing.

CAPABILITY UNIT IVs-2 (DRYLAND)

Suitability:
- The soils in this unit are best suited to alfalfa, grasses, and small grain.

Management concerns:
- The main management concern is insufficient rainfall during the growing season.
- These soils are difficult to till. They are high in content of clay and are firm when moist and very hard and cloddy when dry.

Management practices:
- Leaving the maximum amount of crop residue on the surface helps to control water erosion and conserves soil moisture.
- Including close-grown crops, such as alfalfa and grasses, in the cropping sequence helps to control water erosion and soil blowing.
- Delaying tillage when these soils are wet helps to prevent the formation of extremely hard clods.

CAPABILITY UNIT IVw-5 (DRYLAND)

Suitability:
- The soils in this unit are better suited to grasses and legumes than to row crops.

Management concerns:
- The main management concern is insufficient rainfall during the growing season.
- Soil blowing is the main hazard where these soils are used for crops.
- Because these soils are occasionally flooded for brief periods, crops can be damaged by scouring, standing water, or sedimentation.

Management practices:
- Leaving the maximum amount of crop residue on the surface helps to control soil blowing and conserves soil moisture.
- Including close-grown crops, such as alfalfa and grasses, in the cropping sequence helps to control soil blowing.

CAPABILITY UNIT VIe-1 (DRYLAND)

Suitability:
- Because of the slope and the hazard of water erosion, these soils are unsuitable for cultivation. They are used mainly for range.

Management concerns:
- These soils are subject to severe water erosion if the grass cover is destroyed.

Management practices:
- Areas previously used as cropland should be reseeded to a suitable grass mixture if they are to be used as range.

CAPABILITY UNIT VIe-3 (DRYLAND)

Suitability:
- Because of the slope and the hazards of soil blowing and water erosion, these soils are unsuitable for cultivation. They are used mainly for range.

Management concerns:
- These soils are subject to severe water erosion if the vegetation is removed.

Management practices:
- Areas previously used as cropland should be reseeded to a suitable grass mixture if they are to be used as range.

CAPABILITY UNIT VIe-4 (DRYLAND)

Suitability:
- Because of the slope and the hazard of water erosion,

these soils are unsuitable for cultivation. They are used mainly for range.

Management concerns:
• These soils are subject to severe water erosion if the vegetation is removed.

Management practices:
• Areas previously used as cropland should be reseeded to a suitable grass mixture if they are to be used as range.

CAPABILITY UNIT VIe-5 (DRYLAND)

Suitability:
• Because of the slope, droughtiness, and the hazard of soil blowing, these soils are unsuitable for cultivation. They are used for range or hay.

Management concerns:
• These soils are subject to severe soil blowing if the grass cover is destroyed.

Management practices:
• Areas previously used as cropland should be reseeded to a suitable grass mixture if they are to be used as range.

CAPABILITY UNIT VIe-9 (DRYLAND)

Suitability:
• Because of the slope and the hazard of water erosion, these soils are unsuitable for cultivation. They are used mainly for range.

Management concerns:
• These soils are subject to severe water erosion if the vegetation is removed.

Management practices:
• Areas previously used as cropland should be reseeded to a suitable grass mixture if they are to be used as range.

CAPABILITY UNIT VIs-1 (DRYLAND)

Suitability:
• These soils are generally not suited to cultivated crops. They are used mainly for range or hay.

Management concerns:
• A high content of salts and sodium is the main limitation.

Management practices:
• Careful management is needed in areas where the content of salts and sodium is high because they support little or no vegetation. They are subject to soil blowing during extended dry periods.
• Areas previously used as cropland should be reseeded to a suitable grass mixture if they are to be used as range.

CAPABILITY UNIT VIs-4 (DRYLAND)

Suitability:
• The soils in this unit are too steep and too shallow for cultivated crops. They are used mainly for range.

Management concerns:
• These soils are subject to severe water erosion if the vegetation is removed.
• The soils are droughty because of a low available water capacity.

Management practices:
• Areas previously used as cropland should be reseeded to a suitable grass mixture if they are to be used as range.

CAPABILITY UNIT VIw-7 (DRYLAND)

Suitability:
• The soils in this unit are not suited to cultivated crops because of the hazard of flooding. In most areas they are used for range or hay.

Management concerns:
• Frequent flooding is a hazard.
• Streambank erosion, sedimentation, and the deposition of debris by floodwater are the main limiting factors.

Management practices:
• Flooded areas that lack a ground cover can be reseeded to grass or planted to trees.
• Wooded and brushy areas that are not used for grazing provide excellent wildlife habitat.

CAPABILITY UNIT VIIe-5 (DRYLAND)

Suitability:
• Because of the slope, droughtiness, and the hazard of soil blowing, these soils are unsuitable for cultivation.

Management concerns:
• These soils are subject to severe soil blowing if the grass cover is destroyed.

CAPABILITY UNIT VIIs-4 (DRYLAND)

Suitability:
• The soils in this unit are too steep and too shallow for cultivated crops. They are used mainly for range.

Management concerns:
• These soils are subject to severe water erosion if the vegetation is removed.

CAPABILITY UNIT VIIIw-7 (DRYLAND)

Suitability:
• These soils are too wet for cultivated crops and have limited grazing potential. They are best suited to habitat for wetland wildlife.

Management concerns:
- The wetness caused by a seasonal high water table that is 0.5 foot below to 2.0 feet above the surface is the main limitation.
- During most of the year, these soils are covered with water. They are frequently flooded.

CAPABILITY UNIT VIIIs-8 (DRYLAND)

Suitability:
- This unit consists of steep or very steep, eroded, barren exposures of siltstone and shale. Except for some areas on the lowest part of the landscape, it supports little or no vegetation. It is suitable for recreation and provides limited cover for wildlife.

Management for Irrigated Crops

About 35 percent of the cropland in Sioux County is irrigated. Corn and dry, edible beans are the principal irrigated crops. A smaller acreage is used for alfalfa hay, wheat, or sugar beets. Corn, beans, and sugar beets can be irrigated by the furrow or sprinkler method. Alfalfa can be irrigated by the border, contour ditch, corrugation, or sprinkler method. Wheat, which generally is grown in rotation with beans or corn, is irrigated by sprinkler systems. The irrigation water is drawn from wells or canals (fig. 19).

The management needed in irrigated areas includes selecting a proper cropping sequence; land leveling, which provides a proper grade for the even distribution of irrigation water; applying measures that conserve soil moisture and control water erosion; and ensuring that the rate at which water is applied does not exceed the intake rate of the soil.

The cropping sequence on soils that are well suited to irrigation is dominated by row crops. One that includes different row crops, small grain, and alfalfa or grass helps to control the diseases and insects that are common if the same crop is grown year after year.

A gently sloping soil, such Keith loam, 3 to 6 percent slopes, is subject to water erosion in areas where it is irrigated by furrows that run down the slope. Contour bench leveling or a combination of contour furrows and parallel terraces helps to control water erosion in these areas. In areas where a sprinkler system is used, terraces, contour farming, grassed waterways, and a conservation tillage system, which keeps crop residue on the surface, help to control water erosion and conserve water.

If an adequate amount of water is available, sprinklers are most effective on moderately coarse textured and coarse textured soils and can be used on the more sloping and nearly level soils. The sprinklers either are the center-pivot type, which revolves around a central point, or are sets of sprinklers installed at various locations in the field. The water can be applied at a rate that does not exceed the intake rate of the soil and thus result in excessive runoff. Because the water can be carefully controlled, sprinklers are effective in helping to establish new pastures on moderately steep soils. In summer, however, much of the water is lost through evaporation. Keeping crop residue on the surface increases the intake rate and decreases the evaporation rate. Wind drift can result in an uneven distribution of water in some areas.

Soil holds only a limited amount of water. The loams in Sioux County, for example, hold about 2 inches of available water per foot of soil depth. Thus, a soil that is 4 feet deep and is planted to a crop that has roots extending to that depth can hold about 8 inches of water available for that crop. Irrigation should begin when about half of the available water has been used by the crop. Applying the water at regular intervals helps to keep the soil moist throughout at all times. The interval varies according to the crop and the time of year.

A tailwater recovery pit at the end of a field that is furrow irrigated helps to trap runoff of excess irrigation tailwater. This water can then be pumped to the upper end of the field and used again. These pits increase the efficiency of the irrigation system and conserve the supply of underground water.

All of the soils in Nebraska are assigned to irrigation design groups, which are described in the "Irrigation Guide for Nebraska" *(7)*. Arabic numerals indicate the irrigation design groups to which the soils are assigned.

Assistance in planning and designing an irrigation system is available through the local office of the Natural Resources Conservation Service or the county agricultural agent. Estimates concerning the cost of equipment can be obtained from dealers and manufacturers of irrigation equipment.

Following is a description of the irrigated capability units in Sioux County.

CAPABILITY UNIT I-3 (IRRIGATED)

Suitability:
- The soils in this unit are suited to the crops commonly grown in the county.

Management concerns:
- Soil blowing is a slight hazard in cultivated areas.
- These soils are difficult to till. They are firm when moist and very hard and cloddy when dry.
- The water intake rate for irrigation is low.

Management practices:
- Close-growing crops and crop residue help to protect the soil from soil blowing.
- Furrow and border surface irrigation systems can be used on these soils.
- Where a gravity system is used, leveling slight

Figure 19.—An area of the Interstate Canal, which supplies irrigation water for more than 50,000 acres of cropland in the southwestern part of Sioux County.

irregularities on the surface helps to ensure a uniform distribution of irrigation water.
- Adjusting the water application rate to the intake rate of the soil allows most of the water to be absorbed and helps to control runoff.
- Crops grown on these soils respond well to fertilizer.

CAPABILITY UNIT I-6 (IRRIGATED)

Suitability:
- The soils in this unit are suited to the crops commonly grown in the county.

Management concerns:
- Soil blowing is a hazard where these soils are used for crops.

Management practices:
- Where a gravity system is used, leveling slight irregularities on the surface helps to ensure a uniform distribution of irrigation water.
- Furrow, border, and sprinkler irrigation systems can be used on these soils.
- The hazard of soil blowing can be reduced by stripcropping and a cropping system that keeps crop residue on the surface.
- Crops grown on these soils respond well to fertilizer.

CAPABILITY UNIT IIe-3 (IRRIGATED)

Suitability:
- The soils in this unit are suited to the crops commonly grown in the county.

Management concerns:
- Water erosion is a slight hazard where these soils are used for crops.
- The water intake rate for irrigation is low.

Management practices:
• Sprinkler systems are the best irrigation methods on these soils. Extensive land grading is needed for gravity irrigation.
• Adjusting the water application rate to the intake rate of the soil allows most of the water to be absorbed and helps to control runoff.
• Terraces and contour farming help to control water erosion.
• Crops grown on these soils respond well to fertilizer.

CAPABILITY UNIT IIe-4 (IRRIGATED)

Suitability:
• The soils in this unit are suited to the crops commonly grown in the county.

Management concerns:
• Soil blowing and water erosion are hazards where these soils are used as cropland.
• The water intake rate for irrigation is moderately low.

Management practices:
• A sprinkler system is the best method of irrigation on these soils because land leveling would be required if surface irrigation methods were used.
• Adjusting the water application rate to the intake rate of the soil helps to control runoff and erosion.
• The hazards of soil blowing and water erosion can be reduced by stripcropping and a cropping system that keeps crop residue on the surface.
• Crops grown on these soils respond well to fertilizer.

CAPABILITY UNIT IIe-5 (IRRIGATED)

Suitability:
• The soils in this unit are suited to the crops commonly grown in the county.

Management concerns:
• Soil blowing is the main hazard where these soils are used as cropland.

Management practices:
• Where a gravity system is used, leveling slight irregularities on the surface helps to ensure a uniform distribution of irrigation water.
• Close-growing crops and crop residue help to protect the soil from soil blowing.
• A cropping system in which close-growing crops are grown after row crops and methods of tillage that leave most of the crop residue on the surface increase the organic matter content and help to control soil blowing.
• Gravity and sprinkler irrigation systems can be used on these soils.
• Crops grown on these soils respond well to fertilizer.

CAPABILITY UNIT IIe-6 (IRRIGATED)

Suitability:
• The soils in this unit are suited to the crops commonly grown in the county.

Management concerns:
• Soil blowing is the main hazard where these soils are used for crops.
• The hazard of water erosion is slight.

Management practices:
• Gravity and sprinkler irrigation systems can be used on these soils.
• Where a gravity system is used, leveling slight irregularities on the surface helps to ensure a uniform distribution of irrigation water.
• Crops grown on these soils respond well to fertilizer.

CAPABILITY UNIT IIe-8 (IRRIGATED)

Suitability:
• The soils in this unit are suited to the crops commonly grown in the county.

Management concerns:
• Soil blowing is the main hazard where these soils are used for crops.
• Water erosion is slight hazard.
• The water intake rate for irrigation is moderately high.

Management practices:
• Gravity and sprinkler irrigation systems can be used on these soils.
• Where a gravity system is used, leveling slight irregularities on the surface helps to ensure a uniform distribution of irrigation water.
• Adjusting the water application rate to the intake rate of the soil helps to control runoff and erosion.
• Irrigation runs should be relatively short for furrow and border gravity systems.
• Leaving the maximum amount of crop residue on the surface helps to control soil blowing and conserves soil moisture.
• Where land leveling is needed, deep cuts that expose coarse textured or other undesirable underlying material should be avoided.
• Crops grown on these soils respond well to fertilizer.

CAPABILITY UNIT IIw-6 (IRRIGATED)

Suitability:
• The soils in this unit are suited to the crops commonly grown in the county.

Management concerns:
• Because these soils are occasionally flooded for brief

periods, crops can be damaged by scouring, standing water, or sedimentation.

Management practices:
- Furrow, border, and sprinkler irrigation systems can be used on these soils.
- Soil blowing can be controlled by a cropping system that keeps crop residue on the surface.
- Where a gravity system is used, leveling slight irregularities on the surface helps to ensure a uniform distribution of irrigation water.
- Crops grown on these soils respond well to fertilizer.

CAPABILITY UNIT IIIe-3 (IRRIGATED)

Suitability:
- The soils in this unit are best suited to alfalfa and grasses.

Management concerns:
- Soil blowing and water erosion are hazards where these soils are used for crops.

Management practices:
- The hazards of soil blowing and water erosion can be reduced by stripcropping and a cropping system that keeps crop residue on the surface.
- Terraces, contour farming, and grassed waterways help to keep water from concentrating on long slopes. In some areas deep terrace cuts can expose the clayey subsoil.
- Where a gravity system is used, leveling slight irregularities on the surface helps to ensure a uniform distribution of irrigation water.
- Adjusting the water application rate to the intake rate of the soil allows most of the water to be absorbed and helps to control runoff.
- Crops grown on these soils respond well to fertilizer.

CAPABILITY UNIT IIIe-4 (IRRIGATED)

Suitability:
- The soils in this unit are suited to the crops commonly grown in the county.

Management concerns:
- Soil blowing and water erosion are hazards where these soils are used for crops.

Management practices:
- A cropping system in which close-growing crops are grown after row crops and methods of tillage that leave most of the crop residue on the surface help to control soil blowing and increase the water intake rate.
- Water erosion can be controlled by terraces, contour farming, grassed waterways, and a system of residue management that leaves most of the crop residue on the surface.
- A sprinkler system is the best method of irrigation on these soils because extensive land leveling would be required if surface irrigation methods were used.
- Adjusting the water application rate to the moderate intake rate of these soils allows most of the water to be absorbed and helps to control runoff.
- Wheel-track erosion can be controlled by applying irrigation water at a rate that results in maximum water absorption and minimum runoff.
- Crops grown on these soils respond well to fertilizer.

CAPABILITY UNIT IIIe-5 (IRRIGATED)

Suitability:
- The soils in this unit are suited to the crops commonly grown in the county.

Management concerns:
- Soil blowing and water erosion are hazards where these soils are used for crops.

Management practices:
- Leaving the maximum amount of crop residue on the surface helps to control soil blowing and water erosion.
- Terraces, contour farming, stripcropping, and grassed waterways help to control water erosion.
- A sprinkler system is the best method of irrigation on these soils because extensive land leveling would be required if surface irrigation methods were used.
- Adjusting the water application rate to the intake rate of these soils allows most of the water to be absorbed and helps to control runoff.
- Wheel-track erosion can be controlled by applying irrigation water at a rate that results in maximum water absorption and minimum runoff.
- Crops grown on these soils respond well to fertilizer.

CAPABILITY UNIT IIIe-6 (IRRIGATED)

Suitability:
- The soils in this unit are suited to the crops commonly grown in the county.

Management concerns:
- Soil blowing and water erosion are hazards where these soils are used for crops.

Management practices:
- Leaving the maximum amount of crop residue on the surface helps to control soil blowing and water erosion.
- The hazard of soil blowing can be reduced by stripcropping and a conservation cropping system that keeps crop residue on the surface.
- Terraces, contour farming, and grassed waterways help to control water erosion.
- A sprinkler system is the best method of irrigation on these soils because extensive land leveling would be required if surface irrigation methods were used.
- Wheel-track erosion can be controlled by applying

irrigation water at a rate that results in maximum water absorption and minimum runoff.
• Crops grown on these soils respond well to fertilizer.

CAPABILITY UNIT IIIe-8 (IRRIGATED)

Suitability:
• The soils in this unit are suited to the crops commonly grown in the county.

Management concerns:
• Soil blowing and water erosion are hazards where these soils are used for crops.

Management practices:
• Leaving the maximum amount of crop residue on the surface helps to control soil blowing and water erosion.
• Water erosion can be controlled by terraces, contour farming, grassed waterways, and a system of residue management that leaves most of the crop residue on the surface.
• Adjusting the water application rate to the intake rate of the soil allows most of the water to be absorbed and helps to control runoff.
• A sprinkler system is the best method of irrigation on these soils because land leveling would be required if surface irrigation methods were used.
• Crops grown on these soils respond well to fertilizer.

CAPABILITY UNIT IIIe-10 (IRRIGATED)

Suitability:
• The soils in this unit are suited to the crops commonly grown in the county.

Management concerns:
• Soil blowing and water erosion are hazards where these soils are used for cultivated crops.

Management practices:
• Leaving the maximum amount of crop residue on the surface helps to control soil blowing and water erosion.
• Water erosion can be controlled by terraces, contour farming, grassed waterways, and a system of residue management that leaves most of the crop residue on the surface.
• A sprinkler system is the best method of irrigation on these soils because extensive land leveling would be required if surface irrigation methods were used and because frequent, light applications of irrigation water are needed. Excess water leaches plant nutrients and pesticides below the plant roots.
• Crops grown on these soils respond well to fertilizer.

CAPABILITY UNIT IIIs-3 (IRRIGATED)

Suitability:
• The soils in this unit are suited to the crops commonly grown in the county.

Management concerns:
• Soil blowing is a hazard where these soils are used for crops.
• These soils are difficult to till because they are firm when moist and very hard and cloddy when dry.

Management practices:
• The hazard of soil blowing can be reduced by stripcropping and a conservation cropping system that keeps crop residue on the surface.
• Gravity and sprinkler irrigation systems can be used on these soils.
• Where a gravity system is used, leveling slight irregularities on the surface helps to ensure a uniform distribution of irrigation water.
• Crops grown on these soils respond well to fertilizer.

CAPABILITY UNIT IIIw-1 (IRRIGATED)

Suitability:
• The soils in this unit are best suited to close-growing crops, such as alfalfa, grasses, and small grain.

Management concerns:
• Because these soils are occasionally flooded for brief periods, crops can be damaged by scouring, standing water, or sedimentation.
• Occasional flooding in the spring can limit the production of small grain and alfalfa.
• Soil blowing is a hazard where these soils are used for crops.

Management practices:
• Furrow, border, and sprinkler irrigation systems can be used on these soils.
• Close-growing crops and crop residue help to protect these soils from soil blowing.
• Crops grown on these soils respond well to fertilizer.

CAPABILITY UNIT IIIw-8 (IRRIGATED)

Suitability:
• The soils in this unit are best suited to the grasses or crops that can be planted late in the spring, after the water table has dropped somewhat, and that can later benefit from subirrigation. The soils are poorly suited to alfalfa and small grain.
• Alfalfa production varies on these soils because in some years the root zone is restricted by the high water table and in other years the alfalfa benefits from subirrigation.

Management concerns:
• Because these soils are occasionally flooded for brief periods, crops can be damaged by scouring, standing water, or sedimentation.
• Occasional flooding in the spring can limit the production of small grain and alfalfa.

• Soil blowing is a hazard where these soils are used for cultivated crops.

Management practices:
• Leaving the maximum amount of crop residue on the surface helps to control soil blowing and water erosion.
• Spring planting may be delayed because of the wetness caused by the seasonal high water table.
• Gravity and sprinkler irrigation systems can be used on these soils.
• Adjusting the water application rate to the intake rate of the soil allows most of the water to be absorbed and helps to control runoff.
• Crops grown on these soils respond well to fertilizer.

CAPABILITY UNIT IVe-3 (IRRIGATED)

Suitability:
• The soils in this unit are best suited to alfalfa, grasses, and small grain.

Management concerns:
• Water erosion and soil blowing are hazards in cultivated areas.
• These soils are difficult to till because they are firm when moist and very hard and cloddy when dry.

Management practices:
• These soils are not suited to gravity methods of irrigation but can be irrigated by sprinkler systems.
• Adjusting the water application rate to the intake rate of the soil helps to control runoff and erosion.
• Wheel-track erosion can be controlled by applying irrigation water at a rate that results in maximum water absorption and minimum runoff.
• Water erosion can be controlled by terraces, contour farming, grassed waterways, and a system of residue management that leaves most of the crop residue on the surface.
• The hazard of soil blowing can be reduced by stripcropping and a cropping system that keeps crop residue on the surface.
• Crops grown on these soils respond well to fertilizer.

CAPABILITY UNIT IVe-4 (IRRIGATED)

Suitability:
• The soils in this unit are best suited to alfalfa, grasses, and small grain.

Management concerns:
• Water erosion and soil blowing are hazards where these soils are used for crops.

Management practices:
• These soils are not suited to gravity methods of irrigation but can be irrigated by sprinkler systems.
• The hazard of soil blowing can be reduced by stripcropping and a conservation cropping system that keeps crop residue on the surface.
• Water erosion can be controlled by terraces, contour farming, grassed waterways, and a system of residue management that leaves most of the crop residue on the surface.
• Wheel-track erosion can be controlled by applying irrigation water at a rate that results in maximum water absorption and minimum runoff.
• Adjusting the water application rate to the intake rate of the soil helps to control runoff and erosion.
• Crops grown on these soils respond well to fertilizer.

CAPABILITY UNIT IVe-6 (IRRIGATED)

Suitability:
• The soils in this unit are best suited to alfalfa, grasses, and small grain.

Management concerns:
• Water erosion and soil blowing are hazards where these soils are used for cultivated crops.

Management practices:
• These soils are not suited to gravity methods of irrigation but can be irrigated by sprinkler systems.
• Wheel-track erosion can be controlled by applying irrigation water at a rate that results in maximum water absorption and minimum runoff.
• Water erosion can be controlled by terraces, contour farming, grassed waterways, and a system of residue management that leaves most of the crop residue on the surface.
• The hazard of soil blowing can be reduced by stripcropping and a conservation cropping system that keeps crop residue on the surface.
• Crops grown on these soils respond well to fertilizer.

CAPABILITY UNIT IVe-10 (IRRIGATED)

Suitability:
• The soils in this unit are best suited to alfalfa, grasses, and small grain.

Management concerns:
• Soil blowing is the main hazard where these soils are used for cultivated crops.

Management practices:
• The hazard of soil blowing can be reduced by stripcropping and a conservation cropping system that keeps crop residue on the surface.
• These soils are too sandy for gravity irrigation systems.
• A sprinkler system is the best method of irrigation because frequent, light applications of water are needed. Excess water leaches plant nutrients and pesticides below the plant roots.
• Crops grown on these soils respond well to fertilizer.

CAPABILITY UNIT IVe-11 (IRRIGATED)

Suitability:
• The soils in this unit are best suited to alfalfa, grasses, and small grain.

Management concerns:
• Soil blowing is the main hazard where these soils are used for crops.
• The available water capacity is low.

Management practices:
• These soils are too sandy for gravity methods of irrigation.
• A sprinkler system is the best method of irrigation because frequent, light applications of water are needed. Excess water leaches plant nutrients and pesticides below the plant roots.
• Planting close-growing crops, leaving crop residue on the surface, and growing winter cover crops help to control soil blowing.
• Crops grown on these soils respond well to fertilizer.

CAPABILITY UNIT IVe-12 (IRRIGATED)

Suitability:
• The soils in this unit are best suited to alfalfa, grasses, and small grain.

Management concerns:
• Soil blowing is the main hazard where these soils are used for cultivated crops.
• The available water capacity is low.

Management practices:
• These soils are too sandy for gravity methods of irrigation.
• A sprinkler system is the best method of irrigation because frequent, light applications of water are needed. Excess water leaches plant nutrients and pesticides below the plant roots.
• Planting close-growing crops, leaving crop residue on the surface, and growing winter cover crops help to control soil blowing.
• Crops grown on these soils respond well to fertilizer.

CAPABILITY UNIT IVs-1 (IRRIGATED)

Suitability:
• The soils in this unit are best suited to alfalfa, grasses, and small grain.

Management concerns:
• Soil blowing is a hazard where these soils are used for cultivated crops.
• These soils are difficult to till because they are firm when moist and very hard and cloddy when dry.
• The water intake rate for irrigation is very low.

Management practices:
• Adjusting the water application rate to the intake rate of the soil allows most of the water to be absorbed and helps to control runoff.
• Delaying tillage when these soils are wet helps to prevent the formation of extremely hard clods.
• Furrow and border surface irrigation systems can be used on these soils.
• Where a gravity system is used, leveling slight irregularities on the surface helps to ensure a uniform distribution of irrigation water.
• Leaving the maximum amount of crop residue on the surface helps to control soil blowing and conserves soil moisture.
• Crops grown on these soils respond well to fertilizer.

CAPABILITY UNIT IVs-11 (IRRIGATED)

Suitability:
• The soils in this unit are best suited to the crops that can tolerate alkalinity, such as corn, alfalfa, small grain, and wheatgrass.

Management concerns:
• Strong alkalinity is the main limitation.
• Soil blowing is a hazard where these soils are used for cultivated crops.

Management practices:
• Leaving the maximum amount of crop residue on the surface helps to control soil blowing and water erosion.
• Gravity and sprinkler irrigation systems can be used on these soils.
• A sprinkler system is the best method of irrigation because frequent, light applications of water are needed. Excess water leaches plant nutrients and pesticides below the plant roots.
• Where a gravity system is used, leveling slight irregularities on the surface helps to ensure a uniform distribution of irrigation water. During leveling, the very strongly alkali areas can be exposed.
• Short irrigation runs and frequent applications of irrigation water are needed on these soils because permeability is rapid.
• Crops grown on these soils respond well to fertilizer.

CAPABILITY UNIT IVw-11 (IRRIGATED)

Suitability:
• These soils are suited to the crops commonly grown in the county.

Management concerns:
• Because these soils are occasionally flooded for brief periods, crops can be damaged by scouring, standing water, or sedimentation.

• Soil blowing is a hazard where these soils are used as cropland.
• These soils are droughty because of a low available water capacity.

Management practices:
• Leaving the maximum amount of crop residue on the surface helps to control soil blowing and conserves soil moisture.
• These soils are too sandy for gravity methods of irrigation.
• A sprinkler system is the best method of irrigation because frequent, light applications of water are needed. Excess water leaches plant nutrients and pesticides below the plant roots.
• Crops grown on these soils respond well to fertilizer.

Managing Pasture and Hayland

Areas that are used for hay or pasture should be managed for maximum forage production. A rotation system that results in a uniform distribution of grazing is needed. Many forage plants are a good source of minerals, vitamins, protein, and other nutrients. A well managed pasture can provide a balanced ration throughout the growing season. Adding plant nutrients to the soil helps to obtain maximum production. If pastures are irrigated, a high level of management is needed.

A mixture of grasses and legumes can be grown in rotation with grain crops on many soils. The grasses and legumes improve tilth, increase the organic matter content, and help to control erosion. They are ideal as part of a conservation cropping system.

The most commonly grown grasses in areas of irrigated pasture in the county are smooth brome and orchardgrass. Other grasses and legumes that can be grown in these areas are intermediate wheatgrass, meadow brome, and creeping foxtail. Legumes that may have potential for forage production in areas of pasture are birdsfoot trefoil and cicer milkvetch. Under a high level of management, irrigated pastures in the county can produce 750 to 900 pounds of forage per acre per year.

Grasses that have potential for forage production in areas of dryland pasture are intermediate wheatgrass, pubescent wheatgrass, and western wheatgrass. Smooth brome grows well on the lower, wetter soils.

Grasses and legumes grown on pasture or hayland, both irrigated and dryland, require additional plant nutrients for maximum production. The kinds and amounts of fertilizer should be determined by soil tests.

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 7. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors. The land capability classification of each map unit also is shown in the table.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations are also considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green manure crops; and harvesting that ensures the smallest possible loss.

For yields of irrigated crops, it is assumed that the irrigation system is adapted to the soils and to the crops grown, that good-quality irrigation water is uniformly applied as needed, and that tillage is kept to a minimum.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 7 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Natural Resources Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils for those crops.

Rangeland

Prepared by Kenneth L. Hladek, range conservationist, Natural Resources Conservation Service.

Rangeland makes up approximately 85 percent of the agricultural land in Sioux County. It is in all parts of the county, except for the irrigated cropland in the extreme southwest corner. The largest acreage of rangeland is in the southern two-thirds of the county, on loamy soils in the Busher-Tassel-Jayem association, which is described under the heading "General Soil Map Units." A sizable area of rangeland is on the rolling and hilly sandhills in the Valent association. Soils affected by salts and alkali are in the Pierre-Samsil and Bufton-Orella-Badland associations, in the northern part of the county (the

Oglala National Grassland). The rangeland in the county is used primarily for grazing by livestock and supports a limited acreage of native hay.

The raising of livestock, mainly cow and calf herds, is the largest agricultural industry in the county. The calves are sold in the fall as feeders. The ranches or livestock farms in the county average about 3,800 acres in size. Some are as large as 45,000 acres.

The rangeland in the large ranching areas is generally grazed from late spring to early fall. The livestock spend the remainder of the year grazing native meadow regrowth or in winter pastures near the ranch headquarters. They are fed hay (native or alfalfa) during the winter and during emergency periods caused by snow cover. The livestock in the area of cropland in the southwest corner of the county graze rangeland from late spring to early fall. They then graze crop residue until winter, when they are fed hay (native or alfalfa), silage, or both for the remainder of the winter. The native forage is commonly supplemented with protein for both types of operations.

A substantial acreage of the rangeland is producing well below its potential for the kinds and amounts of native plants, mainly because of past continuous grazing during the summer months and poor livestock grazing distribution.

This section can aid ranchers and conservationists in planning the management of the rangeland in the county. It defines range sites, shows how range condition is evaluated, and describes planned grazing systems and other measures used in managing range and hayland for sustained forage production.

In areas that have similar climate and topography, differences in the kind and amount of vegetation produced on rangeland are closely related to the kind of soil. Effective management is based on the relationship between the soils and vegetation and water.

Table 8 shows, for each soil that supports rangeland vegetation suitable for grazing, the range site; the total annual production of vegetation in favorable, normal, and unfavorable years; the characteristic vegetation; and the average percentage of each species. An explanation of the column headings in table 8 follows.

A *range site* is a distinctive kind of rangeland that produces a characteristic natural plant community that differs from natural plant communities on other range sites in kind, amount, and proportion of range plants. The relationship between soils and vegetation was ascertained during this survey; thus, range sites generally can be determined directly from the soil map. Soil properties that affect moisture supply and plant nutrients have the greatest influence on the productivity of range plants. Soil reaction, salt content, and a seasonal high water table are also important.

Total production is the amount of vegetation that can be expected to grow annually on well managed rangeland that is supporting the potential natural plant community. It includes all vegetation, whether or not it is palatable to grazing animals. It includes the current year's growth of leaves, twigs, and fruits of woody plants. It does not include the increase in stem diameter of trees and shrubs. It is expressed in pounds per acre of air-dry vegetation for favorable, normal, and unfavorable years. In a favorable year, the amount and distribution of precipitation and the temperatures make growing conditions substantially better than average. In a normal year, growing conditions are about average. In an unfavorable year, growing conditions are well below average, generally because of low available soil moisture.

Dry weight is the total annual yield per acre of air-dry vegetation. Yields are adjusted to a common percent of air-dry moisture content. The relationship of green weight to air-dry weight varies according to such factors as exposure, amount of shade, recent rains, and unseasonable dry periods.

Characteristic vegetation—the grasses, forbs, and shrubs that make up most of the potential natural plant community on each soil—is listed by common name. Under *composition*, the expected percentage of the total annual production is given for each species making up the characteristic vegetation. The amount that can be used as forage depends on the kinds of grazing animals and on the grazing season.

Range management requires a knowledge of the kinds of soil and of the potential natural plant community. It also requires an evaluation of the present range condition. Range condition is determined by comparing the present plant community with the potential natural plant community on a particular range site. The more closely the existing community resembles the potential community, the better the range condition. Range condition is an ecological rating only.

The main objective of range management is to keep the range in good or excellent condition. Proper management of rangeland and hayland is most important for the conservation of soil, water, and plant resources in the county. Good range practices improve yields of desirable plants for grazing, are economical, and can increase the efficiency of livestock production. They control grazing so that the plants growing on a site are about the same in kind and amount as the potential natural plant community for that site. Such management generally results in the optimum production of vegetation, control of undesirable brush species, conservation of water, and control of erosion. Sometimes, however, a range condition somewhat below the potential meets grazing needs, provides wildlife habitat, and protects soil and water resources.

Range Condition

Range condition for any range site is the present state of the vegetation compared to its potential, or climax, vegetation. Climax vegetation is a stable plant community that represents the highest point of plant succession. It is the most productive combination of forage plants on rangeland and represents the highest potential in kind and amount of vegetation for a given range site. It maintains itself and changes little as long as the climate and soil remain stable.

The purpose of determining range condition is to provide an approximate measure of the overall health of the plant community. More importantly, it provides a basis for predicting the degree of improvement possible under different kinds of management. Four range condition classes express the degree to which the composition of the present plant community has departed from that of the climax vegetation—excellent, good, fair, and poor.

All food that green plants use for maintenance, growth, and reproduction is manufactured in their leaves. Excessive removal of plant leaves during the growing season affects the growth of both roots and shoots. Livestock graze selectively, removing more leaves from some plants than from others. This selective grazing varies according to the season of use and the kind and class of livestock. Various plants respond to continuous heavy grazing in different ways. Some decrease in abundance, some increase, and others not originally present may invade. Plant responses to grazing are used in classifying range condition.

Decreaser species on a range site are those present in the original plant community that decrease in abundance if grazed closely and continuously during the growing season. *Increaser plants* are those in the original plant community that increase, up to a point, in abundance under continuous heavy grazing. They increase as the decreaser plants cover less of the site. *Invader plants* are not part of the original plant community. They begin growing in an area after the decreasers and increasers have been weakened or eliminated.

Once range condition is determined, it is important to know whether it is improving or deteriorating. Ascertaining this change or trend in range condition is helpful in planning adjustments in grazing use and management. Important factors affecting this trend are plant vigor and reproduction of both the desirable and undesirable plant species.

The goal of range management should be good or excellent range condition. The highest forage yields are obtained, on a sustained basis, when the range is in excellent condition and the trend is up. Under these circumstances, soil blowing and water erosion are kept at an acceptable level without artificial aids. Also, plants make optimum use of precipitation on rangeland in this condition. At the end of each map unit description under the heading "Detailed Soil Map Units," the soil or soils in that unit are assigned to appropriate range sites according to the kind and amount of vegetation that can be expected when the site is in excellent condition.

Proper Grazing Use

Proper grazing use is grazing at an intensity that maintains sufficient cover to protect the soil and maintain or improve both the quantity and quality of the desirable vegetation. It is the first and most important step in successful range management. Proper grazing use increases the vigor and reproduction potential of desirable plants. It also permits the accumulation of litter and mulch necessary to control erosion and increases forage production. Proper grazing use on rangeland is the removal of one-half of the current year's growth, by weight, when the site is grazed throughout the growing season.

Proper grazing use is usually determined by the degree to which a key species is grazed in a key grazing area. The factors that influence proper grazing use include the stocking rate, the distribution of livestock, and the kind and class of livestock.

Stocking rates.—The stocking rate is the number of animals grazing in a particular pasture. To attain proper grazing use, stocking rates are calculated on the basis of animal units (AU) and animal unit months (AUM). An animal unit is generally considered to be one mature cow of approximately 1,000 pounds and a calf as old as 4 months, or their equivalent. An animal unit month is the amount of forage or feed necessary to sustain an animal unit for 1 month. Range sites and range condition are used to determine animal unit months for each pasture. Suggested initial stocking rates can then be calculated for individual pastures. The animal unit months for each range site in excellent condition are given for each soil in the section "Detailed Soil Map Units." AUM values are lower for range sites that are in less than excellent condition.

Suggested initial stocking rates for rangeland are relatively easy to calculate for any given soil or range site. For example, Valent fine sand, rolling, which is in the Sands range site, has a suggested initial stocking rate of 0.5 AUM per acre when the site is in excellent condition. A 640-acre pasture in excellent condition can carry 0.5 x 640, or 320 animal units for 1 month. If the pasture is to be grazed for 5 months, the suggested initial stocking rate would be 320 animal unit months divided by 5 months, or 64 animal units. Suggested initial stocking rates are based on the condition of the plant community and the average annual forage production each range site is capable of producing. This production may be high or low in any given year. Because of weather conditions, forage

production may vary greatly from year to year. Stocking rates are intended to be only a starting point and should be adjusted as forage production or management systems change.

Distribution of livestock.—If proper range use is to be uniform throughout a pasture, good grazing distribution is needed. Cattle tend to graze in areas near water, roads, or trails and in areas of gentle relief. Distant corners, steep areas, and areas away from water are often only lightly grazed. Poor grazing distribution may be caused by too few watering places or by having salt, shade, supplemental feed and water in one location or in a poor location. Continued concentration of livestock causes severe use in only parts of a pasture. As a result, some areas are subject to erosion and other areas are underused. Uniform distribution is best achieved by careful placement of fences, salt, and water (fig. 20) and by planned grazing systems.

Fences help to distribute livestock and provide more uniform grazing of forage if placed at correct locations. In addition, they divide pastures for grazing systems and can be used to exclude livestock from blowouts and reseeded areas. Cross fences should be built so that they follow natural land features and range site boundaries where feasible. More importantly, they should be planned so that all pastures have similar potential stocking rates. Efficiency in forage use should be considered along with convenience in operations when pasture size is determined. Generally, the smaller the pasture, the more efficient the use of forage by livestock.

Properly locating salt and minerals is one of the easiest and most economical methods of encouraging uniform use of forage on a pasture. Salt and minerals should be located away from water. Cattle do not need to drink immediately after consuming salt or minerals. They can be easily moved to areas of the pasture that are undergrazed and can be moved periodically during the grazing season so that a uniform distribution of grazing is achieved. On the sandy soils in the Valent association, moving these locations each time the livestock are permitted to graze

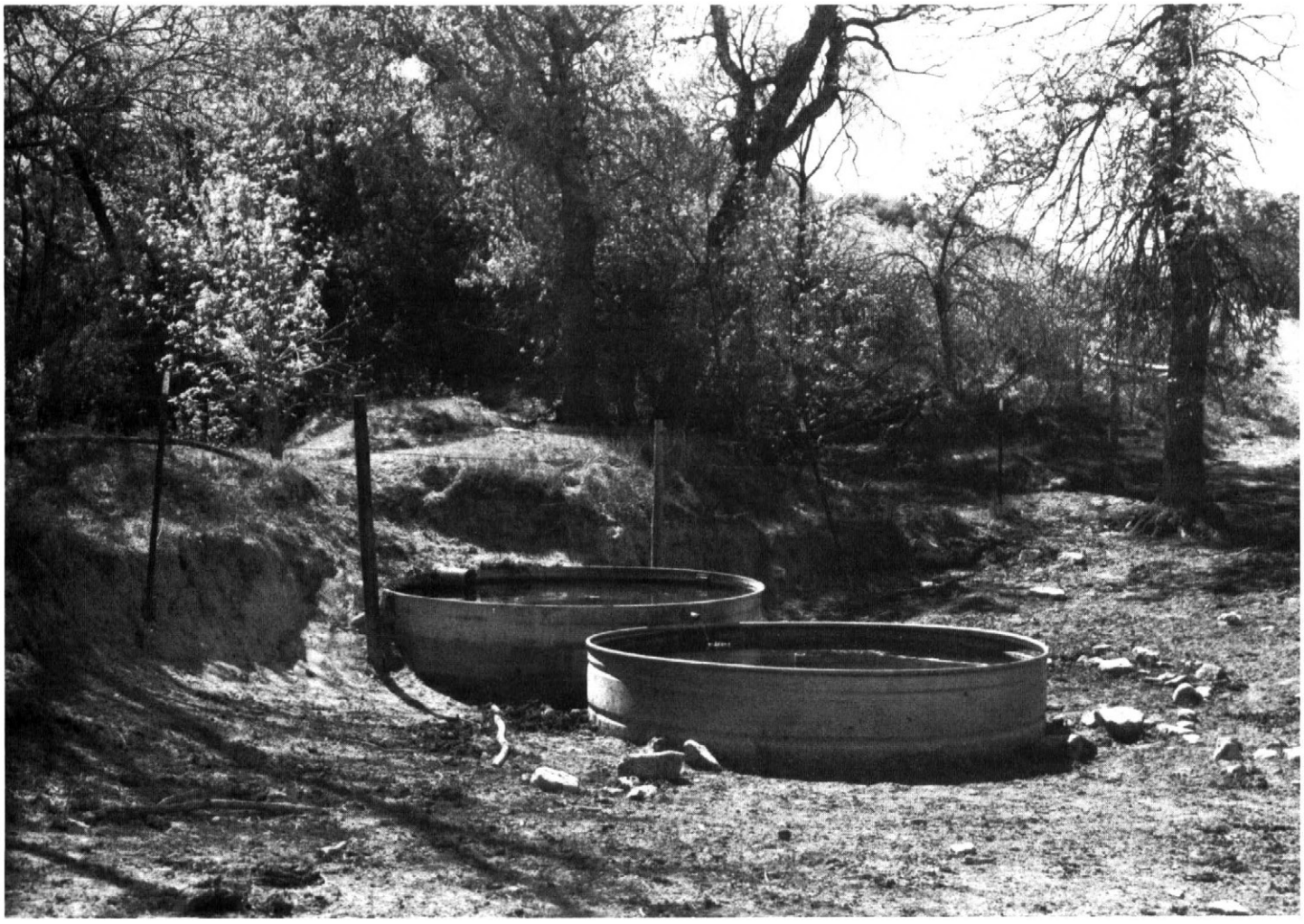

Figure 20.—An area of Mitchell silt loam, 6 to 9 percent slopes, where a spring development helps to achieve a uniform distribution of grazing.

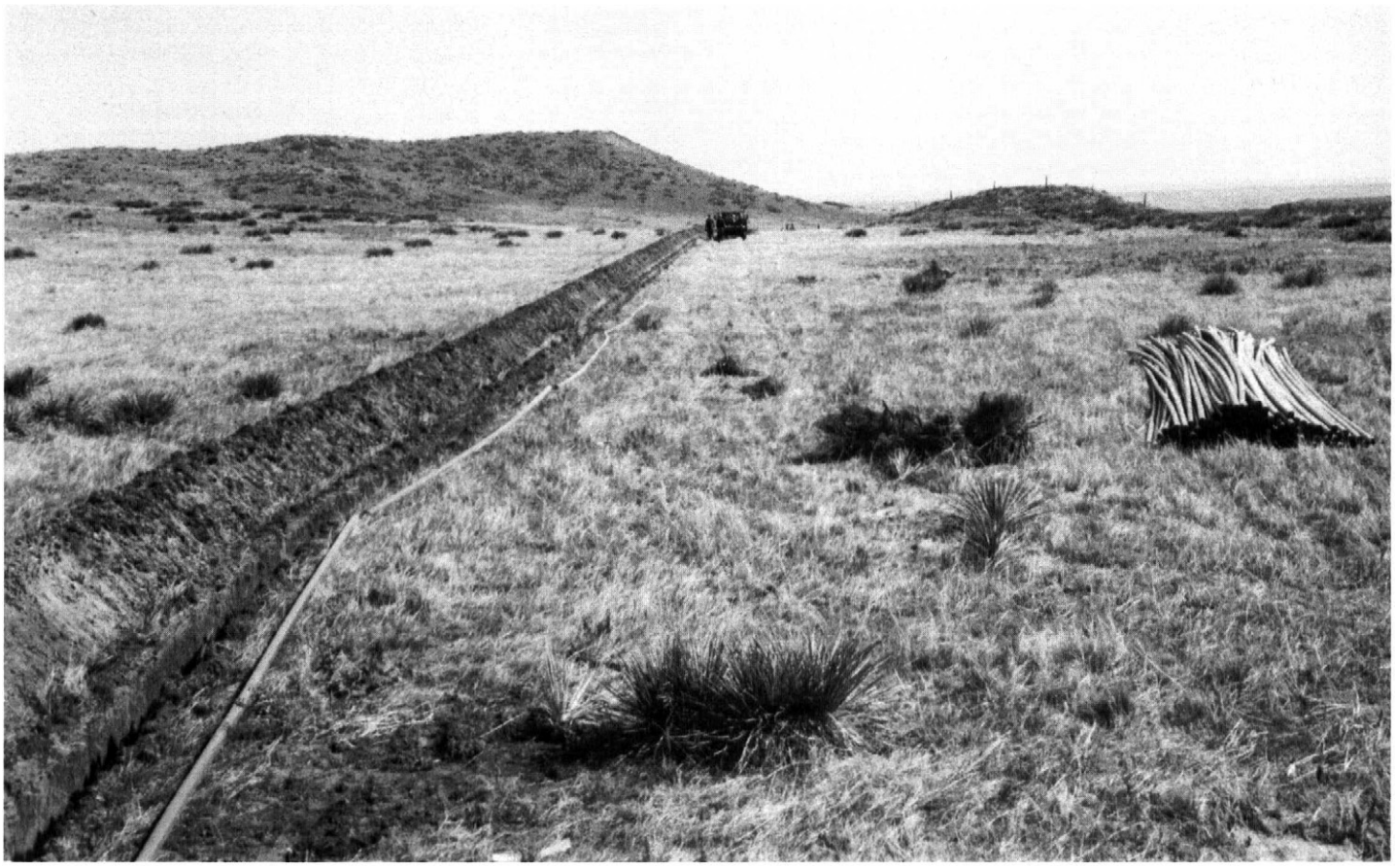

Figure 21.—Construction of pipelines for livestock water in the northern part of Sioux County.

the pasture lessens the hazard of the soil blowing resulting from livestock concentrations.

Properly locating watering facilities can result in a good distribution of grazing. In the sandhills water is often obtained from wells that use windmills for pumping. Dugouts can be used on the wetter range sites. Stock-water dams in the heavier textured soil associations supply livestock water where the drainage provides sufficient runoff. Pipelines are the only source of adequate water in the northern part of the county (fig. 21). Watering facilities require varying degrees of spacing, depending on the type of topography. If distances to water are excessive, cattle tend to graze close to the water sources repeatedly rather than moving out to graze the pasture uniformly. In areas of rough or hilly terrain, cattle should not have to travel more than 1/4 mile to water. In the more nearly level areas, the greatest distance to water should be about 1/2 mile.

Kind and class of livestock.—Management of rangeland is influenced by the kind and class of livestock. Cattle, sheep, and horses have different grazing habits and nutritional needs that affect the way range can best be managed for proper grazing use.

Cattle are the principal livestock raised in Sioux County and are well suited to grazing the dominant range sites. Grazing habits differ among classes of cattle. Yearlings, for example, tend to travel more within a pasture than do cow-calf pairs. Trailing along fence lines, however, sometimes results in erosion. Yearlings also graze the steeper areas and use a pasture more uniformly than cows with calves. Cow-calf pairs tend to graze more on the gentler slopes and stay closer to watering facilities than yearlings. As a result, grazing distribution may be more of a problem on pastures stocked with cow-calf pairs than on pastures stocked with yearlings. Horses and sheep are raised in the county but are relatively few in number.

The general management techniques outlined in this section and in the section "Detailed Soil Map Units" apply principally to cattle production. Where a different kind of livestock grazes the site, adjustments in management may be needed.

Planned Grazing Systems

A planned grazing system is an effective method of achieving higher forage production and livestock

performance and of reducing the hazard of erosion. In a planned grazing system, two or more pastures are alternately rested and grazed in a planned sequence over a period of years. Each pasture is rested sometime during the growing season. All livestock are removed from the pasture being rested. The pastures are grazed in a different sequence each year. Where the same pasture is not grazed at the same time each year, the plants are not close-cropped by livestock at the same stage of development every year, plant vigor and forage production are increased, and the plant community and range condition are improved. Planned grazing systems permit maximum and uniform use of forage and maintain rangeland productivity over a period of years.

Planned grazing systems maintain or speed up improvement in the plant cover and result in the proper use of forage. They increase grazing efficiency by uniformly using all parts of the pasture. The rest periods built into a planned grazing system improve plant vigor, vegetative reproduction, and forage quality, thus increasing forage production. Planned grazing systems also help to buffer the adverse effects of drought and other climatic changes.

To be effective, planned grazing systems should be flexible and tailored to meet the needs of the individual rancher. Fences, watering facilities, range condition, range trend, range sites, kinds or class of grazing animals, and economic factors are all important considerations in determining the best suited system for a particular operation. Grazing systems are dynamic and over a period of time should be modified to reflect improved plant vigor and forage production or changes in management needs.

The use of a planned grazing system, over time, can result in an increase in stocking rates because of improved forage production and quality. Planned grazing systems are also effective in controlling blowouts and may help to control parasites and disease among cattle since the periodically rested pastures are usually cleaner than continuously grazed pastures.

Deferred Grazing

Deferred grazing is the resting of grazing land for a prescribed period of time. The need for deferment is based on the range condition and range trend. To be beneficial, deferment should be for a minimum of 3 consecutive months and coincide with the critical growth periods of the key forage plants. These periods vary with grass species. Maximum benefit from deferment coincides with the food-storage period. For warm-season native grasses, this period occurs from late summer to early fall. In some areas a short deferment of 3 months is all that is needed, while in other areas two complete growing seasons of continuous rest may be required before there is apparent improvement. Generally, however, some grazing during the year is more beneficial than a complete year-long deferment. Deferred pastures may be grazed after heavy frost in fall or early in spring, prior to initiation of growth of the warm-season grasses. During periods of winter grazing, protein supplements should be made available to cattle to meet their nutritional needs.

Deferred grazing allows plants a rest period during critical times in their growth cycle. This period enables grasses to build vigor and to produce a mulch at the surface, thus improving water infiltration. This mulch also reduces the hazard of erosion. Deferred grazing encourages natural grass reseeding by allowing desirable species to set seed and, more importantly, to spread vegetatively.

Where severe overgrazing has eliminated the native grasses, reseeding of adapted native grasses is the best method of native range restoration. Reseeding of native range, excluding old cropland fields, should be done only after careful evaluation.

Range Seeding

In some areas range management practices alone cannot restore a satisfactory cover of native vegetation. Old cultivated fields, "go-back" areas, and abandoned farmsteads generally should be restored by range seeding. Range seeding may also be required in severely overused areas where the native vegetation has deteriorated to the point that it cannot respond to management practices.

Good stands of native grasses can be reestablished if the seedbed is properly prepared, adapted species of native grasses are selected, correct seeding practices are employed, and careful management is used after seeding. Range seeding is most successful when the seedbed is firm and has a mulch cover. A firm seedbed helps to ensure good soil-to-seed contact, which is essential for seedling development. The cover of mulch helps to keep the soil moist, lowers the surface soil temperature, and reduces the hazard of erosion. A mulch cover can be provided by a temporary crop, such as sudangrass or grain sorghum.

Grass seedings should be made directly into the cover crop stubble the following fall, winter, or spring. Avoiding tillage helps to ensure a firm seedbed. On soils having a coarse textured surface layer that is subject to soil blowing, preparing the seedbed and planting the seed in strips over a period of several years or with a range interseeder can minimize the hazard of soil blowing.

Seeding mixtures should be of adapted native grasses that are present when the site is in excellent condition. Consequently, appropriate grass mixtures vary according to soils and range sites. Use of a grass drill with depth bands assures proper placement of seeds at a uniform

depth in the soil. On soils where tillage for seedbed preparation would result in a severe hazard of soil blowing, a range interseeder should be used. Interseeders place the seed in the center of a shallow furrow without disturbing the vegetation between the furrows and thus without increasing the hazard of erosion.

Generally, newly seeded areas should not be fully grazed until after the grass is established. Establishment may take from 2 to 4 years, depending on the grass species, the range site, the method of planting, and the weather. Initial grazing of newly seeded areas should be light. Limited early spring, late fall, or winter grazing may be desirable for weed control until the grass has become established. Proper grazing use and a planned grazing system can keep the range productive after the establishment period.

Additional information about appropriate grass mixtures, grassland drills, and planting dates for range seeding can be obtained from the Natural Resources Conservation Service or natural resources district offices.

Control of Blowouts

Blowouts occur on sandy soils, mainly in areas of the Valent and Valent-Ashollow associations where the vegetation has been disturbed. Many blowouts in the sandhills result from the livestock trailing associated with continuous heavy grazing. The larger blowouts generally start at well locations because livestock usually concentrate near water. The smaller blowouts are more likely to form along trails or fence lines. Drought increases the chance of blowout formation.

When blowouts are not stabilized, they are likely to enlarge. Wind blows the sand onto bordering areas and covers the vegetation. The result is an ever-enlarging area that is subject to severe soil blowing.

Many blowouts can be stabilized in 4 or 5 years by controlling grazing through a planned grazing system. Locating wells, salting facilities, and mineral supplements away from blowouts discourages the concentration of livestock. A planned grazing system is the most effective way to control blowouts.

When a planned grazing system is not feasible, reseeding may be necessary. Reseeding, however, may not be economically feasible. If blowouts are reseeded, steep banks around the edges may need to be shaped to a stable slope. A rapidly growing cover crop should be planted in the spring. An adapted native grass mixture is drilled into the stubble left from the cover crop. This residue helps to protect the surface soil from the wind, lowers surface soil temperatures, and helps to ensure a firm seedbed. If a cover crop is not practical, a mulch of native hay can be spread over the surface and anchored into the sand after seeding. Mulching helps to control the damage from blowing sand while the grasses become established. Once seeded, blowout areas should be fenced to exclude livestock until a desirable stand is obtained. Proper grazing use and a planned grazing system help to prevent reactivation of stabilized blowouts after the grasses are established.

Brush Control

Small soapweed, western snowberry, and sand sagebrush are the main brush species in Sioux County. Although not a major range problem, these plants encroach on the range and reduce grass yields and the carrying capacity by shading out desirable grasses and competing for water and nutrients.

Small soapweed can generally be controlled by winter grazing. Feeding a cottonseed cake supplement in soapweed-infested areas encourages cattle to browse the soapweed. Winter grazing causes small soapweed to lose vigor. Some plants are broken off below the root crown when the cattle feed. Applications of approved herbicides have been effective only in spots.

Western snowberry and sand sagebrush can be best controlled by applications of approved herbicides. Treatment of snowberry may need to be repeated during several consecutive years for complete control. Deferred grazing in the treated areas permits adequate grass recovery. Herbicide recommendations are available from the county extension agent or the local office of the Natural Resources Conservation Service.

Managing Native Hayland

A limited acreage of rangeland in Sioux County is used for the production of native hay. Most of the hay is cut on the deeper, somewhat poorly drained soils on lowlands in the Otero-Las Animas-Lisco association. In a few areas hay is harvested on upland sites that are generally used for grazing. These hayfields are mainly on the Sandy Lowland, Sandy, or Sands range site.

Production from native hayland can be maintained or improved by proper management. In order to maintain a good cover of high-quality forage plants, mowing should be regulated so that the desirable grasses remain vigorous and healthy. If possible, grass should be mowed from the boot stage to just prior to the emergence of the seed heads. Mowing during this period permits adequate regrowth and carbohydrate storage in the plant roots before the first frost. The plant regrowth also helps to hold snow in the winter and thus increases the supply of soil moisture. A mowing height of no less than 3 inches helps to maintain high plant vigor and promotes rapid regrowth. Meadows can be moderately grazed without damage after frost in late fall.

When hay is cut on upland sites, it should be harvested only every other year. The year following cutting, harvesting should be deferred during the growing season

and the hay should be used for fall or winter grazing if needed. This management method allows the warm-season grasses to regain vigor and suppresses cool-season grasses and weeds.

Ranchers and livestock producers can obtain technical assistance in range and hayland management or improvement programs from the local office of the Natural Resources Conservation Service or the natural resources district.

Range Sites

The range sites in Sioux County are Choppy Sands, Clayey, Clayey Overflow, Limy Upland, Panspots, Saline Lowland, Saline Subirrigated, Saline Upland, Sands, Sandy, Sandy Lowland, Shallow Clay, Shallow Limy, Shallow to Gravel, Silty, Silty Lowland, Silty Overflow, Subirrigated, and Wet Land. The following descriptions of these sites indicate the dominant vegetation when the site is in excellent condition, the effect of overgrazing on the plant community, and the suggested initial stocking rate.

The range site for each map unit is given in the section "Detailed Soil Map Units" and in the section "Interpretive Groups," which follows the tables at the back of this publication. Badland, Fluvaquents, Slickspots, and Rock outcrop are not assigned to a range site.

CHOPPY SANDS

If this site is used as range, the climax vegetation is dominantly sand bluestem, little bluestem, switchgrass, prairie sandreed, and needleandthread. These species make up 60 percent or more of the total annual forage. Sand lovegrass, hairy grama, blue grama, sandhill muhly, and forbs make up the rest. If subject to continuous heavy grazing, sand bluestem, sand lovegrass, little bluestem, and switchgrass decrease in abundance and are replaced in the plant community by needleandthread, prairie sandreed, hairy grama, sand dropseed, sandhill muhly, sedges, and forbs. If overgrazing continues for many years, the native plants lose vigor and are unable to stabilize the site. As a result, soil blowing is excessive and blowouts can form.

If the range is in excellent condition, the suggested initial stocking rate is 0.4 animal unit month per acre. A planned grazing system that includes proper grazing use and timely deferment of grazing helps to maintain or improve the range condition. Properly located fences, watering facilities, and salting facilities can result in a more uniform distribution of grazing. Livestock cannot easily cross very steep slopes. Shaping, seeding, and mulching hasten the reclamation of blowouts.

CLAYEY

If this site is used as range, the climax vegetation is dominantly blue grama, buffalograss, green needlegrass, and western wheatgrass. These species make up 70 percent or more of the total annual forage. Sand dropseed, Sandberg bluegrass, threadleaf sedge, other annual and perennial grasses, sedges, forbs, and shrubs make up the remaining 30 percent. If subject to continuous heavy grazing, green needlegrass and western wheatgrass decrease in abundance and are replaced in the plant community by blue grama and buffalograss.

If the range is in excellent condition, the suggested initial stocking rate is 0.4 animal unit month per acre. A planned grazing system that includes proper grazing use and timely deferment of grazing helps to maintain or improve the range condition. Livestock tend to overuse areas near watering and salting facilities and near roads and trails. The areas away from watering facilities and the steeper slopes may be underused. Livestock wells and salting facilities should be distributed in a manner that encourages livestock to graze a pasture uniformly. Locating salting facilities away from watering facilities and relocating them each time that salt is provided help to prevent excessive trampling and local overuse.

CLAYEY OVERFLOW

If this site is used as range, the climax vegetation is dominantly blue grama, buffalograss, green needlegrass, and western wheatgrass. These species make up 70 percent or more of the total annual forage. Sandberg bluegrass, inland saltgrass, other annual and perennial grasses, sedges, forbs, and shrubs make up the remaining 30 percent. Under continuous heavy grazing, green needlegrass and western wheatgrass decrease in abundance. If overgrazing continues for many years on the surrounding soils, the protective plant cover is reduced, permitting rapid runoff onto this site. Occasional flooding, although brief in duration, causes sedimentation, channeling, and the deposition of debris and weed seeds. Delaying grazing after periods of flooding helps to prevent soil compaction.

If the range is in excellent condition, the suggested initial stocking rate is 0.5 animal unit month per acre. A planned grazing system that includes proper grazing use and timely deferment of grazing and haying help to maintain or improve the range condition. Livestock tend to overuse areas near watering facilities, roads, and trails. The areas away from watering facilities may be underused. The distribution of livestock in a pasture can be improved by properly locating fences, watering facilities, and salting facilities. Livestock wells and salting facilities should be distributed in a manner that encourages livestock to graze a pasture uniformly. Locating salting facilities away from watering facilities and relocating them each time that salt is provided help to prevent excessive trampling and local overuse.

LIMY UPLAND

If this site is used as range or hayland, the climax vegetation is dominantly little bluestem, sideoats grama, blue grama, plains muhly, needleandthread, and threadleaf sedge. These species make up 70 percent or more of the total annual forage. Buffalograss, prairie sandreed, western wheatgrass, numerous forbs, and some shrubs make up the rest. If subject to continuous heavy grazing, little bluestem decreases in abundance and is replaced in the plant community by hairy grama, prairie sandreed, western wheatgrass, needleandthread, plains muhly, sedges, and forbs. If overgrazing continues for many years, the native grasses lose vigor and are unable to stabilize the site. As a result, water erosion is excessive.

If the range is in excellent condition, the suggested initial stocking rate is 0.4 animal unit month per acre. A planned grazing system that includes proper grazing use and timely deferment of grazing and haying helps to maintain or improve the range condition. Properly located fences, watering facilities, and salting facilities can result in a more uniform distribution of grazing. Areas previously used as cropland should be reseeded to a suitable grass mixture if they are to be used as range. In areas where gullies have formed because of severe water erosion, land shaping or other mechanical practices may be needed to smooth and stabilize the site before it is reseeded.

If this site is used as hayland, the forage should be harvested only every other year. During the following year, the hayland should be used only as fall or winter range. Mowing should be regulated so that the grasses remain vigorous and healthy.

PANSPOTS

If this site is used as range, the climax vegetation is dominantly alkali sacaton, blue grama, inland saltgrass, Sandberg bluegrass, and western wheatgrass. These species make up 65 percent or more of the total annual forage. Buffalograss, green needlegrass, forbs, and shrubs make up the remaining 35 percent. If subject to continuous heavy grazing, alkali sacaton, green needlegrass, and western wheatgrass decrease in abundance and are replaced in the plant community by blue grama, buffalograss, inland saltgrass, and Sandberg bluegrass.

If the range is in excellent condition the suggested initial stocking rate is 0.2 animal unit month per acre. A planned grazing system that includes proper grazing use and timely deferment of grazing helps to maintain or improve the range condition. Livestock tend to overuse areas near watering facilities, roads, and trails. The areas away from watering facilities may be underused. The distribution of livestock in a pasture can be improved by properly locating fences, watering facilities, and salting facilities. Livestock wells and salting facilities should be distributed in a manner that encourages livestock to graze a pasture uniformly. Locating salting facilities away from watering facilities and relocating them each time that salt is provided help to prevent excessive trampling and local overuse.

SALINE LOWLAND

If this site is used as range or hayland, the climax vegetation is dominantly alkali sacaton, inland saltgrass, blue grama, and western wheatgrass. These species make up 65 percent or more of the total annual forage. Buffalograss, slender wheatgrass, plains bluegrass, sedges, and forbs make up the rest. If subject to continuous heavy grazing, alkali sacaton, western wheatgrass, and slender wheatgrass decrease in abundance and are replaced by inland saltgrass, buffalograss, and sedges.

If the range is in excellent condition, the suggested initial stocking rate is 0.5 animal unit month per acre. A planned grazing system that includes proper grazing use and timely deferment of grazing or haying helps maintain or improve the range condition. Properly located fences, watering facilities, and salting facilities can result in a more uniform distribution of grazing. Varying amounts of alkali on the site result in irregular patterns of short and tall grasses. Short grasses are dominant where the alkali content of the soil is high.

If this site is used as hayland, the forage should be harvested only every other year. During the following year, the hayland should be used only as fall or winter range. Mowing should be regulated so that the grasses remain vigorous.

SALINE SUBIRRIGATED

If this site is used as range or hayland, the climax vegetation is dominantly alkali sacaton, inland saltgrass, western wheatgrass, and plains bluegrass. These species make up 70 percent or more or the total annual forage. Alkali cordgrass, little bluestem, foxtail barley, slender wheatgrass, switchgrass, grasslike plants, sedges, and forbs make up the rest. If subject to continuous heavy grazing or improperly harvested for hay, alkali sacaton, western wheatgrass, and switchgrass decrease in abundance and are replaced in the plant community by inland saltgrass, blue grama, plains bluegrass, foxtail barley, sand dropseed, and alkali-tolerant sedges. If overgrazing or improper haying continues for many years, inland saltgrass, blue grama, plains bluegrass, foxtail barley, alkali-tolerant sedges, rushes, and forbs dominate the site.

If the range is in excellent condition, the suggested initial stocking rate is 0.8 animal unit month per acre. A planned grazing system that includes proper grazing use

and timely deferment of grazing and haying helps to maintain or improve the range condition. Properly located fences, watering facilities, and salting facilities can result in a more uniform distribution of grazing. The alkali condition limits forage production and greatly influences the kinds of plants that grow on the site. Some areas of very strongly alkaline soils support little or no vegetation and are subject to severe soil blowing during dry periods. Careful management is needed to maintain the plant cover.

If this site is used as hayland, mowing should be regulated so that the grasses remain vigorous. After the ground is frozen, livestock can graze without damaging the meadows. They should be removed before the ground thaws in the spring.

SALINE UPLAND

If this site is used as range, the climax vegetation is dominantly blue grama, buffalograss, inland saltgrass, and western wheatgrass. These species make up 75 percent or more of the total annual production. Sand dropseed, alkali sacaton, grasslike plants, and forbs make up the remaining 25 percent. If subject to continuous heavy grazing, alkali sacaton and western wheatgrass decrease in abundance and are replaced in the plant community by blue grama, buffalograss, and inland saltgrass.

If the range is in excellent condition, the suggested initial stocking rate is 0.2 animal unit month per acre. A planned grazing system that includes proper grazing use and timely deferment of grazing helps to maintain or improve the range condition. Livestock tend to overuse areas near watering and salting facilities. The areas away from watering facilities may be underused. The distribution of livestock in a pasture can be improved by properly locating fences, watering facilities, and salting facilities. Livestock wells and salting facilities should be distributed in a manner that encourages livestock to graze a pasture uniformly. Locating salting facilities away from watering facilities and relocating them each time that salt is provided help to prevent excessive trampling and local overuse.

SANDS

If this site is used as range or hayland, the climax vegetation is dominantly sand bluestem, little bluestem, blue grama, prairie sandreed, and needleandthread. These species make up 75 percent or more of the total annual forage. Hairy grama, switchgrass, Indian ricegrass, Scribner panicum, sand dropseed, sedges, and forbs make up the rest. If subject to continuous heavy grazing, sand bluestem, sand lovegrass, little bluestem, and switchgrass decrease in abundance and are replaced in the plant community by needleandthread, blue grama, sand dropseed, sedges, and forbs. If overgrazing continues for many years, the native plants lose vigor and are unable to stabilize the site. As a result, soil blowing is excessive and blowouts can form.

If the range is in excellent condition, the suggested initial stocking rate is 0.5 animal unit month per acre. A planned grazing system that includes proper grazing use and timely deferment of grazing and haying helps to maintain or improve the range condition. Properly located fences, watering facilities, and salting facilities can result in a more uniform distribution of grazing. Areas previously used as cropland should be reseeded to a suitable grass mixture if they are to be used as range.

If this site is used as hayland, the forage should be harvested only every other year. During the following year, the hayland should be used only as fall or winter range. Mowing should be regulated so that the grasses remain vigorous and healthy.

SANDY

If this site is used as range or hayland, the climax vegetation is dominantly prairie sandreed, sand bluestem, needleandthread, and blue grama. These species make up 65 percent or more of the total annual forage. Indian ricegrass, little bluestem, sand dropseed, western wheatgrass, threadleaf sedge, and forbs make up the rest. If subject to continuous heavy grazing, sand bluestem and little bluestem decrease in abundance and are replaced in the plant community by needleandthread, prairie sandreed, blue grama, Scribner panicum, sand dropseed, and forbs. If overgrazing continues for many years, the native plants lose vigor and are unable to stabilize the site. As a result, water erosion and soil blowing are excessive.

If the range is in excellent condition, the suggested initial stocking rate is 0.5 animal unit month per acre. A planned grazing system that includes proper grazing use and timely deferment of grazing and haying helps to maintain or improve the range condition. This site generally is the first to be overgrazed when it is in a pasture that includes Sands or Choppy Sands range sites. Properly located fences, watering facilities, and salting facilities can result in a more uniform distribution of grazing. Areas previously used as cropland should be reseeded to a suitable grass mixture if they are to be used as range.

If this site is used as hayland, mowing should be regulated so that the grasses remain healthy and vigorous. The forage should be harvested for hay only every other year. During the following year, the hayland should be used only as fall or winter range.

SANDY LOWLAND

If this site is used as range or hayland, the climax vegetation is dominantly blue grama, little bluestem, needleandthread, prairie sandreed, and sand bluestem.

These species make up 70 percent or more of the total annual forage. Prairie junegrass, sand dropseed, Scribner panicum, switchgrass, sedges, and numerous forbs make up the rest. If subject to continuous heavy grazing, sand bluestem, little bluestem, and switchgrass decrease in abundance and are replaced in the plant community by prairie sandreed, needleandthread, sand dropseed, blue grama, sedges, and forbs. If overgrazing continues for many years, blue grama, sand dropseed, needleandthread, Scribner panicum, sedges, and forbs dominate the site. Under these conditions, the native plants lose vigor and are unable to stabilize the site. As a result, soil blowing is excessive and blowouts can form.

If the range is in excellent condition, the suggested initial stocking rate is 0.8 animal unit month per acre. A planned grazing system that includes proper grazing use and timely deferment of grazing and haying helps to maintain or improve the range condition. Properly located fences, watering facilities, and salting facilities can result in a more uniform distribution of grazing. This site may receive runoff from the adjacent areas. In some areas flooding, although of brief duration, can cause sedimentation, channeling, and the deposition of debris and weed seeds. Areas previously used as cropland should be reseeded to a suitable grass mixture if they are to be used as range.

If this site is used as hayland, mowing should be regulated so that the grasses remain vigorous. The forage should be harvested for hay only every other year. During the following year, the hayland should be used only as fall or winter range.

SHALLOW CLAY

If this site is used as range, the climax vegetation is dominantly blue grama, green needlegrass, sideoats grama, threadleaf sedge, and western wheatgrass. These species make up 65 percent or more of the total annual production. Buffalograss, Fendler threeawn, Sandberg bluegrass, broom snakeweed, rabbitbrush, and numerous forbs make up the remaining 35 percent. If subject to continuous heavy grazing, green needlegrass, sideoats grama, and western wheatgrass decrease in abundance and are replaced in the plant community by blue grama, buffalograss, Fendler threeawn, and Sandberg bluegrass.

If the range is in excellent condition, the suggested initial stocking rate is 0.3 animal unit month per acre. A planned grazing system that includes proper grazing use and timely deferment of grazing helps to maintain or improve the range condition. A major management problem is achieving uniform grazing in areas of rough terrain. Livestock tend to overuse areas near water and areas of gentle relief. The areas away from watering facilities and the steeply sloping areas may be underused. The distribution of livestock in a pasture can be improved by properly locating fences, watering facilities, and salting facilities. Livestock wells and salting facilities should be distributed in a manner that encourages livestock to graze a pasture uniformly. Locating salting facilities away from watering facilities and relocating them each time that salt is provided help to prevent excessive trampling and local overuse.

Properly using this site as range is effective in controlling water erosion. Very steep slopes and rock outcrops make it difficult for range animals to move over some areas. Brush management may be needed to control woody plants, such as broom snakeweed and rabbitbrush.

SHALLOW LIMY

If this site is used as range, the climax vegetation is dominantly blue grama, little bluestem, needleandthread, sideoats grama, threadleaf sedge, and western wheatgrass. These species make up 65 percent or more of the total annual forage. Buffalograss, green needlegrass, plains muhly, prairie sandreed, and numerous forbs make up the rest. If subject to continuous heavy grazing, little bluestem and green needlegrass decrease in abundance and are replaced in the plant community by sideoats grama, blue grama, hairy grama, prairie sandreed, threadleaf sedge, and forbs. If overgrazing continues for many years, the less desirable woody plants may increase in abundance.

If the range is in excellent condition, the suggested initial stocking rate is 0.3 animal unit month per acre. A planned grazing system that includes proper grazing use and timely deferment of grazing helps to maintain or improve the range condition. Properly located fences, watering facilities, and salting facilities can result in a more uniform distribution of grazing. Livestock cannot easily cross areas of very steep slopes. Brush management may be needed in some areas to control the woody plants that invade the site.

SHALLOW TO GRAVEL

If this site is used as range, the climax vegetation is dominantly blue grama, Fendler threeawn, needleandthread, and sand dropseed. These species make up 50 percent or more of the total annual forage. Buffalograss, little bluestem, prairie sandreed, sand bluestem, forbs, and shrubs also are important plants on the site. If subject to continuous heavy grazing, sand bluestem, little bluestem, and prairie sandreed decrease in abundance and are replaced in the plant community by blue grama, buffalograss, sand dropseed, needleandthread, sedges, and forbs. If overgrazing continues for many years, blue grama, sedges, common pricklypear, brittle pricklypear, fringed sagewort, and other forbs dominate the site.

If the range is in excellent condition, the suggested initial stocking rate is 0.3 animal unit month per acre. A planned grazing system that includes proper grazing use and timely deferment of grazing helps to maintain or improve the range condition. Planned short periods of heavy grazing during the grazing season or deferment of grazing in 2 years out of 3 helps to retain little bluestem and prairie sandreed in the plant community. Properly located fences, watering facilities, and salting facilities can result in a more uniform distribution of grazing.

SILTY

If this site is used as range or hayland, the climax vegetation is dominantly blue grama, buffalograss, needleandthread, threadleaf sedge, and western wheatgrass. These species make up 70 percent or more of the total annual forage. Green needlegrass, sideoats grama, little bluestem, and numerous forbs make up the rest. If subject to continuous heavy grazing, little bluestem and western wheatgrass decrease in abundance and are replaced in the plant community by blue grama, buffalograss, needleandthread, plains muhly, sand dropseed, tall dropseed, and forbs. If overgrazing continues for many years, the native grasses lose vigor and are unable to stabilize the site. As a result, water erosion is excessive.

If the range is in excellent condition, the suggested initial stocking rate is 0.5 animal unit month per acre. A planned grazing system that includes proper grazing use and timely deferment of grazing and haying helps to maintain or improve the range condition. Properly located fences, watering facilities, and salting facilities can result in a more uniform distribution of grazing. Areas previously used as cropland should be reseeded to a suitable grass mixture if they are to be used as range. In areas where gullies have formed because of severe water erosion, land shaping or other mechanical practices may be needed to smooth and stabilize the site before it is reseeded.

If this site is used as hayland, the forage should be harvested only every other year. During the following year, the hayland should be used only as fall or winter range. Mowing should be regulated so that the grasses remain vigorous and healthy.

SILTY LOWLAND

If this site is used as range or hayland, the climax vegetation is dominantly blue grama, needleandthread, and western wheatgrass. These species make up 50 percent or more of the total annual forage. Big bluestem, green needlegrass, sedges, and forbs make up the rest. If subject to continuous heavy grazing, big bluestem decreases in abundance and is replaced in the plant community by plains bluegrass, western wheatgrass, and tall dropseed. If overgrazing continues for many years, blue grama, buffalograss, Scribner panicum, and numerous weeds dominate the site.

If the range is in excellent condition, the suggested initial stocking rate is 0.8 animal unit month per acre. A planned grazing system that includes proper grazing use and timely deferment of grazing and haying helps to maintain or improve the range condition. Properly located fences, watering facilities, and salting facilities can result in a more uniform distribution of grazing.

If this site is used as hayland, the forage usually can be harvested annually. Mowing should be regulated so that the grasses remain healthy and vigorous.

SILTY OVERFLOW

If this site is used as range or hayland, the climax vegetation is dominantly blue grama, needleandthread, and western wheatgrass. These species make up about 50 percent or more of the total annual forage. Big bluestem, buffalograss, green needlegrass, little bluestem, sideoats grama, sedges, and forbs make up the rest. If subject to continuous heavy grazing, big bluestem, little bluestem, and green needlegrass decrease in abundance and are replaced in the plant community by western wheatgrass, plains bluegrass, and sedges. If overgrazing continues for many years on the surrounding soils, the protective plant cover is reduced, causing excessive runoff onto this site. Flooding, although brief in duration, causes sedimentation, channeling, and the deposition of debris and weed seeds. Delaying grazing after periods of flooding helps to prevent soil compaction.

If the range is in excellent condition, the suggested initial stocking rate is 0.8 animal unit month per acre. A planned grazing system that includes proper grazing use and timely deferment of grazing and haying helps to maintain or improve the range condition. Properly located fences, watering facilities, and salting facilities can result in a more uniform distribution of grazing.

If this site is used as hayland, the forage usually can be harvested annually. Mowing should be regulated so that the grasses remain vigorous and healthy.

SUBIRRIGATED

If this site is used as range or hayland, the climax vegetation is dominantly big bluestem, indiangrass, little bluestem, prairie cordgrass, switchgrass, and various sedges and rushes. These species make up 70 percent or more of the total annual forage. Needleandthread, plains bluegrass, slender wheatgrass, and some forbs also are important plants on the site. If subject to continuous heavy grazing or improperly harvested for hay, big bluestem, little bluestem, indiangrass, switchgrass, and prairie cordgrass decrease in abundance and are replaced in the plant community by sideoats grama, western wheatgrass, plains bluegrass, slender wheatgrass, green muhly,

sedges, and rushes. If overgrazing or improper haying continues for many years, plains bluegrass, sedges, rushes, and forbs dominate the site.

If the range is in excellent condition, the suggested initial stocking rate is 1.5 animal unit months per acre. A planned grazing system that includes proper grazing use, timely deferment of grazing and haying, and restricted use during wet periods helps to maintain or improve the range condition. This site generally is the first to be overgrazed when it is in a pasture that includes better drained, sandy soils. Properly located fences, watering facilities, and salting facilities result in a more uniform distribution of grazing.

If this site is used as hayland, mowing should be regulated so that the grasses remain vigorous. It be avoided between the boot stage and seed maturity. Mowing before the dominant grasses reach the boot stage allows the plants to recover. Most of the carbohydrate storage occurs between this stage and seed maturity. The maximum storage of these food reserves is completed by the first frost. The quality of hay is higher when grasses are cut earlier. A proper mowing height helps to maintain the stand of grasses and high forage production. When the soil is frozen, livestock can graze without damaging the meadows. They should be removed from the meadows before the soil thaws in the spring.

WET LAND

If this site is used as range or hayland, the climax vegetation is dominantly bluejoint reedgrass, northern reedgrass, prairie cordgrass, and various sedges and rushes. These species make up 75 percent or more of the total annual forage. Plains bluegrass, slender wheatgrass, and some forbs make up the remaining 25 percent. If subject to continuous heavy grazing or improperly harvested for hay, prairie cordgrass, bluejoint reedgrass, and northern reedgrass decrease in abundance and are replaced in the plant community by slender wheatgrass, plains bluegrass, green muhly, sedges, rushes, and forbs. If overgrazing or improper haying continues for many years, plains bluegrass, foxtail barley, sedges, rushes, and forbs dominate the site.

If the range is in excellent condition, the suggested initial stocking rate is 1.8 animal unit months per acre. This site produces a high quantity of low-quality forage. A planned grazing system that includes proper grazing use, timely deferment of grazing and haying, and restricted use during very wet periods helps to maintain or improve the range condition. When the surface is wet, overgrazing and heavy machinery traffic can cause surface compaction and the formation of mounds and ruts, which make grazing or harvesting for hay difficult.

If this site is used as hayland, mowing should be regulated so that the grasses remain vigorous. It should be avoided between the boot stage and seed maturity. Mowing before the dominant grasses reach the boot stage allows the plants to recover. A proper mowing height helps to maintain the stand of grasses and high forage production. The mowing height should not be less than 3 inches. In some years hay cannot be harvested because of the excessive wetness. When the soil is frozen, livestock can graze without damaging the meadows. They should be removed from the meadows before the soil thaws in the spring and the water table reaches a high level.

Woodland

By Gary Kuhn, forester, Natural Resources Conservation Service, and Doak Nickerson, forester, Nebraska Forest Service.

Ponderosa pine, which is representative of the Rock Mountain forest type, is on the slopes and in the canyons of the Pine Ridge area in Sioux County. Approximately 83 percent of the forest land in the Pine Ridge is under nonindustrial private ownership. The rest is owned by the U.S. Forest Service, the Bureau of Land Management, and the State of Nebraska. The Pine Ridge is a crescent-shaped geologic fault that extends from east to west across Sheridan, Dawes, and Sioux Counties. The topography of this area ranges from steep slopes and canyons to flat and gently rolling surrounding tablelands. The average annual precipitation ranges from 12 to 14 inches in Sioux County and from 16 to 18 inches in Sheridan County.

Before European settlement, the forest land in Sioux County was more savannahlike because of natural or Indian-caused fires. Native grasses were dominant, but old growth stands of ponderosa pine were in scattered areas. Isolated, dense pockets of pine may have been on protected, north-facing slopes. Hardwood forests consisting of American elm, hackberry, boxelder, and green ash were only on the drainage bottoms. Quaking aspen was much more prevalent because of periodic fires. After European settlement, the periodic fires were eliminated. Consequently, ponderosa pine forests began to expand and quaking aspen disappeared, creating the forest of today.

Timber harvesting has been limited in Sioux County, as compared to other areas of the Pine Ridge, because of the extreme topography and lower site productivity. Ridgetops and south-facing slopes have too harsh an environment to produce merchantable stands of ponderosa pine. The most productive stands of pine are on north-facing slopes and in isolated pockets of gently rolling topography. Many areas, however, are practically inaccessible because of steep, highly dissected slopes. The cost of logging and the hazard of water erosion are greatly increased in these areas. Most logging roads were

poorly designed in the past. Excessive water erosion has caused many roads to turn into gullies. Establishing water bars and seeding roadbeds to grass can aid in stabilizing these areas.

Much of the pine forest in Sioux County is unmanaged. Measures that improve timber stands, such as precommercial or commercial thinning, have not been applied. As a result, most of the pine stands are overstocked and the trees are not growing at their full potential. The current average annual growth is estimated at 25 cubic feet per acre. Through management, the annual growth could possibly be increased to 40 cubic feet per acre on the best sites. Ponderosa pine responds well to thinning if the stand is less than 80 years old. The average annual growth can be doubled through thinning. For example, trees taking 12 years to produce 1 inch of diameter growth before thinning take only 6 years to produce 1 inch of diameter growth after thinning. The best pine sites are in areas on north aspects and on the bottom of draws, where the soils are deeper and more moisture is available for tree growth.

The ponderosa pine timber type is unique because it offers opportunities for the growth of both timber and grass on the same site. Unmanaged pine stands shade out desirable forage, resulting in a limited livestock grazing potential. Timber management, however, allows sunlight onto the forest floor, increasing forage production. Studies of Black Hills pine stands have shown that forage production more than doubles after thinning. A good rule of thumb for tree spacing when a pine stand is thinned is that the average tree diameter plus 6 equals the average spacing in feet (D+6). If increased forage for livestock grazing is a primary objective, tree spacing can be greater (i.e., D+8 rather than D+6 spacing). For example, if the average diameter of 10 pine trees measured at d.b.h. (diameter at breast height) is determined to be 8 inches, a spacing of 14 feet (D+6) would result in the best timber growth. If forage production is important, however, a spacing of 16 feet (D+8) would be better.

The trees that remain after a stand is thinned should be the best trees in the stand. They have a fuller crown, appear more vigorous, and generally have a larger diameter than the trees to be removed, which are weaker, are deformed or suppressed, and have a smaller diameter.

Forest fire is a serious threat to the unmanaged pine forests in the county. Because of the lack of management, forest fuels have built up to dangerously high levels. The threat of crown fires is serious because of overstocked stands with no air space between crowns. The major forest fires in the Pine Ridge, such as the Ft. Robinson and Belmont fires of 1989, indicate that fire is a serious threat. Timber management can make the forests more fireproof than they are at present.

Forest pests generally are not a major problem in the county. Western gall rust is pronounced in some stands. The best treatment for this rust is the removal of infected trees during thinning or harvesting. Bark beetle damage has been insignificant. Ips beetles have killed pockets of the weaker pine trees, but no Dendroctonus beetle outbreaks have occurred. Drought cycles and overstocked, stressed pine stands could allow the entry of these beetles. Dendroctonus beetles pose a more serious threat because they can attack and kill the larger, mature pine trees, creating an extreme fire hazard.

The hardwood riparian forests on private land in Sioux County are generally in poor condition. This condition is primarily the result of overgrazing by livestock, whereby all understory shrubs and the capacity for hardwood tree reproduction are destroyed. These forests would normally consist of green ash, hackberry, boxelder, eastern cottonwood, mountain maple, and serviceberry. There are some remaining isolated stands of black birch and quaking aspen. The areas of hardwoods along drainageways are used as calving and feeding sites in spring and are overgrazed during the green-up periods of cool-season grasses in spring and fall. These areas are vital for wildlife and water quality. Livestock grazing should be controlled if the areas are to recover.

The riparian woodland along tributary streams of the North Platte River is in poor condition or has been removed because of the heavy farming pressure in gravity-irrigated areas. The removal of riparian woodland for more crop production results in accelerated streambank erosion, direct entry of sediment and farm chemicals into streams, and degradation of wildlife habitat. Native trout are seriously affected by the increased stream sediment loads and pesticide concentrations. The streams require a forest-grass buffer strip approximately 50 feet wide on each side to protect them from agricultural runoff, to stabilize streambanks, to create a diversity of wildlife habitat, and to moderate stream temperatures for fish survival.

A forest stewardship program can address the proper management of ponderosa pine and hardwood riparian forests. Multiple benefits can result from timber and livestock grazing management.

Woodland Suitability Groups

To assist in planning the management of woodland in Sioux County, soils have been grouped into four woodland suitability groups, which are shown in table 9. Each group is made up of soils that produce similar kinds and amounts of wood crops and that require similar management.

For management purposes, soil depth (the effective rooting depth to bedrock or an impenetrable layer), slope position (distance up the slope as a percentage of total

slope length), slope class, and aspect are used to determine the potential productivity. In growth studies conducted in the Black Hills of South Dakota, the Forest Service has found that these variables are important in determining the site index of ponderosa pine.

Table 9 shows the potential productivity of the soils in each woodland suitability group and rates the hazards and limitations that affect management.

The site index shown in table 9 indicates productivity. It expresses the average height of the taller trees in a stand at a specified age. In table 9, the site index is the height, in feet, of ponderosa pine at 100 years of age.

The increments of periodic annual growth shown in table 9 are expressed in cubic feet per acre for stands at 80 years of age. These yields are based on Forest Service studies of managed, even-aged stands of ponderosa pine in the Black Hills. In a managed stand where ponderosa pine is 80 years old and the soil has a site index of 70, the merchantable volume of wood products added each year would be about 65 cubic feet per acre. The conversion factors at the bottom of table 9 indicate that this amounts to approximately seven-tenths of a cord, or 390 board feet per acre per year. This is approximately double the increase in volume for the same period for a stand of the same age on a soil that has a site index of 55.

WOODLAND SUITABILITY GROUP 1

Only the Ponderosa soils on north and east aspects are in this group. These soils are mainly on the lower half of the total slope length. Slopes range from 3 to 60 percent. The soils are very deep. They have an effective rooting depth of well over 60 inches. The site index for ponderosa pine ranges from 60 to 80. Ponderosa pine grows better on these soils than on soils in the other groups. Timber management opportunities also are better in this group. The hazard of water erosion and equipment limitations are severe where slopes are more than 30 percent. The native understory vegetation includes ponderosa pine, Oregongrape, skunkbush sumac, chokecherry, golden currant, Rocky Mountain maple, western snowberry, green ash, and horizontal juniper.

WOODLAND SUITABILITY GROUP 2

The Canyon and Tassel soils on north and east aspects are in this group. They are on side slopes and ridgetops. Slopes range from 3 to 70 percent. These soils are mainly on the upper half of the total slope length. The major limiting factor affecting tree growth is soil depth. The effective rooting depth is less than 20 inches. The site index for ponderosa pine ranges from 40 to 49. Overstocked stands of ponderosa pine are common. Timber stand improvement activities, such as thinning, can increase the vigor and growth rates of the better trees, reduce the hazard of fire, and increase understory forage production. The hazard of water erosion and equipment limitations are severe where slopes are more than 30 percent. The native understory vegetation includes ponderosa pine, Oregongrape, skunkbush sumac, golden currant, western snowberry, Rocky Mountain maple, Rocky mountain juniper, chockecherry, and horizontal juniper. The percentage of cool- and warm-season grasses is higher in open areas.

WOODLAND SUITABILITY GROUP 3

The Ponderosa soils on south and west aspects are in this group. They are on broad ridgetops and side slopes. Slopes range from 0 to 60 percent. The major limitation affecting tree growth is soil moisture because of the drier site conditions characteristic of south- and west-facing slopes. The productivity for trees is low or moderate. The site index for ponderosa pine ranges from 40 to 49. The potential for timber management is low because of scattered open stands of pine. Areas of this group are ideal for livestock grazing because the soils are deep and grasses are dominant in the understory. Also, these areas are well suited to wildlife habitat and recreation.

WOODLAND SUITABILITY GROUP 4

The Canyon and Tassel soils on south- and west-facing slopes are in this group. Slopes range from 0 to 70 percent. Soil depth is less than 20 inches. Because of the shallow soils and hot, dry site conditions, tree growth rates and the potential for timber management are extremely low. The site index for ponderosa pine is less than 40. Only scattered pine trees of low quality grow on these soils. The vegetation is dominantly a mixture of cool- and warm-season grasses. The soils are better suited to livestock grazing, wildlife habitat, and watershed protection than to timber. Timber management has the lowest priority.

Windbreaks and Environmental Plantings

By Gary Kuhn, forester, Natural Resources Conservation Service, and Doak Nickerson, forester, Nebraska Forest Service.

Windbreaks play a vital role in protecting the farms and ranches in Sioux County (fig. 22). The existing windbreaks in the county, recommendations for improving the windbreaks, and procedures for establishing windbreaks are described in this section.

Most of the existing farmstead windbreaks in the county consist of two to three rows of Siberian elm. Some farmsteads have some evergreen rows of eastern redcedar, Rocky Mountain juniper, or ponderosa pine. Farmstead windbreaks that are made up only of Siberian elm are in poor condition. The elms are rapidly deteriorating and are not providing adequate low- or mid-

Figure 22.—A newly established windbreak in an area of Vetal very fine sandy loam, 1 to 3 percent slopes.

level protection from the wind. These windbreaks can be improved by adding new rows of cedar or junipers on the windward side of the elms. In some areas the farmstead windbreaks are too close to the farmstead. In these areas excessive snow can accumulate around the farmstead. The most windward row of evergreens should be at least 150 feet from the farmstead or feedlot if the windbreak is to trap and store snow. In many areas the farmstead area has expanded over the years with new equipment sheds, livestock-holding areas, and other structures. Extending the length of the existing windbreak can help to protect these areas.

The major land resource in Sioux County is rangeland. Windbreaks that protect livestock, especially in spring and fall calving or wintering areas, can reduce calf mortality and livestock-feeding costs and can create a more comfortable area for feeding livestock. A combination of living snow fences and livestock windbreaks is needed along ranch access roads. Replacing the old elm rows with multirow windbreaks can improve the ranch headquarters. These windbreaks should have at least five rows. The first two windward rows should consist of eastern redcedar or Rocky Mountain juniper if the windbreak is to provide protection in winter. The leeward rows can consist of ponderosa pine and suitable broadleaf trees and shrubs.

The southern end of the county has large acreages of irrigated cropland. Most of the soils in this area are sandy and are subject to severe soil blowing. Low-residue crops, such as dry beans and sugar beets, are commonly grown on these sandy soils along with corn. The residue of beans and beets does not provide sufficient cover to protect the soils from soil blowing. Properly located field windbreaks can provide excellent soil and crop protection. Some of the existing field windbreaks consisting of one or two rows of Siberian elm along the field borders are in poor condition and are losing their effectiveness. There are very few windbreaks within the field.

An understanding of the "zone of wind reduction" behind windbreaks is needed before the benefits of a field windbreak can be fully recognized (fig. 23). Excellent wind protection is provided out to a distance of 10 times the

height of the windbreak (10H). For example, in a windbreak of eastern redcedar 20 feet tall, the zone of effective wind reduction would be 200 feet on the leeward side of the windbreak. A wind velocity of 20 miles per hour would be reduced to 5 miles per hour at 5H and 10 to 14 miles per hour at 8 to 10H on the leeward side. Actually, wind reduction benefits extend all the way out to 20 times the height of the windbreak (20H).

In the zone of wind protection, crop yields are increased, topsoil remains in place, and the efficiency of irrigation is increased. Windbreaks consisting of one to no more than three rows are very effective in protecting soils and crops. Eastern redcedar, Rocky Mountain juniper, and ponderosa pine are excellent species for field windbreaks in Sioux County. It is important to emphasize that a system of windbreaks within the field can provide the best long-term protection of the soil and the farm. The distance between the windbreaks within a field is dependent on the soil, the cropping rotation (residue levels), and 20-year tree heights. The local office of the Natural Resources Conservation Service can assist landowners in planning field windbreaks.

Establishing trees and shrubs for windbreaks and environmental plantings can be a challenge in Sioux County because of the harsh climate and the sandy soils. Successful plantings are the result of good site preparation and a commitment to 5 years of maintenance, which consists of weed control, replanting, and livestock exclusion.

Site preparation is the key to a successful windbreak planting. Good site preparation helps to store moisture for the new planting, eliminates competing vegetation, breaks down potential hardpans or plowpans, and mellows the soil for better planting conditions. Table 10 indicates the best type of site preparation for a particular site.

Moisture is a critical factor during the first 5 years of a new planting. Weed control is essential. It should maintain a weed-free strip 4 to 6 feet wide within the tree row. Weeds can be controlled by mechanical methods, such as using a weed badger; by chemical methods, such as applying labeled postemergent or preemergent herbicides; or by installing a fabric mulch after the trees are planted. This fabric has shown excellent results in establishing windbreaks. It prevents weed growth within the tree rows for at least a 5-year period, and it conserves soil moisture by preventing evaporation of the moisture. Local offices of the Natural Resources Conservation Service and the Cooperative Extension Service can provide information about this mulch.

Supplemental watering by drip or gravity irrigation systems can aid in establishing a windbreak. It should not be considered a substitute for weed control, but rather an effective means of establishing the trees and shrubs. Drip systems should be used no longer than the first 3 to 5 years of a planting. At that point the trees and shrubs should be able to survive on their own, trapping winter snow and thus replenishing subsoil moisture for use in summer months. Improper use of drip systems can cause trees and shrubs to develop shallow root systems incapable of tapping subsoil moisture once the drip system is removed.

Table 11 shows the height that locally grown trees and shrubs are expected to reach in 20 years on various soils. The estimates in table 11 are based on measurements and observation of established plantings that have been given adequate care. They can be used as a guide in planning windbreaks and screens. Additional information on planning windbreaks and screens and planting and caring for trees and shrubs can be obtained from the local office of the Natural Resources Conservation Service or of the Cooperative Extension Service or from a commercial nursery.

Windbreak Suitability Groups

The soils in Sioux County are assigned to windbreak suitability groups according to characteristics that affect tree growth. The soils in a particular group produce trees that have similar growth and survival characteristics under similar conditions of weather and care. The windbreak group for each soil in the county is listed in the section "Detailed Soil Map Units" and in the section "Interpretive Groups," which follows the tables at the back of this publication. Not all of the groups in this statewide system are represented in Sioux County.

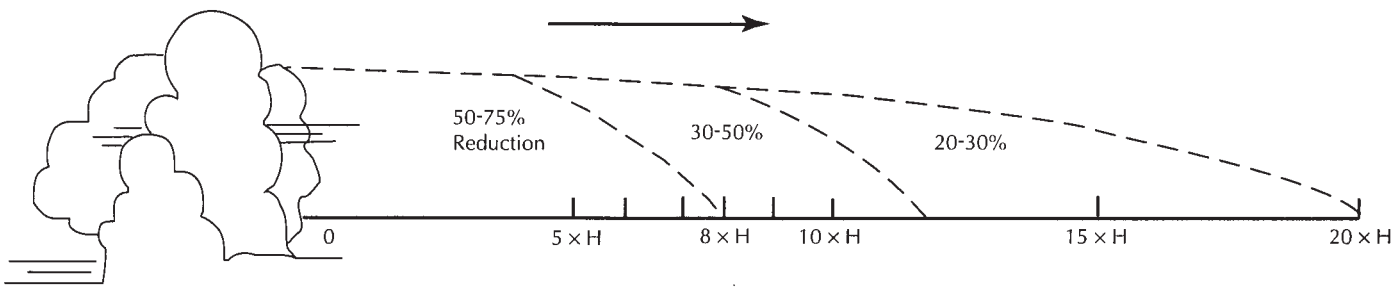

Figure 23.—Zones of wind reduction behind a windbreak.

WINDBREAK SUITABILITY GROUP 1L

The soils in this group are good sites for the trees and shrubs grown in windbreaks and for the plantings that enhance recreational areas and wildlife habitat. The soils receive beneficial moisture because of favorable landscape positions, flooding, or runoff from adjacent areas, or they have a seasonal high water table during the spring. They are high in content of calcium carbonates and have a high pH, which affects the species of trees and shrubs that can be grown. Competition for moisture from undesirable plants affects the establishment and management of trees and shrubs. It can be controlled by cultivating between the tree rows with conventional equipment and by hand hoeing, rototilling, and applying the appropriate herbicides in a timely manner in the tree rows. Drip irrigation can provide the supplemental moisture needed during periods of insufficient rainfall.

WINDBREAK SUITABILITY GROUP 2S

The soils in this group are good sites for the trees and shrubs grown in windbreaks and for the plantings that enhance recreational areas and wildlife habitat. The soils are excessively wet during the spring. Competition from undesirable plants and wetness affect the establishment and management of trees and shrubs. The degree of wetness and the pH affect the selection of tree and shrub species. The trees and shrubs that can withstand occasional wetness survive and grow well. During wet years cultivation and planting may be delayed until the soils have begun to dry. Hand planting in spring may be necessary because of the wetness. The weeds and undesirable grasses that compete with the trees for moisture can be controlled by cultivating between the tree rows with conventional equipment and by hand hoeing, rototilling, and applying the appropriate herbicides in a timely manner in the tree rows.

WINDBREAK SUITABILITY GROUP 3

The soils in this group are good sites for the trees and shrubs grown in windbreaks and for the plantings that enhance recreational areas and wildlife habitat. The soils are loamy and are moderately permeable or moderately slowly permeable. Competition for moisture from undesirable plants affects the establishment and management of trees and shrubs. It can be controlled by cultivating between the tree rows with conventional equipment and by hand hoeing, rototilling, and applying the appropriate herbicides in a timely manner in the tree rows. Water erosion is a hazard in gently sloping to strongly sloping areas. It can be controlled by a combination of contour planting and terraces. Drip irrigation can provide supplemental water to the trees during extended dry periods.

WINDBREAK SUITABILITY GROUP 4L

The soils in this group are poor sites for the trees and shrubs grown in windbreaks and for the plantings that enhance recreational areas and wildlife habitat. The soils are loamy and are slowly permeable. The content of clay and drought conditions affect the selection of tree and shrub species. Competition for moisture from undesirable plants affects the establishment and management of trees and shrubs. It can be controlled by cultivating between the tree rows with conventional equipment and by hand hoeing, rototilling, and applying the appropriate herbicides in a timely manner in the tree rows. Planting the trees on the contour conserves soil moisture and helps to prevent excessive runoff and erosion. The trees should be planted when the soils are moist but not when they are wet. Light cultivation and applications of supplemental water can close cracks that may develop and can protect the roots of the trees and shrubs. Drip irrigation can provide the supplemental moisture needed during periods of low rainfall.

WINDBREAK SUITABILITY GROUP 4C

The soils in this group are poor sites for the trees and shrubs grown in windbreaks and for the plantings that enhance recreational areas and wildlife habitat. The soils are clayey and are very slowly permeable. A high content of clay and droughty conditions affect the selection of tree and shrub species. Competition for moisture from undesirable plants affects the establishment and management of trees and shrubs. It can be controlled by cultivating between the tree rows with conventional equipment and by hand hoeing, rototilling, and applying the appropriate herbicides in a timely manner in the tree rows. Planting the trees on the contour conserves soil moisture and helps to prevent excessive runoff and erosion. The trees should be planted when the soils are moist but not when they are wet. Light cultivation and applications of supplemental water can close cracks that develop and can protect the roots of the trees and shrubs. Drip irrigation can provide the supplemental moisture needed during periods of low rainfall.

WINDBREAK SUITABILITY GROUP 5

The soils in this group are good sites for the trees and shrubs grown in windbreaks and for the plantings that enhance recreational areas and wildlife habitat. The soils are loamy and sandy and have a moderate or high available water capacity. Competition for moisture from undesirable plants and soil blowing affect the establishment and management of trees and shrubs. Water erosion is a hazard in very gently sloping to steep areas. Planting the trees on the contour conserves soil moisture and helps to control runoff and erosion. Soil

blowing can be controlled by maintaining strips of sod or cover crops between the tree rows. Annual cover crops can protect the surface. Drip irrigation can provide the supplemental moisture needed during dry periods. Undesirable weeds and grasses can be controlled by cultivating between the tree rows with conventional equipment and by hand hoeing, rototilling, and applying the appropriate herbicides in a timely manner in the tree rows.

WINDBREAK SUITABILITY GROUP 6R

The soils in this group are fair sites for the trees and shrubs grown in windbreaks and for the plantings that enhance recreational areas and wildlife habitat. The soils are loamy and are moderately deep over bedrock. Competition for moisture from undesirable plants and soil blowing affect the establishment and management of trees and shrubs. Water erosion is a hazard in gently sloping to steep areas. Soil blowing can be controlled by maintaining strips of sod or cover crops between the tree rows. Annual cover crops can protect the surface. Planting the trees on the contour conserves soil moisture and helps to control runoff and erosion. Drip irrigation can provide the supplemental moisture needed during dry periods. Undesirable weeds and grasses can be controlled by cultivating between the tree rows with conventional equipment and by hand hoeing, rototilling, and applying the appropriate herbicides in a timely manner in the tree rows.

WINDBREAK SUITABILITY GROUP 7

The soils in this group are fair sites for the trees and shrubs grown in windbreaks and for the plantings that enhance recreational areas and wildlife habitat. The soils are sandy and have a low or very low available water capacity. Droughty conditions and soil blowing affect the establishment and management of trees and shrubs. Young seedlings can be damaged by high winds and can be covered by drifting sand. Special site preparation and special planting methods are needed to establish the trees and shrubs. Only coniferous species are suitable for planting. These soils are so loose that the trees grown in windbreaks should be planted in shallow furrows with as little disturbance of the surface as possible or in a strip where the vegetation has been destroyed by nonselective herbicides. Maintaining strips of sod or cover crops between the tree rows helps to control soil blowing. Drip irrigation can provide the water needed to establish seedlings and the supplemental moisture needed during periods of low rainfall. Undesirable weeds and grasses can be controlled by cultivating between the tree rows with conventional equipment and by hand hoeing, rototilling, and applying the appropriate herbicides in a timely manner in the tree rows.

WINDBREAK SUITABILITY GROUP 8

The soils in this group are fair sites for the trees and shrubs grown in windbreaks and for the plantings that enhance recreational areas and wildlife habitat. The soils are calcareous at or near the surface. A high content of calcium carbonate and competition for moisture from undesirable plants affect the establishment and management of trees and shrubs. The trees and shrubs selected for planting should be those that can tolerate the high content of calcium carbonate. A combination of contour planting and terraces helps to control runoff and water erosion. Drip irrigation can provide the water needed to establish seedlings and the supplemental moisture needed during periods of insufficient rainfall. The weeds and undesirable grasses that compete with the trees for moisture can be controlled by cultivating between the tree rows with conventional equipment and by hand hoeing, rototilling, and applying the appropriate herbicides in a timely manner in the tree rows.

WINDBREAK SUITABILITY GROUP 9N

The soils in this group are poor sites for the trees and shrubs grown in windbreaks and for the plantings that enhance recreational areas and wildlife habitat. Alkaline or saline conditions affect the establishment and management of trees and shrubs. They can be minimized by planting only those species that can tolerate high alkalinity or salinity. Drip irrigation can provide the water needed to establish seedlings and the supplemental moisture needed during periods of low rainfall. The undesirable grasses and weeds that compete with the trees for moisture can be controlled by cultivating between the tree rows with conventional equipment and by hand hoeing, rototilling, and applying the appropriate herbicides in a timely manner in the tree rows.

WINDBREAK SUITABILITY GROUP 10

The soils in this group are poor sites for the trees and shrubs grown in windbreaks. They are generally too sloping, too wet, or too shallow for windbreaks or are otherwise restricted as sites for trees and shrubs. Onsite investigation may identify areas that can be used for recreational, wildlife, or forestation plantings of selected species if the trees or shrubs are planted by hand or other approved special practices are applied.

Recreation

Edward P. Eitel, natural resources conservationist, and Gerald E. Jasmer, wildlife biologist, Natural Resources Conservation Service, helped prepare this section.

A good diversity of quality recreational activities is available in Sioux County. Opportunities for picnicking,

hiking, swimming, hunting, fishing, camping, rock hunting, and photographing are plentiful in the county.

Because of the many natural, scenic, and historical sites in the county, sightseeing is a particularly enjoyable activity. Harrison is situated on a plain on top of the picturesque Pine Ridge, which crosses the county from Wyoming eastward. A few miles north, Pine Ridge falls away into Sowbelly, Monroe, and Hat Creek canyons. Treeless buttes tower over these canyons in interesting formations, such as Inspiration Point and Colosseum Buttes. Many of the canyons are heavily wooded and have cool, clear streams running through them.

About 20 miles northeast of Harrison are two monuments of historical interest. One monument marks the spot where Buffalo Bill Cody had a duel with Chief Yellowhand, a Cheyenne leader. The other monument marks the site where Colonel Wessley Merritt and troops of the Fifth U.S. Calvary prevented a group of 800 Cheyenne Indians from joining the victors of the Battle of the Little Bighorn. A marker on the Cheyenne Outbreak Trail is 20 miles east of Harrison, along Highway 20. A marker on the old Fort Laramie-Fort Robinson Trail is 10 miles south of Harrison, along Highway 29.

Three interesting and educational circle tours offer opportunities for visiting many of the recreational sites in Sioux County. These are the Monument Tour, the Sowbelly Canyon-Pants Butte Tour, and the Agate Tour.

The Monument Tour begins with a drive north from Harrison about 5 miles for a picnic at the State-owned Gilbert-Baker Wildlife Management Area at the bottom of Monroe Canyon. This area is 2,457 acres in size. It is a bird-watcher's paradise. Monroe Creek, which flows through the grounds, is one of the few Nebraska streams supporting naturally reproducing brook trout. The area provides opportunities for deer, turkey, and dove hunting, for fishing, and for primitive camping. The facilities in the area include rest rooms, grills, and picnic tables.

From the campground, the tour continues 10 miles north and 8 miles east to Montrose for a view of the Yellowhand and Col. Merritt Monuments. This drive takes the traveler through the Oglala National Grassland, where deer, antelope, grouse, ducks, and wild flowers abound. The 44-mile return trip to Harrison takes the visitor through Sowbelly Canyon.

The Sowbelly Canyon-Pants Butte Tour is a scenic 12-mile tour that can be completed in an hour. Sowbelly Canyon reportedly gets its name from soldiers who were trapped there by Indians. The soldiers spent 3 days in this canyon with nothing to eat but salt pork, thus the name sowbelly. The canyons and buttes on this tour provide many opportunities for photography. Coffee Park, in Sowbelly Canyon, is available as a day-use area for picnicking and hiking and provides public fishing access to Sowbelly Creek.

The Agate Tour goes south from Harrison and through the Agate Fossil Beds National Monument, which has a treasure trove of fossils. The monument is 23 miles south of Harrison, along Highway 29. It is 3,000 acres in size. Its fossil beds are internationally known for their valuable fossil deposits. They contain the fossilized remains of animals that lived in the area millions of years ago. The monument is open throughout the year. It has two hiking trails, picnic tables, rest rooms, and an interpretive visitor center that has fossil exhibits, slide programs, and the Cook collection of Indian artifacts. The monument provides opportunities for fishing in the Niobrara River.

Rock hunting is a popular activity in many parts of the county. The most common semiprecious stones in the county are the fairburn, moss, and blue agates. Collection and removal of fossils, rocks, plants, and other natural features are not allowed on most public lands, including the Agate Fossil Beds National Monument.

As the Agate Tour continues, it follows the Niobrara River east to Highway 2, then back north to Crawford. On the return to Harrison on Highway 20, the route passes through Fort Robinson State Park. Fort Robinson straddles the boundary between Sioux and Dawes Counties. Two-thirds of its 22,700 acres is in Sioux County. Fort Robinson is perhaps the finest and most popular of Nebraska's state parks. Facilities include an indoor pool, tennis courts, basketball courts, sand volleyball courts, rest rooms, showers, a dump station, camping areas, cabins, a group lodge, a restaurant, picnic shelters and tables, electrical hookups, grills, a bike-rental area, a stable, playgrounds, a theater and playhouse, water wells, and public telephones. Other guided and individualized activities include arts and crafts, horseback rides, jeep and hayrack tours, fishing, and tours of the fort's museum and 33 historic buildings.

The Soldier Creek National Wilderness area, which is directly west of Fort Robinson State Park, is administered by the U.S. Forest Service. The area features primitive camping, fishing, and hunting and has two hiking and horseback trails. Motor vehicles are prohibited beyond the trailhead. The trailhead has corrals, a vault toilet, and water.

Toadstool Park, which is in the Oglala National Grassland, is an unusual area of badland (fig. 24). The unique rock formations in the park developed when cemented soils weathered and eroded at different rates, forming thousands of umbrella-shaped tops and smaller pedestals. Picnic tables, water, and rest rooms are available in the park. Rattlesnakes are common.

Most of the good fishing in Sioux County is on privately owned land, which can be used only by permission. Several privately owned ponds are in scattered areas throughout the county. Spring-fed ponds tend to support trout, while the warmer, runoff-fed ponds generally

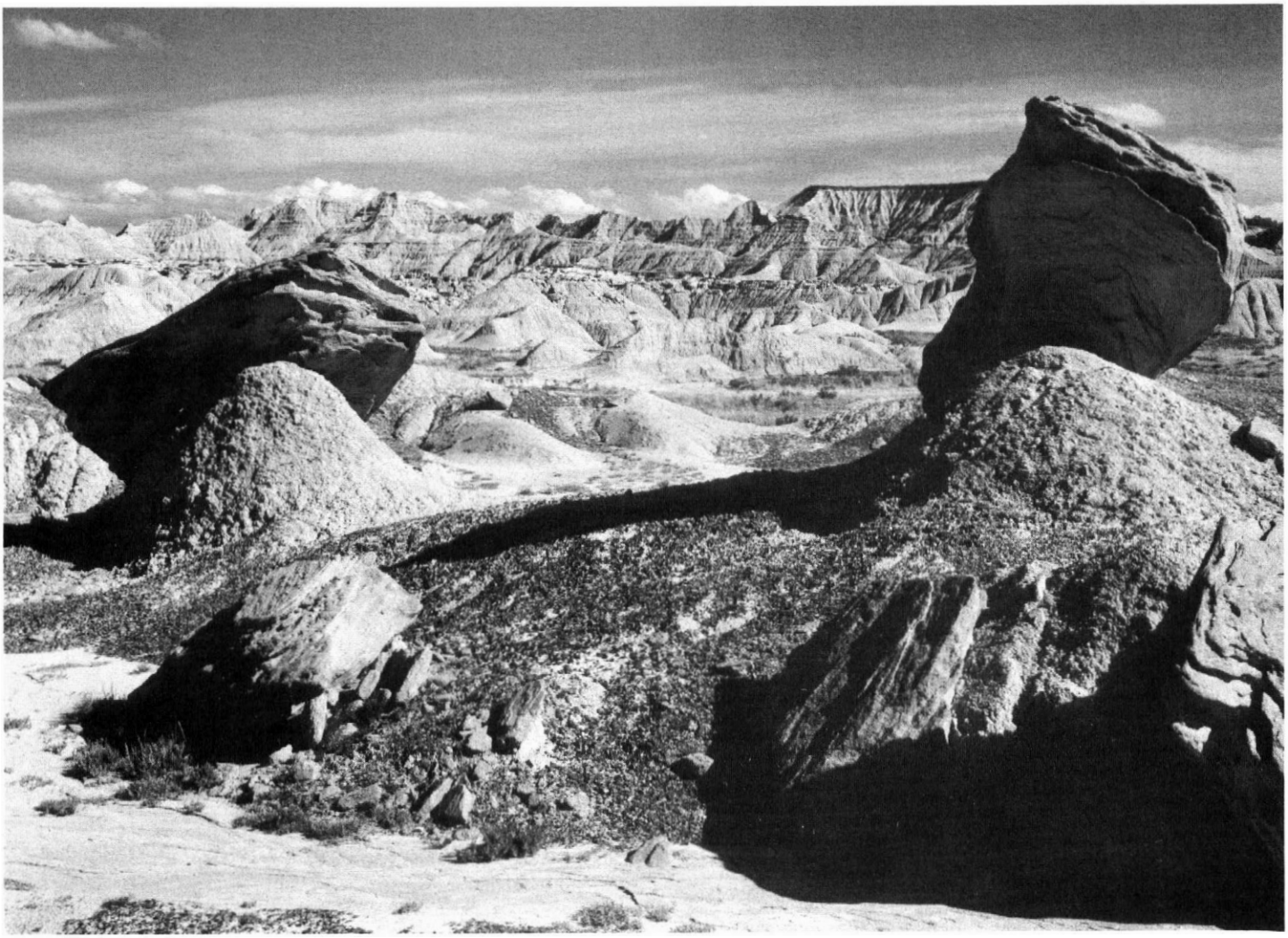

Figure 24.—Toadstool Park, which is part of the Oglala National Grassland.

support bass or bluegill. East and West Hat Creeks, Dry Sheep Creek, Spottedtail and Dry Spottedtail Creeks, and Winters Creek, all of which run entirely through private land, support brook, brown, and rainbow trout.

Several streams in the county are mostly private but have some public access areas. Opportunities for public fishing are available in the Gilbert-Baker State Wildlife Management Area (Monroe Creek); Coffee Park in Sowbelly Canyon (Sowbelly Creek); Fort Robinson State Park (Solder Creek, White River, and various ponds); a small public access area on Sheep Creek; and the Niobrara River at Agate Fossil Beds National Monument. In the Oglala National Grassland, several ponds support largemouth bass, bluegill, and yellow perch. University Lake, which is in the south-central part of the county and is owned by the University of Nebraska, also offers public access.

Hunting for small game, big game, and waterfowl is a popular recreational activity in Sioux County. Small game includes both birds and mammals. Sharp-tailed grouse, cottontail rabbit, fox squirrel, and, in some parts of the county, pheasant are the major small game species subject to harvest. Mourning dove are throughout the county in early fall. The native big game animals that are hunted in the county include mule deer, whitetail deer, and pronghorn antelope. Wild turkeys have been hunted since their successful reintroduction in 1958. The waterfowl hunted in the county include numerous species of ducks and geese.

Recreational trapping of furbearers, such as coyote, beaver, mink, badger, bobcat, red fox, and raccoon, is less common than hunting. Hunting and trapping occur during regular seasons both in public areas, such as the Oglala National Grassland and the State-owned wildlife and recreational areas, and on some private farms and ranches with landowner permission. Fee hunting is

available on some ranches for those who prefer a guided hunt with accommodations.

The soils of the survey area are rated in table 12 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewer lines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for recreational uses by the duration and intensity of flooding and the season when flooding occurs. In planning recreational facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 12, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or a combination of these measures.

The information in table 12 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 15 and interpretations for dwellings without basements and for local roads and streets in table 14.

Camp areas require site preparation, such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils are gently sloping and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing campsites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock or a hardpan should be considered.

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

Technical assistance in improving fish and wildlife habitat and in designing facilities for outdoor recreation is available at the local field office of the Natural Resources Conservation Service in Chadron.

Wildlife Habitat

Edward P. Eitel, natural resources conservationist, and Gerald E. Jasmer, wildlife biologist, Natural Resources Conservation Service, helped prepare this section.

Sioux County has a wide variety of habitat for openland, wetland, woodland, and rangeland wildlife species. The general soil map at the back of this publication provides a guide to the soil associations described in this section and their respective kinds of wildlife habitat.

The Pierre-Samsil, Bufton-Orella-Badland, and Thirtynine-Mitchell-Epping associations consist primarily of rangeland that is used for grazing. The good-quality rangeland in these associations typically supports native short grasses and forbs. Scattered woody vegetation grows along drainageways and stream bottoms. Certain soils support woody shrubs, such as sand sagebrush, silver sagebrush, and greasewood. Mule deer, pronghorn antelope, coyotes, prairie dogs, burrowing owls, golden eagles, sharp-tailed grouse, jackrabbits, small rodents, meadowlarks, and lark bunting inhabit these associations. The associations serve as habitat for the swift fox, a State-listed endangered species, and as potential habitat for the black-footed ferret, a Federally listed endangered species.

The Tassel-Ponderosa-Rock outcrop and Ponderosa-Bridget-Vetal associations consist primarily of rangeland, grazeable woodland, and forest land. Much of the acreage in these associations makes up the area commonly known as the Pine Ridge. Ponderosa pine is a common tree in this area. Other common plants include Rocky Mountain juniper, skunkbush sumac, small soapweed, chokecherry, golden currant, blue grama, Kentucky bluegrass, and little bluestem. Wild turkey, whitetail and mule deer, bobcat, porcupine, turkey vulture, woodpeckers, fox squirrel, and coyote are typical woodland species in areas of these associations. Elk and mountain lions disappeared from this area around the turn

of the century. Recently, elk from Wyoming and South Dakota have reestablished themselves in the area, forming a few small herds. Mountain lions have been observed in the Pine Ridge area on very rare occasions. The recent reintroduction of Rocky Mountain bighorn sheep near Fort Robinson State Park has proved to be rewarding. Successful breeding in the wild has slowly increased the bighorn numbers. The majority of the herd remains near their release site at Fort Robinson.

The Oglala-Canyon, Busher-Tassel-Jayem, Tassel-Busher-Rock outcrop, Tassel-Ashollow-Rock outcrop, and Blueridge-Bayard-Ashollow associations consist primarily of rangeland that is used for grazing. Some of the better soils in these associations are used for small grain or for alfalfa hay. A limited depth to bedrock and low rainfall levels in some years can contribute to low crop yields and a substantial reduction in hay production. The most common grasses on the rangeland are prairie sandreed, western wheatgrass, needleandthread, and blue grama. Shrubs and other woody vegetation include sand sagebrush, fringed sagebrush, and small soapweed. The most common wildlife in areas of these associations are coyote, red-tailed hawk, mule deer, meadowlarks, horned larks, and rattlesnakes. Pronghorn antelope are observed on occasion, and the swift fox and the mountain plover, which is a State-listed threatened species, are observed on very rare occasions.

The Craft-Bufton-Lohmiller and Glenberg-Vetal associations consist primarily of drainageways and riparian areas used for grazing and hay. These areas appear as "ribbons of green" and provide high-quality habitat or have the potential for high-quality habitat. The most common trees in areas of these associations are cottonwood, green ash, willow, boxelder, Russian-olive, and, to a lesser degree, American elm. Many of the drainageways are planted to alfalfa for hay production. These associations have seasonally available water and are therefore very desirable for wintering pronghorn antelope, whitetail and mule deer, wild turkeys, and sharp-tailed grouse.

The Otero-Las Animas-Lisco association is on the bottom land and side slopes along the Niobrara River and Sheep Creek. This association provides a diversity of habitat types that support a rich mixture of wildlife. Shallow water areas, wetlands, shrubs, hardwoods, and wild herbaceous plants are all adjacent to the watercourses. The most common plant species are chokecherry, American plum, snowberry, cottonwood, willow, skunkbush sumac, poison ivy, cattail, and rushes. Waterfowl, herons, shore birds, mink, muskrats, raccoon, coyote, wild turkey, bullsnakes, rattlesnakes, whitetail and mule deer, cottontail rabbits, great horned owl, northern harriers, and small rodents are the most common wildlife. The Niobrara River supports populations of three species of small minnows—the finescale dace, pearl dace, and northern redbelly dace, all of which are threatened in Nebraska.

The Valent and Valent-Ashollow associations are in the sandhills of Sioux County. They consist primarily of rangeland that is used for livestock grazing. The good-quality rangeland habitat in these associations chiefly supports native grasses and forbs. A few woody plants, such as sand sagebrush, grow on certain soils. The typical wildlife species in areas of these associations are sharp-tailed grouse, coyote, mule deer, jackrabbit, meadowlark, bullsnake, small rodents, and pronghorn antelope. The associations also serve as habitat for the swift fox and the mountain plover and as potential habitat for the black-footed ferret.

The Mitchell-Otero-Ashollow and Scoville-Alice-Tripp associations support a mixture of agricultural uses, including rangeland, pasture and hayland, and cropland. The primary crops are winter wheat, irrigated corn, sugar beets, alfalfa, and dry, edible beans. The cropland, irrigation canals, and adjacent grassy borders provide habitat for a variety of openland wildlife, such as pheasant, cottontail rabbit, mourning dove, red fox, and red-tailed hawk.

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Soils and geology influence the availability of natural water. They also affect the potential for the development of water sources. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

In table 13, the soils in the survey area are rated according to their potential for providing habitat for various kinds of wildlife. This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* indicates that the element or kind of habitat is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of *fair* indicates that the element or kind of habitat can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element or kind of habitat. Habitat can be

created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates that restrictions for the element or kind of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.

The elements of wildlife habitat are described in the following paragraphs.

Grain and seed crops are domestic grains and seed-producing herbaceous plants. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flooding. 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. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flooding, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are crested wheatgrass, clover, and alfalfa.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flooding. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are little bluestem, goldenrod, sunflower, wheatgrass, and blue grama.

Hardwood trees and woody understory produce nuts or other fruit, buds, twigs, bark, and foliage. Soil properties and features that affect the growth of hardwood trees and shrubs are depth of the root zone, available water capacity, and wetness. Examples of these plants are oak, hackberry, green ash, and honeylocust. Examples of fruit-producing shrubs that are suitable for planting on soils rated *good* are Russian-olive, American plum, and common chokecherry.

Coniferous plants furnish browse and seeds. Soil properties and features that affect the growth of coniferous trees, shrubs, and ground cover are depth of the root zone, available water capacity, and wetness. Examples of coniferous plants are ponderosa pine, eastern redcedar, and Rocky Mountain juniper.

Shrubs are bushy woody plants that produce fruit, buds, twigs, bark, and foliage. Soil properties and features that affect the growth of shrubs are depth of the root zone, available water capacity, salinity, and soil moisture. Examples of shrubs are Siberian peashrub, Tatarian honeysuckle, and American plum.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Soil properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness. Examples of wetland plants are smartweed, prairie cordgrass, rushes, sedges, and reeds.

Shallow water areas have an average depth of less than 5 feet. Some are naturally wet areas. Others are created by dams, levees, or other water-control structures. Soil properties and features affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. Examples of shallow water areas are marshes, waterfowl feeding areas, and ponds.

The habitat for various kinds of wildlife is described in the following paragraphs.

Habitat for openland wildlife consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. Wildlife attracted to these areas include ring-necked pheasant, prairie grouse, meadowlark, cottontail, and red fox.

Habitat for woodland wildlife consists of areas of deciduous plants or coniferous plants or both and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include wild turkey, deer, squirrels, raccoon, and songbirds.

Habitat for wetland wildlife consists of open, marshy or swampy shallow water areas. Some of the wildlife attracted to such areas are ducks, geese, herons, shore birds, muskrat, mink, and beaver.

Habitat for rangeland wildlife consists of areas of shrubs and wild herbaceous plants. Wildlife attracted to rangeland include antelope, deer, prairie grouse, meadowlark, and coyote.

Technical assistance in improving wildlife habitat is available at the local office of the Natural Resources Conservation Service in Chadron.

Engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. Ratings are given for building site development, sanitary facilities, construction materials, and water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil Properties" section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for

planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations should be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 or 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kinds of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to evaluate the potential of areas for residential, commercial, industrial, and recreational uses; make preliminary estimates of construction conditions; evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; plan detailed onsite investigations of soils and geology; locate potential sources of gravel, sand, earthfill, and topsoil; plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey, can be used to make additional interpretations.

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

Building Site Development

Table 14 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, a cemented pan, or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and depth to the water table.

Dwellings and *small commercial buildings* are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrinking and swelling, and organic layers can cause the movement of footings. A high water table, depth to bedrock or to a cemented pan, large stones, slope, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 or 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material; a base of gravel, crushed rock, or stabilized soil material; and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock or to a cemented pan, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, frost action potential, and depth to a high water table affect the traffic-supporting capacity.

Lawns and landscaping require soils on which turf and

ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil reaction, a high water table, depth to bedrock or to a cemented pan, the available water capacity in the upper 40 inches, and the content of salts, sodium, and sulfidic materials affect plant growth. Flooding, wetness, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

Sanitary Facilities

Table 15 shows the degree and kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 15 also shows the suitability of the soils for use as daily cover for landfill. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock or to a cemented pan, and flooding affect absorption of the effluent. Large stones and bedrock or a cemented pan interfere with installation. The caving of cutbanks is a hazard in areas of sandy soils.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to filter the effluent effectively. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

Table 15 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock or to a cemented pan, flooding, large stones, and content of organic matter.

Excessive seepage resulting from rapid permeability in the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. There are two types of landfill—trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground-water pollution. Ease of excavation and revegetation should be considered.

The ratings in table 15 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock or to a cemented pan, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium affect trench landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, rock fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to soil blowing.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit revegetation. The soil material used as the final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

Construction Materials

Table 16 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a *probable* or *improbable* source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help to determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, a low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have a moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet and have a water table at a depth of less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and *gravel* are natural aggregates suitable for commercial use with a minimum of processing. They are used in many kinds of construction. Specifications for each use vary widely. In table 16, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that is up to 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source. Coarse fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, and toxic material.

Soils rated *good* have friable, loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are low in content of soluble salts, are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable

amount of gravel, stones, or soluble salts, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, have slopes of more than 15 percent, or have a seasonal high water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

Water Management

Table 17 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas and for embankments, dikes, and levees. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect drainage, irrigation, terraces and diversions, and grassed waterways.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock, to a cemented pan, or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; susceptibility to flooding; subsidence of organic layers; and the potential for frost action. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock or to a cemented pan, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as salts, sodium, and sulfur. Availability of drainage outlets is not considered in the ratings.

Irrigation is the controlled application of water to supplement rainfall and support plant growth. The design and management of an irrigation system are affected by depth to the water table, the need for drainage, flooding, available water capacity, intake rate, permeability, erosion hazard, and slope. The construction of a system is affected by large stones and depth to bedrock or to a cemented pan. The performance of a system is affected by the depth of the root zone, the amount of salts or sodium, and soil reaction.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to control erosion and conserve soil moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock or to a cemented pan affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of soil blowing or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock or to a cemented pan affect the construction of grassed waterways. A hazard of soil blowing, low available water capacity, restricted rooting depth, toxic substances such as salts and sodium, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

Soil Properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics. These results are reported in table 21.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help to characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classification, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

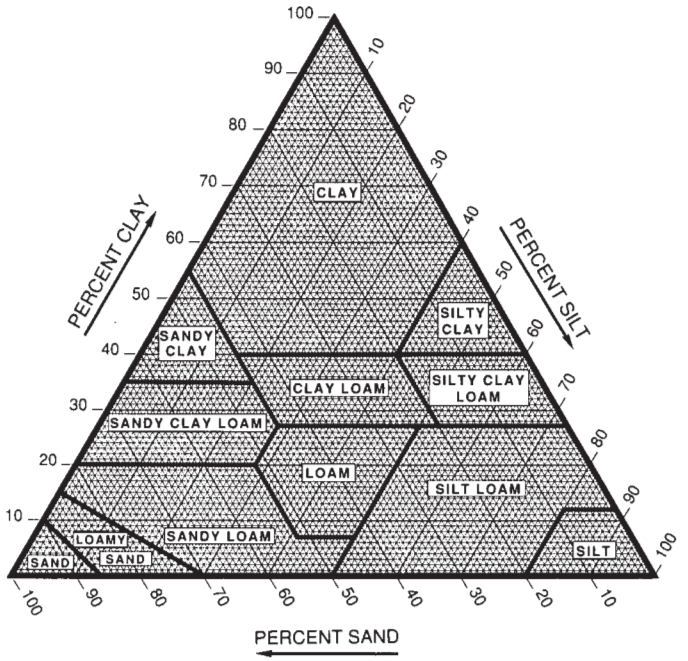

Figure 25.—Percentages of clay, silt, and sand in the basic USDA soil textural classes.

Engineering Index Properties

Table 18 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under the heading "Soil Series and Their Morphology."

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter (fig. 25). "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is as much as about 15 percent, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified soil classification system *(2)* and the system adopted by the American Association of State Highway and Transportation Officials *(1)*.

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, CL-ML.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-

size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. In Nebraska group index numbers range from 4 for the best subgrade material to 32 for the poorest. The AASHTO classification for soils tested, with group index numbers in parentheses, is given in table 21.

Rock fragments 3 to 10 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

The estimates of grain-size distribution, liquid limit, and plasticity index are generally rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is omitted in the table.

Physical and Chemical Properties

Table 19 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earthmoving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at 1/3-bar moisture tension. Weight is determined after drying the soil at 105 degrees C. In this table, the estimated moist bulk density of each major soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. A bulk density of more than 1.6 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems and septic tank absorption fields.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Salinity is a measure of soluble salts in the soil at saturation. It is expressed as the electrical conductivity of the saturation extract, in millimhos per centimeter at 25 degrees C. Estimates are based on field and laboratory measurements at representative sites of nonirrigated soils. The salinity of irrigated soils is affected by the quality of the irrigation water and by the frequency of water application. Hence, the salinity of soils in individual fields can differ greatly from the value given in the table.

Salinity affects the suitability of a soil for crop production, the stability of soil if used as construction material, and the potential of the soil to corrode metal and concrete.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; *high*, more than 6 percent; and *very high*, greater than 9 percent.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.02 to 0.64. Other factors being equal, the higher the value, the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their resistance to soil blowing in cultivated areas. The groups indicate the susceptibility to soil blowing. The soils assigned to group 1 are the most susceptible to soil blowing, and those assigned to group 8 are the least susceptible. The groups are as follows:

1. Coarse sands, sands, fine sands, and very fine sands.
2. Loamy coarse sands, loamy sands, loamy fine sands, loamy very fine sands, ash material, and sapric soil material.
3. Coarse sandy loams, sandy loams, fine sandy loams, and very fine sandy loams.

4L. Calcareous loams, silt loams, clay loams, and silty clay loams.

4. Clays, silty clays, noncalcareous clay loams, and silty clay loams that are more than 35 percent clay.
5. Noncalcareous loams and silt loams that are less than 20 percent clay and sandy clay loams, sandy clays, and hemic soil material.
6. Noncalcareous loams and silt loams that are more than 20 percent clay and noncalcareous clay loams that are less than 35 percent clay.
7. Silts, noncalcareous silty clay loams that are less than 35 percent clay, and fibric soil material.
8. Soils that are not subject to soil blowing because of rock fragments on the surface or because of surface wetness.

Organic matter is the plant and animal residue in the soil at various stages of decomposition. In table 19, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter in a soil can be maintained or increased by returning crop residue to the soil. Organic matter affects the available water capacity, infiltration rate, and tilth. It is a source of nitrogen and other nutrients for crops.

Soil and Water Features

Table 20 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a

claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Flooding, the temporary inundation of an area, is caused by overflowing streams or by runoff from adjacent slopes. Water standing for short periods after rainfall or snowmelt is not considered flooding, and water standing in swamps and marshes is considered ponding rather than flooding.

Table 20 gives the frequency and duration of flooding and the time of year when flooding is most likely.

Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions (the chance of flooding is nearly 0 percent to 5 percent in any year); *occasional* that it occurs, on the average, once or less in 2 years (the chance of flooding is 5 to 50 percent in any year); and *frequent* that it occurs, on the average, more than once in 2 years (the chance of flooding is more than 50 percent in any year). Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, *long* if 7 days to 1 month, and *very long* if more than 1 month. Probable dates are expressed in months. About two-thirds to three-fourths of all flooding occurs during the stated period.

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and little or no horizon development.

Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The estimates are based mainly on observations of the water table at selected sites and on the evidence of a saturated zone, namely grayish colors or mottles (redoximorphic features) in the soil. Indicated in table 20 are the depth to the seasonal high water table, the kind of water table, and the months of the year that the water table commonly is high. A water table that is seasonally high for less than 1 month is not indicated in table 20.

An *apparent* water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil.

Two numbers in the column showing depth to the water table indicate the normal range in depth to a saturated zone. Depth is given to the nearest half foot. The first numeral in the range indicates the highest water level. A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. "More than 6.0" indicates that the water table is below a depth of 6 feet or that it is within a depth of 6 feet for less than a month.

Depth to bedrock is given if bedrock is within a depth of 5 feet. The depth is based on many soil borings and on observations during soil mapping. The rock is either soft or hard. If the rock is soft or fractured, excavations can be made with trenching machines, backhoes, or small rippers. If the rock is hard or massive, blasting or special equipment generally is needed for excavation.

Potential frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, permeability, content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured, clayey soils that have a high water table in winter are the most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage mainly to pavements and other rigid structures.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors results in a severe hazard of corrosion. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low, moderate,* or *high,* is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion is also expressed as *low, moderate,* or *high.* It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

Engineering Index Test Data

Table 21 shows laboratory test data for several pedons sampled at carefully selected sites in the survey area. The pedons are representative of the series described in the section "Soil Series and Their Morphology." The soil samples were tested by the Nebraska Department of Roads.

The testing methods generally are those of the American Association of State Highway and Transportation Officials (AASHTO) or the American Society for Testing and Materials (ASTM).

The tests and methods are AASHTO classification—M 145 (AASHTO), D 3282 (ASTM); Mechanical analysis—T 88 (AASHTO), D 422 (ASTM), D 2217 (ASTM); Liquid limit—T 89 (AASHTO), D 4318 (ASTM); Plasticity index—T 90 (AASHTO), D 4318 (ASTM); and Specific gravity—T 100 (AASHTO). The group index number that is part of the AASHTO classification is computed by the Nebraska Modified System.

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories *(6)*. Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. Table 22 shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

ORDER. Eleven soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Entisol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Aquent (*Aqu*, meaning water, plus *ent*, from Entisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Fluvaquents (*Fluv*, meaning flood plain, plus *aquent*, the suborder of the Entisols that has an aquic moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. An example is Aeric Fluvaquents.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Generally, the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, depth of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is coarse-loamy, mixed (calcareous), mesic Aeric Fluvaquents.

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the substratum can differ within a series.

Soil Series and Their Morphology

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

Characteristics of the soil and the material in which it formed are identified for each series. The soil is compared with similar soils and with nearby soils of other series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the "Soil Survey Manual" *(8)*. Many of the technical terms used in the descriptions are defined in "Soil Taxonomy" *(6)*. Unless otherwise stated, colors in the descriptions are for dry soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units of each soil series are described in the section "Detailed Soil Map Units."

Alice Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderately rapid (2 to 6 inches per hour)
Landform: Stream terraces
Parent material: Loamy and sandy alluvium
Slope range: 0 to 6 percent

Taxonomic class: Coarse-loamy, mixed, mesic Aridic Haplustolls

Typical Pedon

Map unit name: Alice fine sandy loam, 0 to 1 percent slopes
Location: 300 feet west and 1,600 feet north of the southeast corner of sec. 19, T. 25 N., R. 57 W.

Ap—0 to 7 inches; brown (10YR 5/3) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; slightly hard; very friable; neutral; abrupt smooth boundary.
A—7 to 11 inches; brown (10YR 5/3) fine sandy loam, dark grayish brown (10YR 3/2) moist; weak medium granular structure; soft, very friable; mildly alkaline; clear smooth boundary.
Bw—11 to 18 inches; pale brown (10YR 6/3) very fine sandy loam, brown (10YR 5/3) moist; moderate medium subangular blocky structure; soft, very friable; mildly alkaline; clear smooth boundary.
Bk—18 to 26 inches; pale brown (10YR 6/3) very fine sandy loam, brown (10YR 5/3) moist; weak fine subangular blocky structure; common fine accumulations of carbonate; soft, very friable; strong effervescence; clear smooth boundary.
C1—26 to 54 inches; pale brown (10YR 6/3) very fine sandy loam, brown (10YR 5/3) moist; weak coarse prismatic structure; soft, very friable; strong effervescence; moderately alkaline; gradual smooth boundary.
C2—54 to 60 inches; very pale brown (10YR 7/3) loamy fine sand, pale brown (10YR 6/3) moist; massive, soft, very friable; strong effervescence; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 20 inches
Depth to carbonates: 18 to 38 inches
Thickness of the solum: 20 to 45 inches

A horizon:
Value—4 to 6 (2 or 3 moist)
Chroma—2 or 3 (dry or moist)
Texture—fine sandy loam, very fine sandy loam, or loamy fine sand

Bw horizon:
Value—5 to 7 (3 to 5 moist)
Chroma—2 or 3 (dry or moist)
Texture—very fine sandy loam, fine sandy loam, or loamy very fine sand

Bk horizon:
Value—6 to 8 (5 or 6 moist)
Chroma—2 to 4 (dry or moist)
Texture—very fine sandy loam, fine sandy loam, or loamy very fine sand

C horizon:
Value—6 to 8 (5 to 7 moist)
Chroma—2 to 4 (dry or moist)
Texture—fine sandy loam, loamy fine sand, loamy very fine sand, or very fine sandy loam

Alliance Series

Depth class: Deep
Drainage class: Well drained
Permeability: Moderate (0.6 inch to 2.0 inches per hour)
Landform: Hillslopes
Parent material: Loamy loess over calcareous sandstone
Slope range: 1 to 6 percent

Taxonomic class: Fine-silty, mixed, mesic Aridic Argiustolls

Typical Pedon

Map unit name: Alliance loam, 1 to 3 percent slopes
Location: 800 feet west and 350 feet south of the northeast corner of sec. 18, T. 29 N., R. 53 W.

A—0 to 8 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; slightly hard, friable; neutral; clear smooth boundary.
Bt1—8 to 13 inches; grayish brown (10YR 5/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium subangular blocky structure; hard, firm; thin patchy clay films on faces of peds; neutral; clear smooth boundary.
Bt2—13 to 18 inches; brown (10YR 5/3) silty clay loam, dark brown (10YR 4/3) moist; moderate medium subangular blocky structure; hard, firm; thin patchy clay films on faces of peds; neutral; gradual wavy boundary.
BC—18 to 26 inches; pale brown (10YR 6/3) silt loam, brown (10YR 5/3) moist; weak fine subangular blocky structure; slightly hard, friable; mildly alkaline; gradual smooth boundary.
C—26 to 46 inches; pale brown (10YR 6/3) silt loam, brown (10YR 5/3) moist; massive; slightly hard, friable; few fragments of sandstone; strong effervescence; mildly alkaline; gradual wavy boundary.
Cr—46 to 60 inches; very pale brown (10YR 7/3), calcareous sandstone, pale brown (10YR 6/3) moist; strong effervescence.

Range in Characteristics

Depth to paralithic contact: 40 to 60 inches
Thickness of the mollic epipedon: 8 to 18 inches
Depth to carbonates: 16 to 35 inches
Content of clay in the control section: 18 to 35 percent

Thickness of the solum: 16 to 35 inches

A horizon:
Value—4 or 5 (2 or 3 moist)
Chroma—1 or 2 (dry or moist)
Texture—loam, very fine sandy loam, or fine sandy loam

B horizon:
Value—5 or 6 (3 to 5 moist)
Chroma—2 or 3 (dry or moist)
Texture—silty clay loam or loam

C horizon:
Value—6 to 8 (5 or 6 moist)
Chroma—2 or 3 (dry or moist)
Texture—silt loam, loam, or very fine sandy loam

Cr horizon:
Kind of rock—calcareous sandstone

Arvada Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Very slow (less than 0.06 inch per hour)
Landform: Stream terraces
Parent material: Clayey and loamy alluvium and colluvium weathered from sodic shale
Slope range: 0 to 3 percent

Taxonomic class: Fine, montmorillonitic, mesic Ustic Natrargids

Typical Pedon

Map unit name: Arvada loam, 0 to 3 percent slopes
Location: 100 feet north and 2,300 feet east of the southwest corner of sec. 12, T. 34 N., R. 53 W.

E—0 to 1 inch; light brownish gray (10YR 6/2) loam, dark grayish brown (10YR 4/2) moist; weak fine granular structure; slightly hard, friable; moderately alkaline; abrupt smooth boundary.

Btn—1 to 14 inches; olive gray (5Y 5/2) clay, olive (5Y 4/3) moist; moderate medium columnar structure parting to moderate fine blocky; very hard, firm; thin patchy clay films on faces of peds; visible accumulations of salts; strong effervescence; strongly alkaline; clear smooth boundary.

Btnk—14 to 23 inches; light olive gray (5Y 6/2) clay, olive (5Y 4/3) moist; moderate fine subangular blocky structure; very hard, firm; thin patchy clay films on faces of peds; visible accumulations of salts; strong effervescence; moderately alkaline; clear smooth boundary.

Bnky—23 to 60 inches; pale olive (5Y 6/3) clay, olive (5Y 5/3) moist; weak medium and coarse subangular blocky structure; very hard, firm; visible accumulations of salts and carbonate; strong effervescence; moderately alkaline.

Range in Characteristics

Depth to carbonates: 0 to 12 inches
Depth to salts: 0 to 10 inches
Content of clay in the control section: 35 to 60 percent
Thickness of the solum: 40 to 60 inches

E horizon:
Hue—10YR or 2.5Y
Value—5 or 6 (4 or 5 moist)
Chroma—2 to 4 (dry or moist)
Texture—loam or fine sandy loam
Electrical conductivity—0 to 4 mmhos/cm
Sodium adsorption ratio—less than 15

Btn and Btnk horizons:
Hue—2.5Y or 5Y
Value—4 to 6 (4 or 5 moist)
Chroma—2 to 4 (dry or moist)
Texture—clay, silty clay, silty clay loam, or clay loam
Electrical conductivity—0 to 4 mmhos/cm
Sodium adsorption ratio—more than 13
Calcium carbonate equivalent—0 to 12 percent

Bnky horizon:
Hue—2.5Y or 5Y
Value—4 to 6 (4 or 5 moist)
Chroma—2 to 4
Texture—clay, silty clay, silty clay loam, or clay loam
Electrical conductivity—0 to 4 mmhos/cm
Sodium adsorption ratio—8 to 25
Calcium carbonate equivalent—0 to 12 percent

Ashollow Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderately rapid (2 to 6 inches per hour)
Landform: Hillslopes
Position on the landform: Back slopes and foot slopes
Parent material: Residuum weathered from calcareous sandstone
Slope range: 3 to 35 percent

Taxonomic class: Coarse-loamy, mixed (calcareous), mesic Aridic Ustorthents

Typical Pedon

Map unit name: Ashollow loamy very fine sand, 3 to 9 percent slopes
Location: 2,390 feet east and 1,340 feet south of the northwest corner of sec. 22, T. 29 N., R. 56 W.

A—0 to 9 inches; brown (10YR 5/3) loamy very fine sand, dark brown (10YR 4/3) moist; weak fine granular structure; soft, very friable; mildly alkaline; abrupt smooth boundary.
AC—9 to 15 inches; pale brown (10YR 6/3) loamy very fine sand, brown (10YR 5/3) moist; weak fine subangular blocky structure; soft, very friable; strong effervescence; moderately alkaline; gradual smooth boundary.
C—15 to 60 inches; very pale brown (10YR 7/3) loamy very fine sand, pale brown (10YR 6/3) moist; massive; loose; violent effervescence; moderately alkaline.

Range in Characteristics

Depth to carbonates: 0 to 10 inches

A horizon:
Value—4 or 5 (3 or 4 moist)
Chroma—2 or 3 (dry or moist)
Texture—loamy very fine sand, loamy fine sand, or very fine sandy loam

AC horizon:
Value—4 to 6 (4 or 5 moist)
Chroma—2 to 4 (dry or moist)
Texture—loamy very fine sand or very fine sandy loam
Calcium carbonate equivalent—1 to 4 percent

C horizon:
Value—6 to 8 (5 to 7 moist)
Chroma—2 to 4 (dry or moist)
Texture—loamy very fine sand or very fine sandy loam; in some pedons 3 to 10 percent, by volume, gravel-sized sandstone fragments
Calcium carbonate equivalent—1 to 4 percent

Bahl Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Slow (0.06 to 0.2 inch per hour)
Landform: Alluvial fans
Parent material: Clayey alluvium
Slope range: 0 to 6 percent

Taxonomic class: Fine, montmorillonitic (calcareous), mesic Ustertic Torriorthents

Typical Pedon

Map unit name: Bahl clay, 0 to 6 percent slopes
Location: 1,800 feet north and 200 feet west of the southeast corner of sec. 29, T. 39 N., R. 60 W.

A—0 to 5 inches; light brownish gray (2.5Y 6/2) clay, dark grayish brown (2.5Y 4/2) moist; moderate fine granular structure; hard, firm; mildly alkaline; clear smooth boundary.
C—5 to 28 inches; light gray (2.5Y 7/2) clay, grayish brown (2.5Y 5/2) moist; massive; hard, firm; moderately alkaline; strong effervescence; gradual wavy boundary.
Cy—28 to 60 inches; light gray (2.5Y 7/2) clay, light brownish gray (2.5Y 6/2) moist; massive; hard, firm; strongly alkaline; violent effervescence; many very fine soft accumulations of secondary gypsum.

Range in Characteristics

Depth to carbonates: 0 to 10 inches
Content of clay in the control section: 35 to 55 percent
Thickness of the solum: 8 to 21 inches
Other features: Deep, wide cracks are open for less than 8 months per year.

A horizon:
Value—5 to 7 (3 to 5 moist)
Chroma—2 or 3 (dry or moist)
Texture—clay or clay loam
Electrical conductivity—0 to 2 mmhos/cm

C horizon:
Value—5 to 7 (5 or 6 moist)
Chroma—2 to 4 (dry or moist)
Texture—clay or clay loam

Bankard Series

Depth class: Very deep
Drainage class: Somewhat excessively drained
Permeability: Rapid (6 to 20 inches per hour)
Landform: Flood plains
Parent material: Sandy alluvium
Slope range: 0 to 2 percent

Taxonomic class: Sandy, mixed, mesic Ustic Torrifluvents

Typical Pedon

Map unit name: Bankard loamy fine sand, 0 to 2 percent slopes, occasionally flooded
Location: 2,200 feet east and 300 feet south of the northwest corner of sec. 28, T. 35 N., R. 57 W.

A—0 to 4 inches; brown (10YR 5/3) loamy fine sand, dark grayish brown (10YR 4/2) moist; weak fine granular structure; slightly hard, very friable; slight effervescence; moderately alkaline; clear smooth boundary.
C1—4 to 11 inches; pale brown (10YR 6/3) fine sandy loam, dark brown (10YR 4/3) moist; weak medium subangular blocky structure; soft, very friable; strong

effervescence; moderately alkaline; gradual wavy boundary.
C2—11 to 48 inches; pale brown (10YR 6/3), stratified fine sand, brown (10YR 5/3) moist; single grain; loose; strong effervescence; moderately alkaline; gradual wavy boundary.
C3—48 to 60 inches; very pale brown (10YR 7/3), stratified gravelly sand that has 20 percent, by volume, gravel; pale brown (10YR 6/3) moist; single grain; loose; strong effervescence; moderately alkaline.

Range in Characteristics

Depth to unconsolidated material that has rock fragments: 40 to 60 inches
Depth to carbonates: 0 to 6 inches

A horizon:
Hue—2.5Y or 10YR
Value—5 or 6 (3 to 5 moist)
Chroma—2 or 3
Texture—loamy fine sand, fine sandy loam, fine sand, or loam
Content of rock fragments—0 to 15 percent, by volume

C horizon:
Hue—2.5Y or 10YR
Value—5 to 8 (4 to 6 moist)
Chroma—2 to 4
Texture—fine sand, sand, loamy sand, gravelly sand, very gravelly loamy sand, or very gravelly sand
Content of rock fragments—0 to 60 percent, by volume

Bayard Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderately rapid (2 to 6 inches per hour)
Landform: Foot slopes of hillslopes, alluvial fans, and stream terraces
Parent material: Loamy colluvial and alluvial material
Slope range: 0 to 20 percent

Taxonomic class: Coarse-loamy, mixed, mesic Torriorthentic Haplustolls

Typical Pedon

Map unit name: Bayard fine sandy loam, 3 to 6 percent slopes
Location: 1,200 feet east and 350 feet north of the southwest corner of sec. 35, T. 24 N., R. 56 W.

Ap—0 to 6 inches; brown (10YR 5/3) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable; mildly alkaline; abrupt smooth boundary.
A—6 to 14 inches; brown (10YR 5/3) fine sandy loam, dark brown (10YR 3/3) moist; weak fine granular structure; soft, very friable; moderately alkaline; clear smooth boundary.
AC—14 to 19 inches; pale brown (10YR 6/3) fine sandy loam, brown (10YR 4/3) moist; weak fine subangular blocky structure; soft, very friable; slight effervescence; moderately alkaline; clear smooth boundary.
C1—19 to 32 inches; very pale brown (10YR 7/3) fine sandy loam, brown (10YR 5/3) moist; massive; soft, very friable; strong effervescence; moderately alkaline; clear smooth boundary.
C2—32 to 60 inches; light gray (10YR 7/2) loamy very fine sand, pale brown (10YR 6/3) moist; massive; soft, very friable; strong effervescence; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 8 to 20 inches
Depth to carbonates: 8 to 20 inches

A horizon:
Value—4 or 5 (2 or 3 moist)
Chroma—2 or 3 (dry or moist)
Texture—fine sandy loam, very fine sandy loam, or loamy very fine sand

AC horizon:
Value—5 or 6 (3 or 4 moist)
Chroma—2 or 3 (dry or moist)
Texture—fine sandy loam, very fine sandy loam, or loamy very fine sand
Content of rock fragments—0 to 10 percent, by volume

C horizon:
Value—5 to 7 (4 to 6 moist)
Chroma—2 or 3 (dry or moist)
Texture—loamy very fine sand, very fine sandy loam, or fine sandy loam
Content of rock fragments—0 to 15 percent, by volume

Bigwinder Series

Depth class: Very deep
Drainage class: Poorly drained
Permeability: Moderate (0.6 inch to 2.0 inches per hour)
Landform: Flood plains
Parent material: Stratified, loamy and sandy alluvium
Slope range: 0 to 1 percent

Taxonomic class: Coarse-loamy, mixed (calcareous), mesic Aeric Fluvaquents

Typical Pedon

Map unit name: Bigwinder fine sandy loam, 0 to 1 percent slopes
Location: 1,400 feet west and 500 feet north of the southeast corner of sec. 30, T. 24 N., R. 57 W.

A—0 to 4 inches; gray (10YR 5/1) fine sandy loam, very dark gray (10YR 3/1) moist; weak fine granular structure; slightly hard, very friable; strong effervescence; mildly alkaline; clear smooth boundary.
AC—4 to 12 inches; light gray (10YR 7/1) very fine sandy loam, grayish brown (10YR 5/2) moist; common medium distinct brownish yellow (10YR 6/6) mottles; weak coarse subangular blocky structure; slightly hard, very friable; strong effervescence; moderately alkaline; gradual wavy boundary.
C1—12 to 39 inches; light gray (10YR 7/1) loamy very fine sand stratified with fine sandy loam; grayish brown (10YR 5/2) moist; massive; slightly hard, very friable; strong effervescence; moderately alkaline; clear wavy boundary.
C2—39 to 43 inches; light gray (10YR 7/1) very fine sandy loam, grayish brown (10YR 5/2) moist; massive; slightly hard, very friable; strong effervescence; few fine concretions of secondary lime; moderately alkaline; clear smooth boundary.
C3—43 to 60 inches; light gray (10YR 7/1) loamy very fine sand stratified with sandy loam; grayish brown (10YR 5/2) moist; massive; slightly hard, very friable; strong effervescence; moderately alkaline.

Range in Characteristics

Depth to mottles: 0 to 10 inches
Depth to carbonates: 0 to 10 inches

A horizon:
Hue—10YR or 2.5Y
Value—5 to 7 (3 to 5 moist)
Chroma—1 or 2 (dry or moist)
Texture—fine sandy loam

C horizon:
Hue—10YR or 2.5Y
Value—5 to 7 (3 to 6 moist)
Chroma—1 to 3 (dry or moist)
Texture—loamy very fine sand, fine sandy loam, or very fine sandy loam stratified with sand, loamy sand, or sandy loam
Content of rock fragments—0 to 5 percent, by volume

Blueridge Series

Depth class: Very deep
Drainage class: Excessively drained
Permeability: Rapid (6 to 20 inches per hour) in the solum, very rapid (more than 20 inches per hour) in the underlying material
Landform: Hillslopes
Position on the landform: Back slopes, shoulders, and summits
Parent material: Sandy and gravelly material
Slope range: 6 to 50 percent

Taxonomic class: Mixed, mesic Aridic Ustipsamments

Typical Pedon

Map unit name: Blueridge-Bayard complex, 6 to 20 percent slopes
Location: 1,400 feet east and 1,600 feet north of the southwest corner of sec. 5, T. 24 N., R. 56 W.

A—0 to 5 inches; dark grayish brown (10YR 4/2) loamy sand, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable; moderately acid; clear wavy boundary.
C1—5 to 12 inches; brown (10YR 4/3) gravelly coarse sand, dark grayish brown (10YR 4/2) moist; single grain; loose; 30 percent, by volume, gravel; neutral; gradual wavy boundary.
C2—12 to 60 inches; very pale brown (10YR 7/3) gravelly coarse sand, brown (10YR 5/3) moist; single grain; loose; 34 percent, by volume, gravel; strata of gravel with carbonate coatings on the underside of individual pebbles; neutral.

Range in Characteristics

Depth to unconsolidated material that has rock fragments: 0 to 20 inches
Depth to carbonates: 20 to 60 inches
Content of rock fragments in the particle-size control section: 15 to 35 percent

A horizon:
Value—4 or 5 (2 or 3 moist)
Chroma—2 or 3 (dry or moist)
Texture—loamy sand, coarse sand, gravelly sand, loamy coarse sand, or gravelly loamy sand
Content of rock fragments—0 to 35 percent

C horizon:
Hue—10YR or 2.5Y
Value—5 to 8 (3 to 6 moist)
Chroma—2 to 4 (dry or moist)
Texture of the fine-earth fraction—sand or coarse sand

Content of rock fragments—15 to 35 percent

Bridget Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate (0.6 inch to 2.0 inches per hour)
Landform: Hillslopes
Parent material: Loamy colluvial and alluvial sediments
Slope range: 3 to 30 percent

Taxonomic class: Coarse-silty, mixed, mesic Torriorthentic Haplustolls

Typical Pedon

Map unit name: Bridget very fine sandy loam, 6 to 9 percent slopes
Location: 2,600 feet east and 1,600 feet south of the northwest corner of sec. 2, T. 30 N., R. 53 W.

Ap—0 to 8 inches; grayish brown (10YR 5/2) very fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; slightly hard, very friable; neutral; clear smooth boundary.
AC—8 to 15 inches; brown (10YR 5/3) very fine sandy loam, dark brown (10YR 4/3) moist; weak medium subangular blocky structure; slightly hard, very friable; slight effervescence; mildly alkaline; gradual wavy boundary.
C1—15 to 30 inches; light gray (10YR 7/2) very fine sandy loam, brown (10YR 5/3) moist; weak medium prismatic structure; slightly hard, friable; strong effervescence; moderately alkaline; gradual wavy boundary.
C2—30 to 60 inches; light gray (10YR 7/2) very fine sandy loam, brown (10YR 5/3) moist; massive; slightly hard, very friable; strong effervescence; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 20 inches
Depth to carbonates: 0 to 15 inches
Content of clay in the control section: 5 to 18 percent

A horizon:
Value—4 or 5 (2 or 3 moist)
Chroma—1 to 3 (dry or moist)
Texture—very fine sandy loam or loam

AC horizon:
Value—5 to 7 (3 or 4 moist)
Chroma—2 to 4 (dry or moist)
Texture—very fine sandy loam or loam

C horizon:
Value—6 to 8 (4 to 6 moist)
Chroma—2 to 4 (dry or moist)
Texture—very fine sandy loam or loam

Bufton Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Slow (0.06 to 0.2 inch per hour)
Landform: Hillslopes and stream terraces
Parent material: Colluvial and alluvial material weathered from shale
Slope range: 0 to 20 percent

Taxonomic class: Fine, mixed, mesic Aridic Ustochrepts

Typical Pedon

Map unit name: Bufton clay loam, 3 to 9 percent slopes
Location: 4,700 feet west and 600 feet north of the southeast corner of sec. 15, T. 33 N., R. 56 W.

A—0 to 5 inches; grayish brown (10YR 5/2) clay loam, dark grayish brown (10YR 4/2) moist; weak fine granular structure; hard, firm; neutral; clear smooth boundary.
Bw1—5 to 16 inches; brown (10YR 5/3) silty clay loam, dark brown (10YR 4/3) moist; moderate medium subangular blocky structure; hard, firm; strong effervescence; mildly alkaline; clear smooth boundary.
Bw2—16 to 27 inches; brown (10YR 5/3) silty clay loam, dark brown (10YR 4/3) moist; moderate medium and fine subangular blocky structure; hard, firm; strong effervescence; mildly alkaline; clear smooth boundary.
BC—27 to 35 inches; pale brown (10YR 6/3) silty clay loam, brown (10YR 5/3) moist; weak medium subangular blocky structure; hard, firm; strong effervescence; moderately alkaline; gradual wavy boundary.
C—35 to 60 inches; very pale brown (10YR 7/3) clay loam, pale brown (10YR 6/3) moist; massive; hard, firm; strong effervescence; moderately alkaline.

Range in Characteristics

Depth to carbonates: 0 to 9 inches
Content of clay in the control section: 35 to 45 percent
Thickness of the solum: 15 to 40 inches
Other features: Chalcedony fragments are commonly on the surface and throughout the profile; horizons with mollic colors are less than 7 inches thick.

A horizon:
Value—4 to 6 (3 or 4 moist)
Chroma—2
Texture—clay loam, silty clay loam, or silty clay

Bw horizon:
Value—5 to 8 (4 to 7 moist)

Chroma—2 to 4 (dry or moist)
Texture—silty clay loam, clay loam, or clay

BC horizon:
Hue—2.5Y or 10YR
Value—6 to 8 (5 to 7 moist)
Chroma—2 to 4 (dry or moist)
Texture—silty clay loam, clay loam, or silty clay

C horizon:
Hue—2.5Y or 10YR
Value—6 to 8 (5 to 7 moist)
Chroma—2 to 4 (dry or moist)
Texture—clay loam, silty clay loam, silt loam, or silty clay

Busher Series

Depth class: Deep
Drainage class: Well drained
Permeability: Moderately rapid (2 to 6 inches per hour) above paralithic contact
Landform: Hillslopes
Parent material: Residuum weathered from calcareous sandstone
Slope range: 0 to 20 percent

Taxonomic class: Coarse-loamy, mixed, mesic Aridic Haplustolls

Typical Pedon

Map unit name: Busher loamy very fine sand, 3 to 6 percent slopes
Location: 1,650 feet east and 2,200 feet south of the northwest corner of sec. 4, T. 30 N., R. 55 W.

A—0 to 8 inches; dark grayish brown (10YR 4/2) loamy very fine sand, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable; neutral; clear smooth boundary.
Bw—8 to 24 inches; brown (10YR 5/3) loamy very fine sand, dark grayish brown (10YR 4/2) moist; weak coarse prismatic structure parting to moderate medium subangular blocky; soft, very friable; neutral; clear smooth boundary.
C1—24 to 40 inches; pale brown (10YR 6/3) loamy very fine sand, dark brown (10YR 4/3) moist; massive; soft, very friable; strong effervescence; mildly alkaline; clear smooth boundary.
C2—40 to 50 inches; light gray (10YR 7/2) loamy very fine sand, brown (10YR 5/3) moist; massive; soft, very friable; 5 percent, by volume, gravel-sized sandstone fragments; strong effervescence; mildly alkaline; gradual wavy boundary.
Cr—50 to 60 inches; light gray (10YR 7/2), calcareous sandstone; strong effervescence.

Range in Characteristics

Depth to paralithic contact: 40 to 60 inches
Thickness of the mollic epipedon: 7 to 20 inches
Depth to carbonates: 18 to 48 inches
Thickness of the solum: 15 to 40 inches

A horizon:
Value—4 or 5 (2 or 3 moist)
Chroma—2 or 3 (dry or moist)
Texture—loamy very fine sand, very fine sandy loam, or fine sandy loam

Bw horizon:
Value—5 or 6 (4 or 5 moist)
Chroma—2 or 3 (dry or moist)
Texture—loamy very fine sand, fine sandy loam, or very fine sandy loam
Content of rock fragments—0 to 15 percent

C horizon:
Value—5 to 8 (4 to 7 moist)
Chroma—2 or 3 (dry or moist)
Texture—loamy very fine sand, loamy fine sand, fine sandy loam, or very fine sandy loam
Content of rock fragments—0 to 15 percent

Canyon Series

Depth class: Shallow
Drainage class: Well drained
Permeability: Moderate (0.6 inch to 2.0 inches per hour)
Landform: Hillslopes
Position on the landform: Summits and shoulders
Parent material: Residuum weathered from calcareous sandstone
Slope range: 3 to 30 percent

Taxonomic class: Loamy, mixed (calcareous), mesic, shallow Ustic Torriorthents

Typical Pedon

Map unit name: Oglala-Canyon complex, 3 to 9 percent slopes
Location: 500 feet west and 2,250 feet south of the northeast corner of sec. 14, T. 30 N., R. 55 W.

A—0 to 4 inches; brown (10YR 5/3) very fine sandy loam, dark brown (10YR 4/3) moist; weak fine granular structure; slightly hard, very friable; 5 percent, by volume, sandstone gravel; moderately alkaline; strong effervescence; clear smooth boundary.
AC—4 to 10 inches; brown (10YR 5/3) very fine sandy loam, dark brown (10YR 4/3) moist; massive; slightly hard, very friable; 5 percent, by volume, sandstone gravel; moderately alkaline; strong effervescence; clear smooth boundary.

C—10 to 15 inches; pale brown (10YR 6/3) very fine sandy loam, brown (10YR 5/3) moist; massive; slightly hard, very friable; 5 percent, by volume, sandstone gravel; moderately alkaline; violent effervescence; gradual wavy boundary.
Cr—15 to 60 inches; light gray (10YR 7/2), calcareous sandstone.

Range in Characteristics

Depth to paralithic contact: 6 to 20 inches
Depth to carbonates: 0 to 6 inches
Content of clay in the control section: 12 to 20 percent
Content of rock fragments in the control section: 2 to 15 percent
Thickness of the solum: 6 to 12 inches

A horizon:
Value—4 to 7 (3 to 6 moist)
Chroma—2 or 3 (dry or moist)
Texture—very fine sandy loam, loam, or fine sandy loam
Content of rock fragments—0 to 10 percent

AC horizon:
Value—5 to 8 (4 to 7 moist)
Chroma—1 to 3 (dry or moist)
Texture—very fine sandy loam, loam, or fine sandy loam
Content of rock fragments—2 to 15 percent

C horizon:
Value—6 to 8 (4 to 7 moist)
Chroma—2 to 4 (dry or moist)
Texture—very fine sandy loam, loam, or fine sandy loam
Content of rock fragments—2 to 15 percent

Craft Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate (0.6 inch to 2.0 inches per hour)
Landform: River valleys
Position on the landform: Flood plains
Parent material: Loamy alluvium
Slope range: 0 to 2 percent

Taxonomic class: Coarse-silty, mixed (calcareous), mesic Aridic Ustifluvents

Typical Pedon

Map unit name: Craft loam, 0 to 2 percent slopes
Location: 1,000 feet north of the southeast corner of sec. 23, T. 35 N., R. 55 W.

A—0 to 6 inches; brown (10YR 5/3) loam, dark brown (10YR 4/3) moist; weak fine granular structure; slightly hard, friable; strong effervescence; moderately alkaline; clear smooth boundary.
C1—6 to 35 inches; pale brown (10YR 6/3) loam stratified with clay loam and fine sandy loam; brown (10YR 5/3) moist; massive; slightly hard, friable; strong effervescence; moderately alkaline; gradual wavy boundary.
C2—35 to 60 inches; pale brown (10YR 6/3) loam stratified with very fine sandy loam and fine sandy loam; brown (10YR 5/3) moist; massive; slightly hard, friable; strong effervescence; moderately alkaline.

Range in Characteristics

Depth to carbonates: 0 to 10 inches
Content of clay in the control section: 8 to 36 percent
Thickness of the solum: 0 to 10 inches

A horizon:
Hue—2.5Y or 10YR
Value—5 or 6 (3 to 5 moist)
Chroma—2 or 3 (dry or moist)
Texture—loam or silt loam

C horizon:
Hue—10YR or 2.5Y
Value—5 or 6 (4 or 5 moist)
Chroma—2 or 3 (dry or moist)
Texture—loam that has strata ranging from loamy sand to silty clay
Calcium carbonate equivalent—1 to 15 percent

Draknab Series

Depth class: Very deep
Drainage class: Excessively drained
Permeability: Rapid (6 to 20 inches per hour)
Landform: Flood plains
Parent material: Sandy alluvium
Slope range: 0 to 3 percent

Taxonomic class: Sandy, mixed, mesic Ustic Torrifluvents

Typical Pedon

Map unit name: Draknab loamy fine sand, 0 to 3 percent slopes
Location: 450 feet south and 2,000 feet east of the northwest corner of sec. 27, T. 35 N., R. 60 W.

A—0 to 5 inches; brown (10YR 5/3) loamy fine sand, dark brown (10YR 4/3 moist); weak fine granular structure; soft, very friable; slight effervescence; mildly alkaline; clear smooth boundary.
C1—5 to 29 inches; pale brown (10YR 6/3) loamy sand stratified with fine sandy loam; brown (10YR 4/3)

moist; massive; soft, very friable; slight effervescence; moderately alkaline; abrupt smooth boundary.
C2—29 to 60 inches; pale brown (10YR 6/3) coarse sand stratified with loamy fine sand and fine sand; brown (10YR 5/3) moist; massive; soft, very friable; slight effervescence; moderately alkaline.

Range in Characteristics

Depth to paralithic contact: More than 60 inches
Depth to carbonates: 0 to 5 inches

A horizon:
Value—5 or 6 (4 or 5 moist)
Chroma—2 or 3 (dry or moist)
Texture—loamy fine sand or fine sandy loam
Content of rock fragments—0 to 15 percent
Electrical conductivity—2 to 4 mmhos/cm

C horizon:
Value—6 or 7 (4 or 5 moist)
Chroma—2 to 4 (dry or moist)
Texture—coarse sand, sand, or loamy sand stratified with loamy fine sand to very fine sandy loam
Content of rock fragments—1 to 15 percent
Electrical conductivity—2 to 4 mmhos/cm

Epping Series

Depth class: Shallow
Drainage class: Well drained
Permeability: Moderate (0.6 inch to 2.0 inches per hour) above paralithic contact
Landform: Hillslopes
Position on the landform: Summits and shoulders
Parent material: Residuum weathered from calcareous siltstone
Slope range: 3 to 50 percent

Taxonomic class: Loamy, mixed (calcareous), mesic, shallow Ustic Torriorthents

Typical Pedon

Map unit name: Epping-Badland complex, 3 to 50 percent slopes
Location: 1,000 feet east and 1,000 feet south of the northwest corner of sec. 9, T. 32 N., R. 53 W.

A—0 to 4 inches; brown (10YR 5/3) silt loam, dark brown (10YR 4/3) moist; weak fine granular structure; slightly hard, very friable; strong effervescence; mildly alkaline; clear smooth boundary.
AC—4 to 9 inches; pale brown (10YR 6/3) silt loam, brown (10YR 5/3) moist; weak fine subangular blocky structure; slightly hard, very friable; strong effervescence; moderately alkaline; clear smooth boundary.
C—9 to 18 inches; pale brown (10YR 6/3) silt loam, brown (10YR 5/3) moist; massive; slightly hard, very friable; 10 percent, by volume fragments of siltstone; strong effervescence; moderately alkaline; clear smooth boundary.
Cr—18 to 60 inches; white (10YR 8/2) siltstone, very pale brown (10YR 7/3) moist; strong effervescence.

Range in Characteristics

Depth to paralithic contact: 10 to 20 inches
Depth to carbonates: 0 to 6 inches
Content of clay in the control section: 15 to 30 percent
Content of rock fragments in the control section: 1 to 15 percent
Thickness of the solum: 10 to 20 inches

A horizon:
Value—6 or 7 (3 or 4 moist)
Chroma—2 or 3 (dry or moist)
Texture—silt loam, loam, or very fine sandy loam
Calcium carbonate equivalent—1 to 10 percent

AC horizon:
Value—5 or 6 (4 or 5 moist)
Chroma—2 or 3 (dry or moist)
Texture—silt loam, loam, or very fine sandy loam
Content of rock fragments—0 to 15 percent
Calcium carbonate equivalent—1 to 10 percent

C horizon:
Value—5 to 7 (4 or 5 moist)
Chroma—2 or 3 (dry or moist)
Texture—silt loam, loam, or very fine sandy loam
Content of rock fragments—1 to 15 percent
Calcium carbonate equivalent—1 to 10 percent

Glenberg Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderately rapid (2 to 6 inches per hour)
Landform: Flood plains
Parent material: Loamy alluvium
Slope range: 0 to 2 percent

Taxonomic class: Coarse-loamy, mixed (calcareous), mesic Ustic Torrifluvents

Typical Pedon

Map unit name: Glenberg fine sandy loam, 0 to 2 percent slopes
Location: 1,300 feet west and 200 feet south of the northeast corner of sec. 28, T. 35 N., R. 57 W.

A—0 to 5 inches; brown (10YR 5/3) fine sandy loam, dark grayish brown (10YR 4/2) moist; weak fine granular

structure; slightly hard, very friable; strong effervescence; moderately alkaline; clear smooth boundary.

C—5 to 60 inches; pale brown (10YR 6/3) fine sandy loam stratified with thin layers of very fine sandy loam, silt loam, and gravelly sandy loam; brown (10YR 5/3) moist; 17 percent gravel, by volume; massive; soft, very friable; strong effervescence; strongly alkaline.

Range in Characteristics

Depth to carbonates: 0 to 6 inches
Content of rock fragments in the control section: 0 to 15 percent
Thickness of the solum: 4 to 8 inches

A horizon:
Hue—10YR or 2.5Y
Value—5 or 6 (3 or 4 moist)
Chroma—2 or 3 (dry or moist)
Texture—fine sandy loam or sandy loam
Content of rock fragments—0 to 5 percent

C horizon:
Hue—2.5Y or 10YR
Value—6 or 7 (4 or 5 moist)
Chroma—2 or 3 (dry or moist)
Texture—fine sandy loam or sandy loam stratified with silt loam or with loamy fine sand to silty clay loam
Content of rock fragments—1 to 15 percent, by volume

Hisle Series

Depth class: Moderately deep
Drainage class: Well drained
Permeability: Very slow (less than 0.06 inch per hour) above paralithic contact
Landform: Hillslopes
Position on the landform: Shoulders, back slopes, and foot slopes
Parent material: Residuum weathered from shale
Slope range: 0 to 6 percent

Taxonomic class: Fine, montmorillonitic, mesic Ustollic Natrargids

Typical Pedon

Map unit name: Hisle-Slickspots complex, 0 to 6 percent slopes
Location: 2,300 feet east and 1,100 feet north of the southwest corner of sec. 23, T. 34 N., R. 53 W.

E—0 to 2 inches; grayish brown (10YR 5/2) loam, dark grayish brown (10YR 4/2) moist; weak fine granular structure; soft, friable; slightly acid; abrupt smooth boundary.

Bt1—2 to 5 inches; light olive brown (2.5Y 5/4) clay, dark grayish brown (2.5Y 4/2) moist; strong medium columnar structure parting to strong medium blocky; extremely hard, very firm; thin patchy clay films on faces of peds; slight effervescence; mildly alkaline; abrupt wavy boundary.

Bt2—5 to 11 inches; olive (5Y 5/3) clay, olive (5Y 4/3) moist; strong medium blocky structure; extremely hard, very firm; thin patchy clay films on faces of peds; strong effervescence; strongly alkaline; clear smooth boundary.

Bt3—11 to 18 inches; olive gray (5Y 5/2) clay, olive (5Y 4/3) moist; strong medium subangular blocky structure; very hard, very firm; thin patchy clay films on faces of peds; strong effervescence; strongly alkaline; clear wavy boundary.

BCkz—18 to 27 inches; pale olive (5Y 6/3) clay, grayish brown (2.5Y 5/2) moist; strong medium subangular blocky structure; very hard, very firm; visible accumulations of carbonate and salts; strong effervescence; moderately alkaline; gradual wavy boundary.

Cr—27 to 60 inches; light yellowish brown (2.5Y 6/4), bedded clay shale, light olive brown (2.5Y 5/4) moist; moderately alkaline.

Range in Characteristics

Depth to paralithic contact: 20 to 40 inches
Depth to carbonates: 0 to 6 inches
Content of clay in the control section: 35 to 59 percent
Thickness of the solum: 6 to 26 inches
Other features: Most pedons have accumulations of carbonate and salts in the lower part.

E horizon:
Hue—2.5Y or 10YR
Value—5 to 8 (4 or 5 moist)
Chroma—1 or 2 (dry or moist)
Texture—loam or silt loam

Bt horizon:
Hue—2.5Y or 10YR
Value—5 to 7 (4 to 6 moist)
Chroma—2 to 4 (dry or moist)
Texture—clay or silty clay
Electrical conductivity—2 to 16 mmhos/cm
Calcium carbonate equivalent—1 to 10 percent

BCkz horizon:
Hue—10YR to 5Y
Value—5 to 8 (3 to 5 moist)
Chroma—1 to 4 (dry or moist)
Texture—silty clay or clay
Content of rock fragments—0 to 15 percent
Electrical conductivity—2 to 16 mmhos/cm
Sodium adsorption ratio—2 to 13

Calcium carbonate equivalent—1 to 15 percent

C horizon (if it occurs):
Hue—2.5Y or 5Y
Value—5 to 8 (3 to 5 moist)
Chroma—2 to 4 (dry or moist)
Texture—clay
Content of rock fragments—5 to 50 percent
Electrical conductivity—2 to 16 mmhos/cm
Sodium adsorption ratio—5 to 20
Calcium carbonate equivalent—1 to 10 percent

Cr horizon:
Hue—2.5Y or 5Y
Value—5 to 8 (3 to 5 moist)
Chroma—1 to 4 (dry or moist)
Kind of rock—shale

Interior Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate (0.6 inch to 2.0 inches per hour)
Landform: Flood plains
Parent material: Silty alluvium
Slope range: 0 to 3 percent

Taxonomic class: Fine-silty, mixed (calcareous), mesic Ustic Torrifluvents

Typical Pedon

Map unit name: Interior silty clay, channeled, 0 to 2 percent slopes
Location: 1,000 feet west and 800 feet north of the southeast corner of sec. 10, T. 34 N., R. 54 W.

A—0 to 6 inches; light gray (10YR 7/2) silty clay, grayish brown (10YR 5/2) moist; moderate medium subangular blocky structure; slightly hard, very friable; strong effervescence; strongly alkaline; clear smooth boundary.
AC—6 to 13 inches; light gray (10YR 7/2) silty clay loam, grayish brown (10YR 5/2) moist; weak thin platy structure parting to weak fine subangular blocky; slightly hard, friable; violent effervescence; strongly alkaline; gradual wavy boundary.
C—13 to 60 inches; light gray (10YR 7/2) silt loam stratified with very fine sandy loam; grayish brown (10YR 5/2) moist; massive; soft, very friable; violent effervescence; strongly alkaline.

Range in Characteristics

Depth to carbonates: 0 to 3 inches
Content of clay in the control section: 20 to 35 percent

A horizon:
Hue—10YR or 7.5YR
Value—5 to 8 (4 to 7 moist)
Chroma—1 to 3 (dry or moist)
Texture—silty clay loam, silty clay, or silt loam
Electrical conductivity 0 to 2 mmhos/cm
Sodium adsorption ratio—10 to 25
Calcium carbonate equivalent—1 to 10 percent

AC horizon:
Hue—10YR or 7.5YR
Value—5 to 8 (4 to 7 moist)
Chroma—1 to 3 (dry or moist)
Texture—silty clay loam or silt loam
Electrical conductivity—1 to 4 mmhos/cm
Sodium adsorption ratio—10 to 25
Calcium carbonate equivalent—1 to 10 percent

C horizon:
Hue—10YR or 7.5YR
Value—5 to 8 (4 to 7 moist)
Chroma—1 to 3 (dry or moist)
Texture—stratified silt loam, loam, very fine sandy loam, or silty clay loam
Electrical conductivity—1 to 4 mmhos/cm
Sodium adsorption ratio—10 to 35
Calcium carbonate equivalent—1 to 10 percent

Jayem Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderately rapid (2 to 6 inches per hour)
Landform: Hillslopes
Position on the landform: Summits, shoulders, and back slopes
Parent material: Loamy and sandy eolian material
Slope range: 0 to 9 percent

Taxonomic class: Coarse-loamy, mixed, mesic Aridic Haplustolls

Typical Pedon

Map unit name: Jayem loamy very fine sand, 0 to 3 percent slopes
Location: 1,500 feet west and 500 feet south of the northeast corner of sec. 16, T. 29 N., R. 57 W.

A1—0 to 8 inches; dark brown (10YR 4/3) loamy very fine sand, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable; neutral; clear smooth boundary.
A2—8 to 18 inches; brown (10YR 5/3) loamy very fine sand, dark brown (10YR 3/3) moist; weak coarse

prismatic structure parting to weak fine subangular blocky; soft, very friable; mildly alkaline; clear smooth boundary.

Bw—18 to 32 inches; brown (10YR 5/3) loamy very fine sand, dark brown (10YR 4/3) moist; moderate coarse prismatic structure parting to moderate medium subangular blocky; soft, very friable; mildly alkaline; clear smooth boundary.

C—32 to 60 inches; pale brown (10YR 6/3) loamy very fine sand, brown (10YR 5/3) moist; weak coarse prismatic structure; soft, very friable; mildly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 19 inches
Depth to carbonates: 40 to 60 inches
Thickness of the solum: 15 to 40 inches

A horizon:
Value—4 or 5 (2 or 3 moist)
Chroma—2 or 3 (dry or moist)
Texture—loamy very fine sand, very fine sandy loam, or fine sandy loam

Bw horizon:
Value—5 or 6 (3 to 5 moist)
Chroma—2 to 4 (dry or moist)
Texture—loamy very fine sand or very fine sandy loam

C horizon:
Value—6 or 7 (5 or 6 moist)
Chroma—2 to 4 (dry or moist)
Texture—loamy very fine sand or very fine sandy loam

Keith Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate (0.6 inch to 2.0 inches per hour)
Landform: Hillslopes
Parent material: Loess
Slope range: 1 to 6 percent

Taxonomic class: Fine-silty, mixed, mesic Aridic Argiustolls

Typical Pedon

Map unit name: Keith loam, 1 to 3 percent slopes (fig. 26)
Location: 1,200 feet south and 2,600 feet west of the northeast corner of sec. 35, T. 32 N., R. 54 W.

A—0 to 9 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; slightly hard, friable; neutral; clear smooth boundary.

Bt1—9 to 18 inches; brown (10YR 5/3) silty clay loam, dark brown (10YR 4/3) moist; weak coarse prismatic structure parting to moderate medium subangular blocky; hard, firm; thin patchy clay films on faces of peds; neutral; clear smooth boundary.

Bt2—18 to 26 inches; pale brown (10YR 6/3) silty clay loam, dark brown (10YR 4/3) moist; weak coarse prismatic structure parting to moderate fine subangular blocky; hard, firm; thin patchy clay films on faces of peds; mildly alkaline; clear smooth boundary.

BC—26 to 36 inches; pale brown (10YR 6/3) silt loam, brown (10YR 5/3) moist; weak fine subangular blocky structure; slightly hard, friable; mildly alkaline; clear wavy boundary.

C—36 to 60 inches; very pale brown (10YR 7/3) silt loam, pale brown (10YR 6/3) moist; massive; slightly hard, friable; strong effervescence; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 18 inches
Depth to carbonates: 15 to 33 inches
Content of clay in the control section: 18 to 35 percent
Thickness of the solum: 15 to 48 inches

A horizon:
Value—4 or 5 (2 or 3 moist)
Chroma—1 or 2 (dry or moist)
Texture—loam, silt loam, or very fine sandy loam

Bt horizon:
Value—value of 4 to 6 (2 to 5 moist)
Chroma—2 to 4 (dry or moist)
Texture—silty clay loam, silt loam, loam, or clay loam

C horizon:
Value—6 to 8 (5 or 6 moist)
Chroma—2 or 3 (dry or moist)
Texture—silt loam, loam, or very fine sandy loam

Kyle Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Very slow (less than 0.06 inch per hour)
Landform: Hillslopes and stream terraces
Parent material: Clayey sediments weathered from shale
Slope range: 0 to 6 percent

Taxonomic class: Very fine, montmorillonitic, mesic Adidic Haplusterts

Typical Pedon

Map unit name: Kyle silty clay, 0 to 1 percent slopes
Location: 600 feet east and 2,500 feet north of the southwest corner of sec. 8, T. 34 N., R. 54 W.

A—0 to 4 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; weak fine subangular blocky structure; extremely hard, very firm; strong effervescence; mildly alkaline; clear smooth boundary.
Bw—4 to 28 inches; light brownish gray (2.5Y 6/2) clay, grayish brown (2.5Y 5/2) moist; moderate medium prismatic structure parting to strong medium blocky; very hard, very firm; few intersecting slickensides; strong effervescence; moderately alkaline; clear smooth boundary.
BC—28 to 37 inches; light olive gray (5Y 6/2) clay, olive (5Y 5/3) moist; moderate medium subangular blocky structure; very hard, very firm; few intersecting slickensides; strong effervescence; moderately alkaline; clear smooth boundary.
Cky—37 to 60 inches; light olive gray (5Y 6/2) clay, olive (5Y 5/3) moist; massive; very hard, very firm; common fine accumulations of carbonate and gypsum; strong effervescence; moderately alkaline.

Range in Characteristics

Depth to carbonates: 0 to 6 inches
Content of clay in the control section: 60 to 65 percent
Thickness of the solum: 18 to 40 inches
Other features: Cracks 0.5 inch to 2 inches wide and several feet long extend downward in the solum when the soils are dry.

A horizon:
Hue—2.5Y or 5Y
Value—5 or 6 (3 or 4 moist)
Chroma—1 to 3 (dry or moist)
Texture—silty clay or clay

B horizon:
Hue—2.5Y or 5Y
Value—5 or 6 (4 or 5 moist)
Chroma—1 to 3 (dry or moist)
Texture—clay

C horizon:
Hue—2.5Y or 5Y
Value—5 or 6 (4 or 5 moist)
Chroma—2 or 3 (dry or moist)
Texture—clay

Las Animas Series

Depth class: Very deep
Drainage class: Somewhat poorly drained
Permeability: Moderately rapid (2 to 6 inches per hour)
Landform: Flood plains
Parent material: Loamy alluvium
Slope range: 0 to 2 percent

Taxonomic class: Coarse-loamy, mixed (calcareous), mesic Typic Fluvaquents

Typical Pedon

Map unit name: Las Animas-Lisco complex, 0 to 2 percent slopes, occasionally flooded
Location: 1,000 feet east and 2,640 feet north of the southwest corner of sec. 2, T. 28 N., R. 54 W.

A—0 to 6 inches; light brownish gray (2.5Y 6/2) very fine sandy loam, dark grayish brown (2.5Y 4/2) moist; weak fine granular structure; slightly hard, very friable; strong effervescence; moderately alkaline; clear smooth boundary.
ACg—6 to 12 inches; light brownish gray (2.5Y 6/2) very fine sandy loam, dark grayish brown (2.5Y 4/2) moist; weak coarse subangular blocky structure; slightly hard, very friable; strong effervescence; moderately alkaline; clear smooth boundary.
Cg—12 to 60 inches; light gray (2.5Y 7/2) very fine sandy loam stratified with 1- to 3-inch layers of loam and loamy very fine sand; grayish brown (2.5Y 5/2) moist; common fine distinct yellow (10YR 7/8) mottles; massive; slightly hard, very friable; strong effervescence; moderately alkaline.

Range in Characteristics

Depth to mottles: 10 to 20 inches
Depth to carbonates: 0 to 10 inches
Thickness of the solum: 4 to 16 inches

A horizon:
Hue—2.5Y, 10YR, or N
Value—4 to 6 (3 or 4 moist)
Chroma—0 to 2 (dry or moist)
Texture—very fine sandy loam, fine sandy loam, or loamy fine sand

AC and C horizons:
Hue—2.5Y or 10YR
Value—3 to 7 (5 or 6 moist)
Chroma—1 to 3 (dry or moist)
Texture—very fine sandy loam, fine sandy loam, or loamy very fine sand with strata of loam, loamy very fine sand, fine sand, or loamy sand
Content of rock fragments—0 to 10 percent, by volume

Lisco Series

Depth class: Very deep
Drainage class: Somewhat poorly drained
Permeability: Moderately rapid (2 to 6 inches per hour)

Figure 26.—Typical profile of Keith loam. The upper arrow indicates the bottom of the tillage layer, the middle arrow indicates the bottom of the surface layer, and the lower arrow indicates the bottom of the subsoil. Depth is marked in feet.

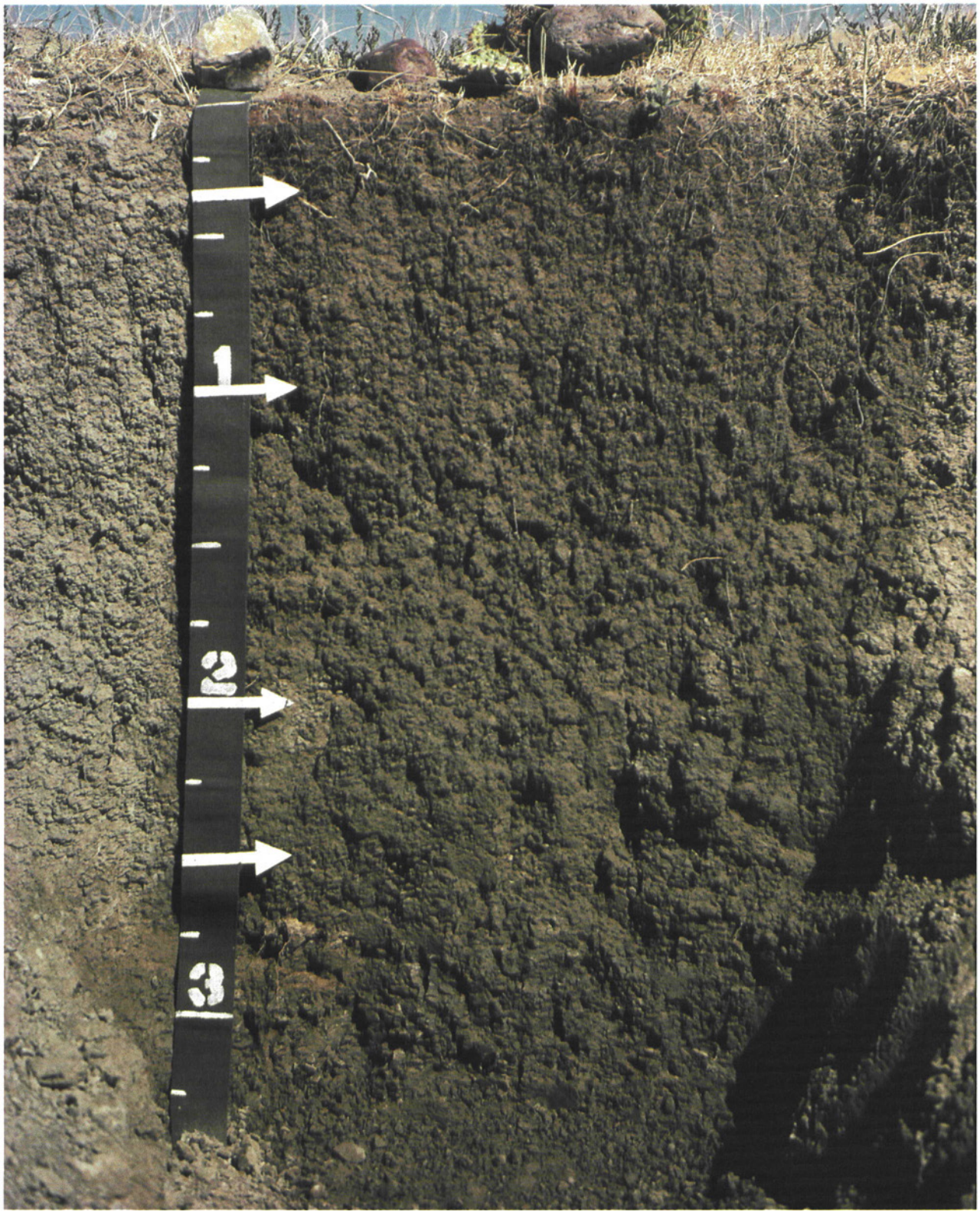

Figure 27.—Typical profile of Pierre clay. The upper arrow indicates the bottom of the surface layer. The lowest arrow indicates the depth to shale, which is 30 inches. Depth is marked in feet.

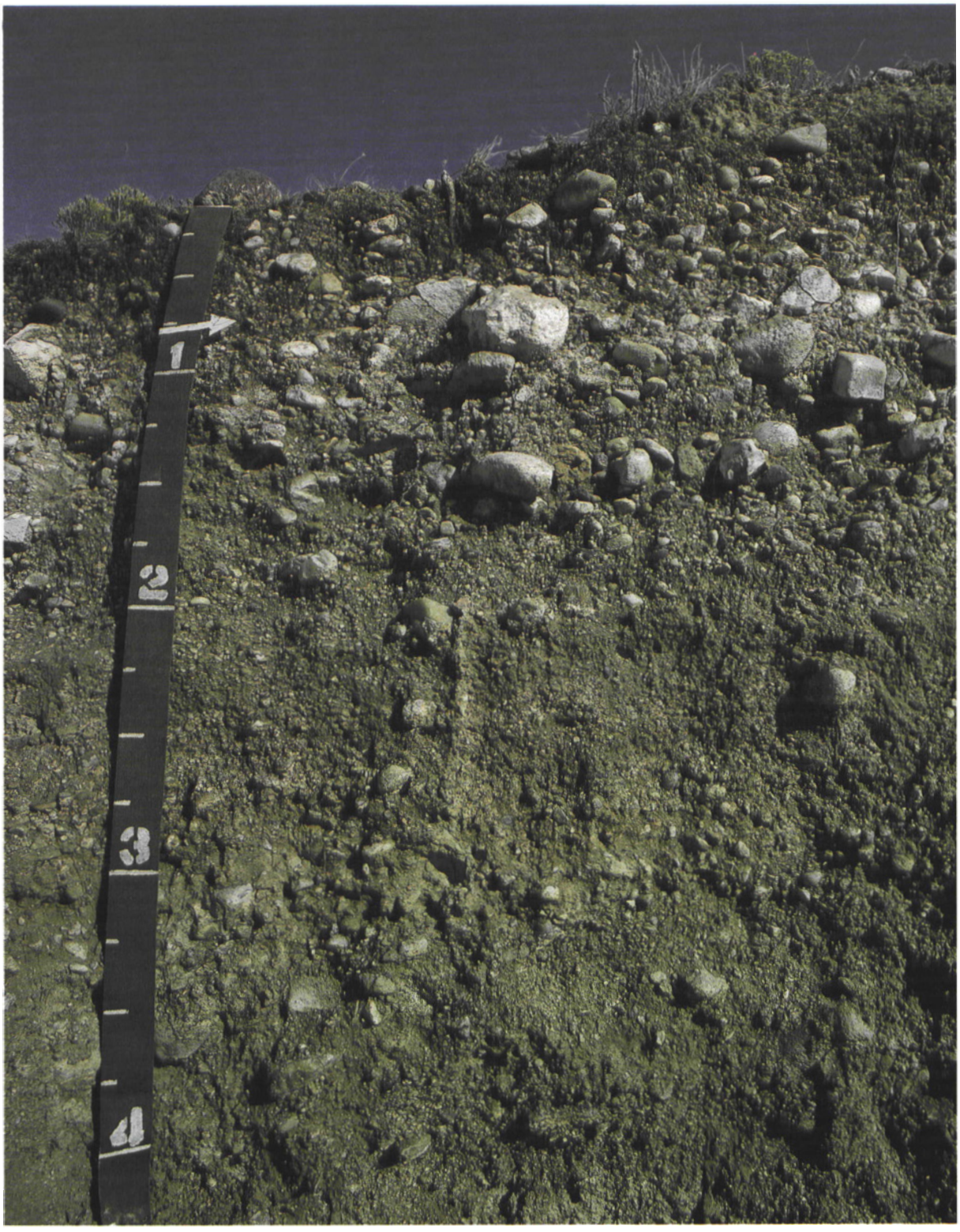

Figure 28.—Typical profile of Schamber gravelly sandy loam. The arrow indicates the bottom of the surface layer and the depth to very gravelly sand. Depth is marked in feet.

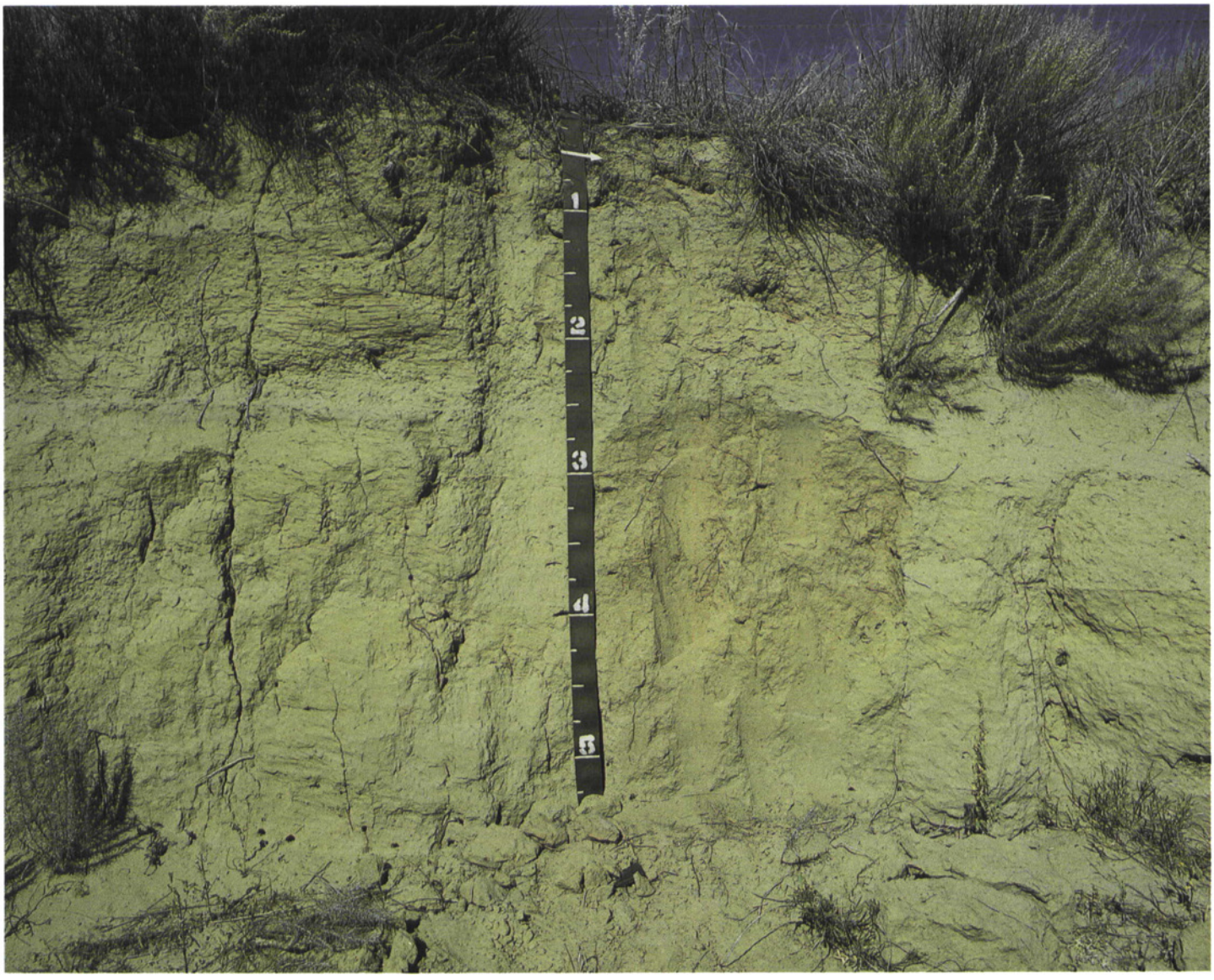

Figure 29.—Typical profile of Valent fine sand, which is characterized by little profile development. The arrow indicates the bottom of the surface layer. Depth is marked in feet.

Landform: Flood plains
Parent material: Loamy alluvium
Slope range: 0 to 2 percent

Taxonomic class: Coarse-loamy, mixed (calcareous), mesic Typic Halaquepts

Typical Pedon

Map unit name: Las Animas-Lisco complex, 0 to 2 percent slopes, occasionally flooded
Location: 200 feet west and 1,600 feet north of the southeast corner of sec. 2, T. 28 N., R. 54 W.

A—0 to 6 inches; light brownish gray (10YR 6/2) very fine sandy loam, dark grayish brown (10YR 4/2) moist; weak fine granular structure; slightly hard, very friable; strongly alkaline; strong effervescence; clear smooth boundary.
Bw1—6 to 19 inches; light brownish gray (10YR 6/2) loamy very fine sand, dark grayish brown (10YR 4/2) moist; weak fine subangular blocky structure; slightly hard, very friable; very strongly alkaline; strong effervescence; clear smooth boundary.
Bw2—19 to 25 inches; light brownish gray (10YR 6/2) loamy very fine sand, dark grayish brown (10YR 4/2) moist; common medium distinct yellow (10YR 7/6) mottles; moderate medium subangular blocky structure; slightly hard, very friable; very strongly alkaline; strong effervescence; clear smooth boundary.
C1—25 to 38 inches; light gray (10YR 7/2) loamy very fine sand, grayish brown (10YR 5/2) moist; common medium distinct yellow (10YR 7/6) mottles; massive; slightly hard, very friable; very strongly alkaline; strong effervescence; gradual wavy boundary.
C2—38 to 60 inches; light gray (10YR 6/1) loam stratified with very fine sandy loam; dark gray (10YR 4/1) moist; common medium distinct yellow (10YR 7/6) mottles; massive; slightly hard, very friable; very strongly alkaline; strong effervescence.

Range in Characteristics

Depth to mottles: 20 to 40 inches
Depth to carbonates: 0 to 10 inches
Thickness of the solum: 10 to 44 inches

A horizon:
Value—5 to 7 (3 to 5 moist)
Chroma—1 or 2 (dry or moist)
Texture—very fine sandy loam, silt loam, sandy loam, or fine sandy loam
Electrical conductivity—0 to 4 mmhos/cm
Sodium adsorption ratio—0 to 10
Calcium carbonate equivalent—0 to 10 percent

Bw horizon:
Hue—10YR or 2.5Y
Value—5 to 7 (3 to 5 moist)
Chroma—1 or 2 (dry or moist)
Texture—very fine sandy loam, sandy loam, fine sandy loam, loamy very fine sand, or loam
Electrical conductivity—8 to 20 mmhos/cm
Sodium adsorption ratio—2 to 13
Calcium carbonate equivalent—2 to 15 percent

C horizon:
Hue—10YR or 2.5Y
Value—6 to 8 (4 to 7 moist)
Chroma—1 to 3 (dry or moist)
Texture—very fine sandy loam, sandy loam, fine sandy loam, loamy very fine sand, loam, or loamy fine sand
Content of rock fragments—0 to 15 percent, by volume
Electrical conductivity—0 to 4 mmhos/cm
Sodium adsorption ratio—1 to 10
Calcium carbonate equivalent—1 to 15 percent

Lohmiller Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Slow (0.06 to 0.2 inch per hour)
Landform: Flood plains
Parent material: Clayey alluvium
Slope range: 0 to 2 percent

Taxonomic class: Fine, montmorillonitic (calcareous), mesic Ustic Torrifluvents

Typical Pedon

Map unit name: Lohmiller silty clay loam, channeled, 0 to 2 percent slopes
Location: 1,100 feet south and 1,800 feet west of the northeast corner of sec. 15, T. 34 N., R. 53 W.

A—0 to 6 inches; grayish brown (10YR 5/2) silty clay loam, dark brown (10YR 4/3) moist; moderate fine granular structure; hard, friable; mildly alkaline; clear smooth boundary.
C1—6 to 10 inches; pale brown (10YR 6/3) silty clay loam, brown (10YR 5/3) moist; thin platy structure; hard, firm; strong effervescence; moderately alkaline; clear smooth boundary.
C2—10 to 60 inches; light brownish gray (2.5Y 6/2) silty clay loam stratified with loam and clay loam; grayish brown (2.5Y 5/2) moist; massive; hard, friable; strong effervescence; moderately alkaline.

Range in Characteristics

Depth to carbonates: 0 to 10 inches
Content of clay in the control section: 35 to 50 percent

A horizon:
Hue—10YR or 2.5Y
Value—5 or 6 (4 or 5 moist)
Chroma—2 or 3 (dry or moist)
Texture—silty clay loam, clay loam, or silty clay

C horizon:
Hue—10YR or 2.5Y
Value—5 to 7 (4 to 6 moist)
Chroma—2 or 3
Texture—silty clay loam, clay loam, or clay stratified with thin layers of fine sandy loam, loam, or silt loam

Mitchell Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate (0.6 inch to 2.0 inches per hour)
Landform: Hillslopes and alluvial fans
Parent material: Colluvial and alluvial material weathered from calcareous siltstone
Slope range: 0 to 30 percent

Taxonomic class: Coarse-silty, mixed (calcareous), mesic Ustic Torriorthents

Typical Pedon

Map unit name: Mitchell silt loam, 6 to 9 percent slopes
Location: 1,300 feet west and 2,250 feet south of the northeast corner of sec. 4, T. 32 N., R. 53 W.

A—0 to 5 inches; pale brown (10YR 6/3) silt loam, dark brown (10YR 4/3) moist; weak fine granular structure; slightly hard, friable; mildly alkaline; clear smooth boundary.
AC—5 to 15 inches; pale brown (10YR 6/3) loam, brown (10YR 5/3) moist; weak medium subangular blocky structure; slightly hard, very friable; strong effervescence; moderately alkaline; clear smooth boundary.
C1—15 to 38 inches; pale brown (10YR 6/3) silt loam, brown (10YR 5/3) moist; massive; slightly hard, very friable; violent effervescence; moderately alkaline; gradual wavy boundary.
C2—38 to 60 inches; very pale brown (10YR 7/3) silt loam, pale brown (10YR 6/3) moist; massive; slightly hard, very friable; violent effervescence; moderately alkaline.

Range in Characteristics

Depth to paralithic contact: More than 60 inches
Content of clay in the control section: 8 to 18 percent
Depth to carbonates: 0 to 10 inches
Thickness of the solum: 7 to 24 inches

A horizon:
Value—5 to 7 (4 or 5 moist)
Chroma—2 or 3 (dry or moist)
Texture—silt loam or very fine sandy loam

AC horizon:
Value—6 to 8 (5 to 7 moist)
Chroma—2 or 3 (dry or moist)
Texture—silt loam, loam, or very fine sandy loam

C horizon:
Value—6 to 8 (5 to 7 moist)
Chroma—2 or 3 (dry or moist)
Texture—silt loam or very fine sandy loam

Norrest Series

Depth class: Moderately deep
Drainage class: Well drained
Permeability: Moderately slow (0.2 to 0.6 inch per hour)
Landform: Hillslopes
Parent material: Residuum weathered from shale
Slope range: 1 to 9 percent

Taxonomic class: Fine, montmorillonitic, mesic Ustollic Haplargids

Typical Pedon

Map unit name: Norrest clay loam, 1 to 3 percent slopes
Location: 2,400 feet north and 150 feet west of the southeast corner of sec. 31, T. 34 N., R. 53 W.

A—0 to 6 inches; grayish brown (10YR 5/2) clay loam, dark grayish brown (10YR 4/2) moist; weak fine granular structure; hard, friable; mildly alkaline; clear smooth boundary.
Bt1—6 to 12 inches; pale brown (10YR 6/3) silty clay, grayish brown (10YR 5/2) moist; weak medium prismatic structure parting to strong medium subangular blocky; hard, firm; strong effervescence; moderately alkaline; clear smooth boundary.
Bt2—12 to 18 inches; very pale brown (10YR 7/3) silty clay, brown (10YR 5/3) moist; moderate fine subangular blocky structure; hard, firm; strong effervescence; moderately alkaline; clear smooth boundary.
Bk—18 to 24 inches; light gray (10YR 7/2) silty clay loam, pale brown (10YR 6/3) moist; weak fine subangular

blocky structure; hard, firm; common fine fragments of shale; few fine threads of carbonate; 5 percent, by volume, shale fragments; violent effervescence; moderately alkaline; clear smooth boundary.
Cr—24 to 60 inches; light gray (10YR 7/2), bedded silty shale, pale brown (10YR 6/3) moist; strong effervescence.

Range in Characteristics

Depth to paralithic contact: 20 to 40 inches
Depth to carbonates: 0 to 10 inches
Content of clay in the control section: 35 to 45 percent
Thickness of the solum: 20 to 40 inches
Other features: Scattered chalcedony fragments are commonly on the surface and throughout the profile.

A horizon:
Value—4 to 6 (2 to 5 moist)
Chroma—1 or 2 (dry or moist)
Texture—clay loam, silty clay loam, or silt loam
Content of rock fragments—0 to 15 percent
Calcium carbonate equivalent—1 to 10 percent

Bt horizon:
Hue—10YR or 2.5Y
Value—5 to 8 (4 to 6 moist)
Chroma—1 to 3 (dry or moist)
Texture—silty clay, clay loam, or silty clay loam

Bk horizon:
Hue—10YR or 2.5Y
Value—5 to 8 (4 to 6 moist)
Chroma—1 to 3 (dry or moist)
Texture—silty clay, clay loam, or silty clay loam
Calcium carbonate equivalent—15 to 30 percent; few to many accumulations of carbonate occurring as threads or fine masses

Oglala Series

Depth class: Deep
Drainage class: Well drained
Permeability: Moderate (0.6 inch to 2.0 inches per hour)
Landform: Hillslopes
Parent material: Residuum weathered from calcareous sandstone
Slope range: 1 to 30 percent

Taxonomic class: Coarse-silty, mixed, mesic Aridic Haplustolls

Typical Pedon

Map unit name: Oglala-Canyon complex, 3 to 9 percent slopes

Location: 600 feet west and 2,100 feet south of the northeast corner of sec. 14, T. 30 N., R. 55 W.

Ap—0 to 7 inches; grayish brown (10YR 5/2) very fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak medium granular structure; slightly hard, very friable; neutral; clear smooth boundary.
A—7 to 13 inches; grayish brown (10YR 5/2) very fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure; slightly hard, very friable; neutral; clear smooth boundary.
AC—13 to 28 inches; grayish brown (10YR 5/2) very fine sandy loam, dark grayish brown (10YR 4/2) moist; weak medium prismatic structure parting to weak fine subangular blocky; slightly hard, very friable; neutral; gradual smooth boundary.
C—28 to 49 inches; light brownish gray (10YR 6/2) very fine sandy loam, dark grayish brown (10YR 4/2) moist; weak coarse prismatic structure; 3 percent, by volume, sandstone gravel; slightly hard, very friable; neutral; gradual wavy boundary.
Cr—49 to 60 inches; light gray (10YR 7/2), calcareous sandstone.

Range in Characteristics

Depth to paralithic contact: 40 to 60 inches
Thickness of the mollic epipedon: 7 to 19 inches
Depth to carbonates: 15 to 50 inches
Content of clay in the control section: 5 to 18 percent
Thickness of the solum: 15 to 36 inches

A horizon:
Value—4 or 5 (2 or 3 moist)
Chroma—2 or 3 (dry or moist)
Texture—very fine sandy loam, loam, or silt loam

AC horizon:
Value—5 to 7 (4 or 5 moist)
Chroma—2 or 3 (dry or moist)
Texture—very fine sandy loam, loam, or silt loam

C horizon:
Value—6 to 8 (5 or 6 moist)
Chroma—2 or 3 (dry or moist)
Texture—very fine sandy loam, silt loam, or loamy very fine sand
Content of rock fragments—0 to 10 percent

Olney Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate (0.6 inch to 2.0 inches per hour)

Landform: Hillslopes
Parent material: Loamy eolian sediments
Slope range: 3 to 9 percent

Taxonomic class: Fine-loamy, mixed, mesic Ustollic Haplargids

Typical Pedon

Map unit name: Olney loam, 3 to 9 percent slopes
Location: 450 feet east and 2,300 feet south of the northwest corner of sec. 17, T. 34 N., R. 54 W.

A—0 to 4 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; slightly hard, very friable; mildly alkaline; clear wavy boundary.
Bt1—4 to 10 inches; brown (10YR 5/3) sandy clay loam, dark grayish brown (10YR 4/2) moist; moderate coarse prismatic structure parting to moderate medium blocky; hard, friable; mildly alkaline; clear smooth boundary.
Bt2—10 to 14 inches; brown (10YR 5/3) fine sandy loam, dark brown (10YR 4/3) moist; weak coarse prismatic structure parting to weak coarse blocky; slightly hard, very friable; mildly alkaline; abrupt smooth boundary.
BCk—14 to 20 inches; pale brown (10YR 6/3) fine sandy loam, brown (10YR 5/3) moist; weak coarse prismatic structure; soft, very friable; fine threads of carbonate; violent effervescence; moderately alkaline; gradual smooth boundary.
C—20 to 60 inches; pale brown (10YR 6/3) sandy loam, brown (10YR 5/3) moist; single grain; loose; fine threads of carbonate; violent effervescence; moderately alkaline.

Range in Characteristics

Depth to carbonates: 10 to 24 inches
Content of clay in the control section: 18 to 35 percent
Thickness of the solum: 15 to 30 inches
Other features: If they occur, horizons with mollic colors are less than 7 inches thick.

A horizon:
Hue—2.5Y or 10YR
Value—5 or 6 (3 to 5 moist)
Chroma—1 to 3 (dry or moist)
Texture—loam, fine sandy loam, or sandy loam

Bt horizon:
Hue—2.5Y or 10YR
Value—5 to 7 (4 to 6 moist)
Chroma—2 or 3 (dry or moist)
Texture—sandy clay loam or sandy loam

BCk horizon:
Hue—2.5Y or 10YR
Value—5 to 7 (4 to 6 moist)
Chroma—2 or 3 (dry or moist)
Texture—fine sandy loam, sandy loam, or sandy clay loam
Calcium carbonate equivalent—8 to 14 percent

C horizon:
Hue—2.5Y or 10YR
Value—6 or 7 (4 to 6 moist)
Chroma—2 or 3 (dry or moist)
Texture—loamy fine sand, fine sandy loam, or sandy loam
Calcium carbonate equivalent—8 to 14 percent

Orella Series

Depth class: Shallow
Drainage class: Well drained
Permeability: Very slow (less than 0.06 inch per hour)
Landform: Hillslopes
Parent material: Residuum weathered from shale
Slope range: 1 to 30 percent

Taxonomic class: Clayey, mixed (calcareous), mesic, shallow Ustic Torriorthents

Typical Pedon

Map unit name: Orella-Badland complex, 3 to 50 percent slopes
Location: 1,400 feet east and 200 feet south of the northwest corner of sec. 29, T. 34 N., R. 53 W.

A—0 to 5 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; weak fine granular structure; hard, very firm; strong effervescence; strongly alkaline; clear smooth boundary.
AC—5 to 12 inches; light brownish gray (2.5Y 6/2) clay, grayish brown (2.5Y 5/2) moist; strong medium subangular blocky structure; hard, very firm; violent effervescence; strongly alkaline; gradual wavy boundary.
C—12 to 18 inches; light gray (2.5Y 7/2) clay, light brownish gray (2.5Y 6/2) moist; weak fine subangular blocky structure; hard, very firm; violent effervescence; strongly alkaline; gradual wavy boundary.
Cr—18 to 60 inches; light gray (5Y 7/2), bedded silty shale, light olive gray (5Y 6/2) moist; many fine pockets and seams of carbonate and gypsum; strong effervescence.

Range in Characteristics

Depth to paralithic contact: 10 to 20 inches
Depth to carbonates: 0 to 10 inches
Content of clay in the control section: 38 to 65 percent
Other features: In many areas the soils have scattered

chalcedony fragments on the surface and throughout the profile.

A horizon:
Hue—10YR ↄ 2.5Y
Value—6 or 7 (4 or 5 moist)
Chroma—2 to 5 (dry or moist)
Texture—clay, silty clay, clay loam, or silty clay loam
Content of shale fragments—0 to 5 percent
Calcium carbonate equivalent—0 to 10 percent

AC and C horizons:
Hue—7.5YR to 2.5Y
Value—5 to 7 (4 to 6 moist)
Chroma—2 to 4
Texture—clay, silty clay loam, or clay loam
Content of shale fragments—1 to 15 percent
Electrical conductivity—4 to 16 mmhos/cm
Sodium adsorption ratio—2 to 25
Calcium carbonate equivalent—1 to 15 percent

Otero Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderately rapid (2 to 6 inches per hour)
Landform: Stream terraces
Parent material: Loamy and sandy alluvium
Slope range: 0 to 3 percent

Taxonomic class: Coarse-loamy, mixed (calcareous), mesic Aridic Ustorthents

Typical Pedon

Map unit name: Otero loamy very fine sand, 0 to 3 percent slopes
Location: 1,300 feet west and 1,200 feet north of the southeast corner of sec. 1, T. 28 N., R. 53 W.

A—0 to 7 inches; brown (10YR 5/3) loamy very fine sand, dark brown (10YR 4/3) moist; weak fine granular structure; soft, very friable; strong effervescence; moderately alkaline; clear smooth boundary.
AC—7 to 15 inches; pale brown (10YR 6/3) loamy very fine sand, brown (10YR 5/3) moist; weak fine subangular blocky structure; soft, very friable; strong effervescence; moderately alkaline; gradual smooth boundary.
C—15 to 60 inches; very pale brown (10YR 7/3) loamy very fine sand, pale brown (10YR 6/3) moist; 3 percent, by volume, gravel-sized sandstone fragments; massive; soft, very friable; violent effervescence; moderately alkaline.

Range in Characteristics

Depth to carbonates: 0 to 10 inches
Thickness of the solum: 4 to 17 inches
Content of rock fragments in the control section: 1 to 15 percent

A horizon:
Value—5 to 7 (3 to 6 moist)
Chroma—2 to 4
Texture—loamy very fine sand, loamy fine sand, very fine sandy loam, or loam

AC horizon:
Value—6 to 8 (4 to 6 moist)
Chroma—2 to 4
Texture—loamy very fine sand or very fine sandy loam

C horizon:
Value—6 or 7 (5 or 6 moist)
Chroma—3 or 4
Texture—loamy very fine sand or very fine sandy loam
Content of rock fragments—1 to 15 percent
Calcium carbonate equivalent—1 to 4 percent

Pathfinder Series

Depth class: Very deep
Drainage class: Somewhat excessively drained
Permeability: Rapid (6 to 20 inches per hour)
Landform: Flood plains
Parent material: Sandy alluvium
Slope range: 0 to 2 percent

Taxonomic class: Sandy, mixed, mesic Aridic Ustifluvents

Typical Pedon

Map unit name: Pathfinder loamy fine sand, 0 to 2 percent slopes
Location: 1,300 feet north and 2,400 feet east of the southwest corner of sec. 36, T. 24 N., R. 58 W.

Ap—0 to 5 inches; grayish brown (10YR 5/2) loamy fine sand, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable; mildly alkaline; strong effervescence; abrupt smooth boundary.
C1—5 to 18 inches; light brownish gray (10YR 6/2) fine sand, dark grayish brown (10YR 4/2) moist; single grain; soft, very friable; strong effervescence; moderately alkaline; clear smooth boundary.
C2—18 to 29 inches; light brownish gray (10YR 6/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; few fine distinct strong brown (7.5YR 5/6) mottles; massive; slightly hard, friable; strong effervescence; moderately alkaline; clear smooth boundary.

C3—29 to 38 inches; light brownish gray (10YR 6/2) loamy fine sand, dark grayish brown (10YR 4/2) moist; few fine distinct strong brown (7.5YR 5/6) mottles; single grain; soft, very friable; violent effervescence; strongly alkaline; clear smooth boundary.
C4—38 to 48 inches; pale brown (10YR 6/3) fine sand, grayish brown (10YR 5/2) moist; few fine distinct strong brown (7.5YR 5/6) mottles; single grain; soft, very friable; violent effervescence; strongly alkaline; clear smooth boundary.
C5—48 to 60 inches; pale brown (10YR 6/3) fine sand, grayish brown (10YR 5/2) moist; few fine distinct strong brown (7.5YR 5/6) mottles; single grain; soft, very friable; violent effervescence; very strongly alkaline.

Range in Characteristics

Depth to mottles: 15 to 30 inches to relict mottles that are not indicative of present moisture conditions
Depth to carbonates: 0 to 5 inches
Content of rock fragments in the control section: 0 to 5 percent

A horizon:
Value—5 or 6 (3 to 5 moist)
Chroma—2 to 4 (dry or moist)
Texture—loamy fine sand or fine sand

C horizon:
Value—6 or 7 (4 to 6 moist)
Chroma—2 to 4
Texture—stratified fine sand, fine sandy loam, or loamy fine sand
Content of rock fragments—0 to 5 percent, by volume
Electrical conductivity—0 to 8 mmhos/cm
Sodium adsorption ratio—6 to 15
Calcium carbonate equivalent—1 to 10 percent

Phiferson Series

Depth class: Moderately deep
Drainage class: Well drained
Permeability: Moderately rapid (2 to 6 inches per hour)
Landform: Hillslopes
Parent material: Residuum weathered from calcareous sandstone
Slope range: 0 to 25 percent

Taxonomic class: Coarse-loamy, mixed, mesic Aridic Haplustolls

Typical Pedon

Map unit name: Phiferson-Tassel-Rock outcrop complex, 6 to 30 percent slopes

Location: 1,600 feet south and 300 feet east of the northwest corner of sec. 17, T. 31 N., R. 57 W.

A—0 to 8 inches; grayish brown (10YR 5/2) loamy very fine sand, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable; mildly alkaline; clear wavy boundary.
Bw—8 to 20 inches; pale brown (10YR 6/3) very fine sandy loam, dark brown (10YR 4/3) moist; weak coarse prismatic structure parting to weak medium subangular blocky; soft, very friable; mildly alkaline; clear wavy boundary.
C1—20 to 28 inches; pale brown (10YR 6/3) loamy very fine sand, dark brown (10YR 4/3) moist; single grain; loose when dry and when moist; mildly alkaline; clear wavy boundary.
C2—28 to 33 inches; very pale brown (10YR 7/3) loamy very fine sand, brown (10YR 5/3) moist; single grain; loose when dry and when moist; strong effervescence; moderately alkaline; clear wavy boundary.
Cr—33 to 60 inches; white (10YR 8/2), calcareous sandstone.

Range in Characteristics

Depth to paralithic contact: 20 to 40 inches
Thickness of the mollic epipedon: 7 to 18 inches
Depth to carbonates: 13 to 36 inches
Content of rock fragments in the control section: 0 to 10 percent
Thickness of the solum: 19 to 40 inches

A horizon:
Value—4 or 5 (2 or 3 moist)
Chroma—2 or 3
Texture—fine sandy loam or loamy very fine sand

Bw horizon:
Value—4 to 6 (3 to 5 moist)
Chroma—2 to 4
Texture—very fine sandy loam or loamy very fine sand
Content of rock fragments—0 to 15 percent

C horizon:
Value—5 to 7 (4 or 5 moist)
Chroma—2 or 3
Texture—very fine sandy loam or loamy very fine sand
Content of rock fragments—0 to 15 percent
Calcium carbonate equivalent—1 to 5 percent

Pierre Series

Depth class: Moderately deep
Drainage class: Well drained

Permeability: Very slow (less than 0.06 inch per hour)
Landform: Hillslopes
Parent material: Residuum weathered from shale
Slope range: 1 to 30 percent

Taxonomic class: Fine, smectitic, mesic Aridic Haplusterts

Typical Pedon

Map unit name: Pierre clay, 6 to 20 percent slopes (fig. 27)
Location: 1,500 feet west and 1,400 feet south of the northeast corner of sec. 33, T. 35 N., R. 53 W.

A—0 to 3 inches; olive (5Y 5/3) clay, olive (5Y 4/3) moist; weak fine subangular blocky structure; very hard, very firm; slight effervescence; moderately alkaline; clear smooth boundary.
Bw—3 to 20 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; strong medium blocky structure; very hard, very firm; few distinct intersecting slickensides; strong effervescence; moderately alkaline; clear smooth boundary.
Bky1—20 to 29 inches; light brownish gray (2.5Y 6/2) clay, grayish brown (2.5Y 5/2) moist; weak medium subangular blocky structure; very hard, very firm; strong effervescence; common medium accumulations of carbonate and gypsum; moderately alkaline; clear smooth boundary.
Bky2—29 to 32 inches; light brownish gray (2.5Y 6/2) clay, grayish brown (2.5Y 5/2) moist; common fine distinct yellow (2.5Y 7/8) stains in partially weathered, soft shale fragments; 14 percent, by volume, shale fragments; massive; very hard, very firm; slight effervescence; common medium accumulations of carbonate and gypsum; moderately alkaline; gradual wavy boundary.
Cr—32 to 60 inches; light brownish gray (2.5Y 6/2) clay shale, grayish brown (2.5Y 5/2) moist; common medium distinct olive yellow (2.5Y 6/8) stains; common fine accumulations of carbonate and gypsum; mildly alkaline.

Range in Characteristics

Depth to paralithic contact: 20 to 40 inches
Depth to carbonates: 0 to 6 inches
Content of clay in the control section: 50 to 60 percent
Thickness of the solum: 14 to 31 inches

A horizon:
Hue—2.5Y or 5Y
Value—4 to 6 (3 to 5 moist)
Chroma—1 to 3 (dry or moist)
Texture—silty clay or clay

Bw horizon:
Hue—2.5Y or 5Y
Value—5 or 6 (4 or 5 moist)
Chroma—1 to 3
Texture—clay

Bky horizon:
Hue—2.5 or 5Y
Value—5 or 6 (4 or 5 moist)
Chroma—1 to 3
Texture—clay
Content of shale fragments—5 to 35 percent

Cr horizon:
Hue—2.5Y or 5Y
Value—5 or 6 (4 or 5 moist)
Chroma—1 to 3 (dry or moist)

Ponderosa Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderately rapid (2 to 6 inches per hour)
Landform: Hillslopes
Parent material: Sandy and loamy colluvium and residuum weathered from calcareous sandstone
Slope range: 6 to 60 percent

Taxonomic class: Coarse-loamy, mixed, mesic Torriorthentic Haplustolls

Typical Pedon

Map unit name: Tassel-Ponderosa-Rock outcrop association, 9 to 70 percent slopes
Location: 1,350 feet east and 1,900 feet south of the northwest corner of sec. 12, T. 30 N., R. 53 W.

A1—0 to 8 inches; grayish brown (10YR 5/2) loamy very fine sand, dark brown (10YR 3/3) moist; weak fine granular structure; soft, very friable; neutral; clear smooth boundary.
A2—8 to 13 inches; grayish brown (10YR 5/2) loamy very fine sand, dark brown (10YR 3/3) moist; weak medium granular structure; soft, very friable; mildly alkaline; clear wavy boundary.
Bw—13 to 22 inches; light brownish gray (10YR 6/2) loamy very fine sand, dark brown (10YR 4/3) moist; weak coarse prismatic structure; soft, very friable; mildly alkaline; clear wavy boundary.
C1—22 to 45 inches; light brownish gray (10YR 6/2) loamy very fine sand, dark brown (10YR 4/3) moist; massive; soft, very friable; strong effervescence; moderately alkaline; clear wavy boundary.
C2—45 to 60 inches; very pale brown (10YR 7/3) loamy

very fine sand, brown (10YR 5/3) moist; massive; soft, very friable; 5 percent, by volume, sandstone gravel fragments; moderately alkaline; strong effervescence.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 20 inches
Depth to carbonates: Typically 15 to 40 inches but more than 60 inches in some pedons
Thickness of the solum: 15 to 30 inches

A horizon:
Value—4 or 5 (2 or 3 moist)
Chroma—1 to 3 (dry or moist)
Texture—very fine sandy loam or loamy very fine sand

Bw horizon:
Value—5 or 6 (3 or 4 moist)
Chroma—2 to 4 (dry or moist)
Texture—very fine sandy loam or loamy very fine sand
Content of rock fragments—0 to 5 percent

C horizon:
Value—5 to 7 (4 to 6 moist)
Chroma—2 to 4 (dry or moist)
Texture—very fine sandy loam or loamy very fine sand
Content of rock fragments—2 to 15 percent

Samsil Series

Depth class: Shallow
Drainage class: Well drained
Permeability: Slow (0.06 to 0.2 inch per hour) above paralithic contact
Landform: Hillslopes
Parent material: Residuum weathered from shale
Slope range: 3 to 50 percent

Taxonomic class: Clayey, montmorillonitic (calcareous), mesic, shallow Ustic Torriorthents

Typical Pedon

Map unit name: Samsil-Pierre complex, 3 to 30 percent slopes
Location: 400 feet west and 1,600 feet south of the northeast corner of sec. 3, T. 34 N., R. 53 W.

A—0 to 3 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; moderate fine granular structure; very hard, very firm; moderately alkaline; clear smooth boundary
AC—3 to 9 inches; light brownish gray (2.5Y 6/2) clay, grayish brown (2.5Y 5/2) moist; weak coarse prismatic structure; very hard, very firm; slight effervescence; moderately alkaline; clear smooth boundary
C—9 to 18 inches; light brownish gray (2.5Y 6/2) clay, olive (5Y 5/3) moist; massive; very hard, very firm; 5 percent, by volume, shale fragments; strong effervescence; moderately alkaline; clear smooth boundary
Cr—18 to 60 inches; grayish brown (2.5Y 5/2) shale, olive gray (5Y 4/2) moist; slight effervescence; moderately alkaline

Range in Characteristics

Depth to paralithic contact: 6 to 20 inches
Depth to carbonates: 0 to 3 inches
Content of clay in the control section: 50 to 65 percent

A horizon:
Hue—2.5Y or 10YR
Value—5 to 7 (3 to 5 moist)
Chroma—2 to 4 (dry or moist)
Texture—clay

AC horizon:
Hue—2.5Y or 5Y
Value—5 to 7 (3 to 5 moist)
Chroma—1 to 4
Texture—clay
Content of shale fragments—0 to 30 percent

C horizon:
Hue—2.5Y or 5Y
Value—5 to 7 (3 to 5 moist)
Chroma—1 to 4
Texture—clay
Content of shale fragments—5 to 35 percent

Cr horizon:
Hue—2.5Y or 5Y
Value—5 to 7 (3 to 5 moist)
Chroma—1 to 4

Sarben Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderately rapid (2 to 6 inches per hour)
Landform: Hillslopes
Parent material: Loamy and sandy eolian material
Slope range: 3 to 30 percent

Taxonomic class: Coarse-loamy, mixed, nonacid, mesic Aridic Ustorthents

Typical Pedon

Map unit name: Sarben loamy very fine sand, 9 to 30 percent slopes

Location: 1,100 feet east and 400 feet north of the southwest corner of sec. 30, T. 26 N., R. 56 W.

A—0 to 4 inches; grayish brown (10YR 5/2) loamy very fine sand, dark grayish brown (10YR 4/2) moist; weak fine granular structure; soft, very friable; neutral; clear smooth boundary.

AC—4 to 21 inches; grayish brown (10YR 5/2) loamy very fine sand, dark grayish brown (10YR 4/2) moist; weak coarse prismatic structure; soft, very friable; neutral; gradual wavy boundary.

C—21 to 60 inches; pale brown (10YR 6/3) loamy very fine sand, brown (10YR 5/3) moist; massive; soft, very friable; strong effervescence; moderately alkaline.

Range in Characteristics

Depth to carbonates: 15 to 40 inches
Thickness of the solum: 4 to 26 inches

A horizon:
Value—4 to 6 (3 to 5 moist)
Chroma—2 or 3
Texture—loamy very fine sand, very fine sandy loam, or loamy fine sand

AC horizon:
Value—5 or 6 (4 or 5 moist)
Chroma—2 to 3
Texture—loamy very fine sand, very fine sandy loam, or fine sandy loam

C horizon:
Value—5 to 8 (4 to 6 moist)
Chroma—2 or 3
Texture—loamy very fine sand, fine sandy loam, or very fine sandy loam

Satanta Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate (0.6 inch to 2.0 inches per hour)
Landform: Hillslopes
Parent material: Loamy eolian material
Slope range: 1 to 6 percent

Taxonomic class: Fine-loamy, mixed, mesic Aridic Argiustolls

Typical Pedon

Map unit name: Satanta very fine sandy loam, 1 to 3 percent slopes
Location: 1,600 feet west and 75 feet south of the northeast corner of sec. 6, T. 28 N., R. 56 W.

A—0 to 9 inches; grayish brown (10YR 5/2) very fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable; slightly acid; abrupt smooth boundary.

Bt1—9 to 16 inches; brown (10YR 5/3) sandy clay loam, brown (10YR 4/3) moist; moderate medium subangular blocky structure; hard, friable; neutral; clear smooth boundary.

Bt2—16 to 26 inches; brown (10YR 5/3) loam, dark brown (10YR 4/3) moist; moderate fine subangular blocky structure; hard, friable; mildly alkaline; clear smooth boundary.

Bk—26 to 39 inches; light gray (10YR 7/2) very fine sandy loam, light brownish gray (10YR 6/2) moist; moderate fine subangular structure; slightly hard, very friable; strong effervescence; threadlike deposits of secondary carbonate; moderately alkaline; gradual wavy boundary.

C—39 to 60 inches; light gray (10YR 7/2) loam, light brownish gray (10YR 6/2) moist; massive; slightly hard, very friable; strong effervescence; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 20 inches
Depth to carbonates: 15 to 36 inches
Content of clay in the control section: 18 to 35 percent
Thickness of the solum: 21 to 40 inches

A horizon:
Value—4 or 5 (2 or 3 moist)
Chroma—2 or 3 (dry or moist)
Texture—very fine sandy loam, fine sandy loam, or loam

Bt horizon:
Value—4 to 6 (3 to 5 moist)
Chroma—2 or 3 (dry or moist)
Texture—clay loam, loam, or sandy clay loam

Bk and C horizons:
Value—5 to 7 (4 to 6 moist)
Chroma—2 or 3 (dry or moist)
Texture—loam, fine sandy loam, or very fine sandy loam
Calcium carbonate equivalent—5 to 15 percent

Savo Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderately slow (0.2 to 0.6 inch per hour)
Landform: Hillslopes and stream terraces
Parent material: Loamy and clayey sediments
Slope range: 0 to 6 percent

Taxonomic class: Fine, montmorillonitic, mesic Aridic Argiustolls

Typical Pedon

Map unit name: Savo silty clay loam, 0 to 2 percent slopes
Location: 2,200 feet north and 1,200 feet east of the southwest corner of sec. 17, T. 33 N., R. 54 W.

Ap—0 to 4 inches; grayish brown (10YR 5/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; hard, friable; neutral; clear smooth boundary.
Bt1—4 to 10 inches; grayish brown (10YR 5/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; weak coarse prismatic structure parting to moderate medium subangular blocky; hard, firm; thin patchy clay films on faces of peds; neutral; clear smooth boundary.
Bt2—10 to 20 inches; grayish brown (10YR 5/2) silty clay, dark grayish brown (10YR 4/2) moist; weak coarse prismatic structure parting to moderate medium subangular blocky; hard, firm; thin patchy clay films on faces of peds; mildly alkaline; clear smooth boundary.
Bk—20 to 27 inches; light olive brown (2.5Y 5/3) silty clay loam, olive brown (2.5Y 4/3) moist; moderate coarse subangular blocky structure; hard, firm; few fine accumulations of carbonate; violent effervescence; moderately alkaline; gradual wavy boundary.
C1—27 to 40 inches; light brownish gray (2.5Y 6/2) silty clay loam, grayish brown (2.5Y 5/2) moist; massive; hard, firm; strong effervescence; moderately alkaline; gradual wavy boundary.
C2—40 to 60 inches; light gray (2.5Y 7/2) silty clay loam, light olive brown (2.5Y 5/3) moist; massive; hard, firm; strong effervescence; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 15 inches
Depth to carbonates: 12 to 20 inches
Content of clay in the control section: 35 to 50 percent
Thickness of the solum: 20 to 36 inches

A horizon:
Value—4 or 5 (2 or 3 moist)
Chroma—1 or 2 (dry or moist)
Texture—silty clay loam or silt loam

Bt horizon:
Hue—10YR or 2.5Y
Value—4 or 5 (2 to 4 moist)
Chroma—1 to 3 (dry or moist)
Texture—silty clay or silty clay loam

Bk and C horizons:
Hue—10YR or 2.5Y
Value—5 to 7 (5 or 6 moist)
Chroma—2 or 3 (dry or moist)
Texture—silty clay loam, silt loam, or clay loam

Schamber Series

Depth class: Very deep
Drainage class: Excessively drained
Permeability: Very rapid (more than 20 inches per hour)
Landform: Hillslopes
Parent material: Gravelly outwash sediments
Slope range: 3 to 30 percent

Taxonomic class: Sandy-skeletal, mixed, mesic Ustic Torriorthents

Typical Pedon

Map unit name: Schamber gravelly sandy loam, 3 to 30 percent slopes (fig. 28)
Location: 1,200 feet north and 1,200 feet west of the southeast corner of sec. 22, T. 34 N., R. 53 W.

A—0 to 4 inches; light yellowish brown (10YR 6/4) gravelly sandy loam, dark grayish brown (10YR 4/2) moist; weak fine granular structure; slightly hard, friable; 16 percent gravel, by volume; violent effervescence; moderately alkaline; clear smooth boundary.
C1—4 to 9 inches; very pale brown (10YR 7/4) very gravelly sand, brown (10YR 5/3) moist; single grain; loose; 45 percent gravel, by volume; violent effervescence; moderately alkaline; gradual wavy boundary.
C2—9 to 60 inches; very pale brown (10YR 7/4) very gravelly sand, pale brown (10YR 6/3) moist; massive; loose; 50 percent gravel, by volume; coatings of lime on the underside of pebbles; violent effervescence; moderately alkaline.

Range in Characteristics

Depth to unconsolidated material that has rock fragments: 4 to 10 inches
Depth to carbonates: 0 to 10 inches
Content of rock fragments in the control section: 35 to more than 50 percent

A horizon:
Hue—10YR
Value—5 or 6 (3 to 5 moist)
Chroma—2 to 4 (dry or moist)
Texture—gravelly sandy loam, sandy loam, gravelly loam, or very gravelly loam
Content of rock fragments—5 to 60 percent

C horizon:
Hue—10YR
Value—5 to 7 (4 to 6 moist)

Chroma—2 to 4 (dry or moist)
Texture—very gravelly sand or very gravelly loamy sand
Content of rock fragments—35 to 60 percent

Scoville Series

Depth class: Very deep
Drainage class: Somewhat excessively drained
Permeability: Rapid (6 to 20 inches per hour) in the upper part of the profile, moderate (0.6 inch to 2.0 inches per hour) in the 2C horizon
Landform: Stream terraces
Parent material: Sandy alluvium over loamy alluvium
Slope range: 0 to 3 percent

Taxonomic class: Mixed, mesic Ustic Torripsamments

Typical Pedon

Map unit name: Scoville fine sand, 0 to 1 percent slopes
Location: 1,700 feet west and 150 feet north of the southeast corner of sec. 33, T. 24 N., R. 57 W.

Ap—0 to 8 inches; brown (10YR 5/3) fine sand, dark grayish brown (10YR 4/2) moist; weak fine granular structure; loose; mildly alkaline; abrupt smooth boundary.
AC—8 to 15 inches; yellowish brown (10YR 5/4) fine sand, dark brown (10YR 4/3) moist; weak very fine subangular blocky structure; loose; mildly alkaline; gradual wavy boundary.
C1—15 to 49 inches; light yellowish brown (10YR 6/4) fine sand, brown (10YR 5/3) moist; single grain; loose; mildly alkaline; abrupt wavy boundary.
2C2—49 to 60 inches; light gray (10YR 7/2) very fine sandy loam, brown (10YR 5/3) moist; weak prismatic structure; slightly hard, friable; violent effervescence; few fine accumulations of secondary carbonate; moderately alkaline.

Range in Characteristics

Depth to lithologic discontinuity: 35 to 55 inches
Depth to carbonates: 35 to 55 inches

A horizon:
Value—4 to 6 (3 to 5 moist)
Chroma—2 or 3 (dry or moist)
Texture—fine sand, loamy fine sand, or loamy sand

AC horizon:
Value—5 or 6 (4 or 5 moist)
Chroma—3 or 4 (dry or moist)
Texture—loamy fine sand, fine sand, or loamy sand

C horizon:
Value—5 or 6 (4 to 6 moist)
Chroma—2 to 4 (dry or moist)
Texture—fine sand, loamy fine sand, or loamy sand

2C horizon:
Value—6 to 8 (5 to 7 moist)
Chroma—2 to 4
Texture—very fine sandy loam, fine sandy loam, or loam

Skilak Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate (0.6 inch to 2.0 inches per hour)
Landform: Stream terraces
Parent material: Silty alluvium
Slope range: 6 to 20 percent

Taxonomic class: Fine-silty, mixed (calcareous), mesic Ustic Torriorthents

Typical Pedon

Map unit name: Skilak silty clay loam, 6 to 20 percent slopes
Location: 1,700 feet west and 1,400 feet north of the southeast corner of sec. 10, T. 34 N., R. 56 W.

A—0 to 3 inches; light gray (2.5Y 7/2) silty clay loam, grayish brown (2.5Y 5/2) moist; weak fine granular structure; slightly hard, friable; strong effervescence; moderately alkaline; clear smooth boundary.
AC—3 to 8 inches; light gray (2.5Y 7/2) silt loam, grayish brown (2.5Y 5/2) moist; weak fine subangular blocky structure; slightly hard, friable; violent effervescence; moderately alkaline; gradual wavy boundary.
C—8 to 60 inches; light gray (2.5Y 7/2) silt loam that has thin strata of very fine sandy loam; grayish brown (2.5Y 5/2) moist; massive; slightly hard, friable; violent effervescence; strongly alkaline.

Range in Characteristics

Depth to carbonates: 0 to 5 inches
Content of clay in the control section: 18 to 35 percent

A horizon:
Hue—10YR or 2.5Y
Value—6 or 7 (4 or 5 moist)
Chroma—2 to 4 (dry or moist)
Texture—silty clay loam, silt loam, or silty clay

AC horizon:
Hue—10YR or 2.5Y

Value—6 or 7 (4 or 5 moist)
Chroma—2 to 4 (dry or moist)
Texture—silt loam or silty clay loam

C horizon:
Hue—10YR or 2.5Y
Value—6 or 7 (4 or 5 moist)
Chroma—2 to 4 (dry or moist)
Texture—silt loam or silty clay loam; thin strata of very fine sandy loam, loam, or silt in some pedons
Electrical conductivity—1 to 8 mmhos/cm
Sodium adsorption ratio—5 to 35

Tassel Series

Depth class: Shallow
Drainage class: Well drained
Permeability: Moderately rapid (2 to 6 inches per hour)
Landform: Hillslopes
Position on the landform: Summits and shoulders
Parent material: Residuum weathered from calcareous sandstone
Slope range: 3 to 70 percent

Taxonomic class: Loamy, mixed (calcareous), mesic, shallow Ustic Torriorthents

Typical Pedon

Map unit name: Tassel-Busher-Rock outcrop complex, 6 to 30 percent slopes
Location: 2,200 feet west and 1,700 feet north of the southeast corner of sec. 35, T. 32 N., R. 56 W.

A—0 to 3 inches; grayish brown (10YR 5/2) loamy very fine sand, dark grayish brown (10YR 4/2) moist; weak fine granular structure; slightly hard, very friable; moderately alkaline; slight effervescence; clear smooth boundary
AC—3 to 8 inches; light brownish gray (10YR 6/2) loamy very fine sand, dark grayish brown (10YR 4/2) moist; weak medium subangular blocky structure; slightly hard, very friable; moderately alkaline; slight effervescence; clear wavy boundary
C—8 to 15 inches; pale brown (10YR 6/3) loamy very fine sand, brown (10YR 4/3) moist; massive; slightly hard, very friable; strong effervescence; moderately alkaline; common fine fragments of sandstone; gradual wavy boundary
Cr—15 to 60 inches; light gray (10YR 7/2), weathered, calcareous sandstone; violent effervescence.

Range in Characteristics

Depth to paralithic contact: 6 to 20 inches
Depth to carbonates: 0 to 3 inches
Content of clay in the control section: 5 to 12 percent
Content of rock fragments in the control section: 0 to 15 percent
Thickness of the solum: 3 to 9 inches

A horizon:
Value—4 to 7 (3 to 6 moist)
Chroma—2 to 4 (dry or moist)
Texture—loamy very fine sand, very fine sandy loam, or loamy fine sand

C horizon:
Value—5 to 8 (4 to 7 moist)
Chroma—2 or 3 (dry or moist)
Texture—loamy very fine sand or very fine sandy loam
Content of rock fragments—0 to 15 percent

Thirtynine Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate (0.6 inch to 2.0 inches/hour)
Landform: Hillslopes
Parent material: Loamy sediments weathered from calcareous siltstone
Slope range: 1 to 9 percent

Taxonomic class: Fine-silty, mixed, mesic Aridic Argiustolls

Typical Pedon

Map unit name: Thirtynine loam, 6 to 9 percent slopes
Location: 2,200 feet east and 2,000 feet south of the northwest corner of sec. 11, T. 32 N., R. 55 W.

A—0 to 8 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, friable; mildly alkaline; clear smooth boundary.
Bt1—8 to 13 inches; brown (10YR 5/3) silty clay loam, dark brown (10YR 3/3) moist; moderate medium subangular blocky structure; slightly hard, friable; thin patchy clay films on faces of peds; mildly alkaline; clear smooth boundary.
Bt2—13 to 20 inches; pale brown (10YR 6/3) loam, dark brown (10YR 4/3) moist; moderate fine subangular blocky structure; slightly hard, friable; thin patchy clay films on faces of peds; mildly alkaline; clear smooth boundary.
BCk—20 to 26 inches; pale brown (10YR 6/3) loam, brown (10YR 5/3) moist; weak fine subangular structure; soft, friable; strong effervescence; moderately alkaline; gradual wavy boundary.
C1—26 to 40 inches; pale brown (10YR 6/3) loam, brown (10YR 5/3) moist; weak coarse prismatic structure;

soft, friable; strong effervescence; moderately alkaline; gradual wavy boundary.
C2—40 to 60 inches; pale brown (10YR 6/3) loam, brown (10YR 5/3) moist; massive; soft, friable; strong effervescence; few small concretions of secondary lime; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 16 inches
Depth to carbonates: 15 to 30 inches
Content of clay in the control section: 18 to 35 percent
Thickness of the solum: 16 to 32 inches

A horizon:
Value—4 or 5 (2 or 3 moist)
Chroma—1 to 3 (dry or moist)
Texture—loam or silt loam

Bt horizon:
Value—4 to 6 (3 to 5 moist)
Chroma—2 to 4 (dry or moist)
Texture—silty clay loam, sandy clay loam, or loam

BC and C horizons:
Value—6 to 8 (5 to 7 moist)
Chroma—2 to 4
Texture—silt loam or loam
Content of siltstone fragments—0 to 10 percent
Calcium carbonate equivalent—1 to 10 percent

Tripp Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate (0.6 inch to 2.0 inches per hour)
Landform: Stream terraces
Parent material: Loamy alluvium
Slope range: 0 to 3 percent

Taxonomic class: Coarse-silty, mixed, mesic Aridic Haplustolls

Typical Pedon

Map unit name: Tripp very fine sandy loam, 0 to 1 percent slopes
Location: 500 feet west and 150 feet north of the southeast corner of sec. 36, T. 24 N., R. 57 W.

Ap—0 to 6 inches; grayish brown (10YR 5/2) very fine sandy loam, very dark grayish brown (10YR 3/2) moist; moderate fine granular structure; slightly hard, very friable; neutral; abrupt smooth boundary.
A—6 to 14 inches; grayish brown (10YR 5/2) very fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; slightly hard, very friable; neutral; clear smooth boundary.
Bw1—14 to 24 inches; light brownish gray (10YR 6/2) very fine sandy loam, dark grayish brown (10YR 4/2) moist; moderate medium subangular blocky structure; slightly hard, very friable; mildly alkaline; clear smooth boundary.
Bw2—24 to 32 inches; light gray (10YR 7/2) very fine sandy loam, grayish brown (10YR 5/2) moist; moderate medium subangular blocky structure; slightly hard, very friable; mildly alkaline; abrupt wavy boundary.
Bk—32 to 42 inches; white (10YR 8/2) very fine sandy loam, light brownish gray (10YR 6/2) moist; weak medium subangular blocky structure; slightly hard, very friable; threadlike deposits of secondary carbonate; violent effervescence; moderately alkaline; gradual wavy boundary.
C—42 to 60 inches; very pale brown (10YR 7/3) very fine sandy loam, brown (10YR 5/3) moist; massive, slightly hard, very friable; strong effervescence; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 20 inches
Depth to carbonates: 18 to 40 inches
Content of clay in the control section: 13 to 18 percent
Thickness of the solum: 20 to 48 inches

A horizon:
Value—4 or 5 (2 or 3 moist)
Chroma—2 or 3 (dry or moist)
Texture—very fine sandy loam or fine sandy loam
Content of rock fragments—0 to 3 percent

Bw horizon:
Value—4 to 7 (3 to 5 moist)
Chroma—2 or 3 (dry or moist)
Texture—very fine sandy loam or loam
Content of rock fragments—0 to 3 percent

Bk horizon:
Value—6 to 8 (5 to 7 moist)
Chroma—2 or 3 (dry or moist)
Texture—very fine sandy loam or loam
Content of rock fragments—0 to 3 percent, by volume
Calcium carbonate equivalent—10 to 15 percent

C horizon:
Value—6 to 8 (5 to 7 moist)
Chroma—2 or 3 (dry or moist)
Texture—very fine sandy loam or loam
Content of rock fragments—0 to 3 percent
Calcium carbonate equivalent—5 to 15 percent

Valent Series

Depth class: Very deep
Drainage class: Excessively drained
Permeability: Rapid (6 to 20 inches per hour)
Landform: Dunes
Parent material: Sandy eolian material
Slope range: 0 to 60 percent

Taxonomic class: Mixed, mesic Ustic Torripsamments

Typical Pedon

Map unit name: Valent fine sand, rolling (fig. 29)
Location: 1,700 feet west and 450 feet south of the northeast corner of sec. 7, T. 28 N., R. 57 W.

A—0 to 7 inches; light brownish gray (10YR 6/2) fine sand, dark grayish brown (10YR 4/2) moist; single grain, loose; neutral; clear smooth boundary.
C—7 to 60 inches; pale brown (10YR 6/3) fine sand, brown (10YR 5/3) moist; single grain; loose; neutral.

Range in Characteristics

Depth to carbonates: 40 to more than 60 inches
Thickness of the solum: 3 to 10 inches

A horizon:
Value—5 or 6 (3 to 5 moist)
Chroma—2 to 4 (dry or moist)
Texture—fine sand or loamy fine sand

C horizon:
Value—5 to 7 (4 to 6 moist)
Chroma—2 or 3 (dry or moist)
Texture—fine sand or loamy fine sand

Vetal Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderately rapid (2 to 6 inches per hour)
Landform: Hillslopes and stream terraces
Parent material: Loamy and sandy alluvium and eolian sediments
Slope range: 0 to 6 percent

Taxonomic class: Coarse-loamy, mixed, mesic Pachic Haplustolls

Typical Pedon

Map unit name: Vetal very fine sandy loam, 1 to 3 percent slopes
Location: 1,500 feet east and 2,600 feet south of the northwest corner of sec. 5, T. 31 N., R. 53 W.

A1—0 to 7 inches; dark grayish brown (10YR 4/2) very fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; slightly hard, very friable; neutral; clear smooth boundary.
A2—7 to 14 inches; dark grayish brown (10YR 4/2) very fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine subangular blocky; slightly hard, very friable; neutral; clear smooth boundary.
A3—14 to 30 inches; dark grayish brown (10YR 4/2) very fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak coarse prismatic structure parting to weak medium subangular blocky; slightly hard, very friable; mildly alkaline; clear smooth boundary.
AC—30 to 45 inches; brown (10YR 4/3) very fine sandy loam, dark brown (10YR 3/3) moist; weak coarse prismatic structure parting to weak coarse subangular blocky; slightly hard, very friable; mildly alkaline; gradual wavy boundary.
C—45 to 60 inches; brown (10YR 5/3) very fine sandy loam, dark brown (10YR 4/3) moist; massive; slightly hard, very friable; mildly alkaline.

Range in Characteristics

Depth to paralithic contact: More than 60 inches
Thickness of the mollic epipedon: 20 to 50 inches
Depth to carbonates: 30 to 60 inches
Thickness of the solum: 24 to 60 inches

A horizon:
Value—4 or 5 (2 or 3 moist)
Chroma—1 or 2 (dry or moist)
Texture—very fine sandy loam, loamy very fine sand, or fine sandy loam

AC horizon:
Value—4 to 6 (3 or 4 moist)
Chroma—1 to 3
Texture—very fine sandy loam, loamy very fine sand, or fine sandy loam

C horizon:
Value—5 to 7 (4 or 5 moist)
Chroma—2 or 3
Texture—very fine sandy loam, loamy very fine sand, or fine sandy loam
Content of rock fragments—0 to 3 percent, by volume

Wildhorse Series

Depth class: Very deep
Drainage class: Somewhat poorly drained
Permeability: Rapid (6 to 20 inches per hour)
Landform: Stream terraces
Parent material: Sandy alluvium
Slope range: 0 to 3 percent

Taxonomic class: Sandy, mixed, mesic Typic Halaquepts

Typical Pedon

Map unit name: Wildhorse loamy fine sand, 0 to 3 percent slopes

Location: 1,000 feet east and 200 feet south of the northwest corner of sec. 29, T. 24 N., R. 55 W.

A—0 to 6 inches; dark grayish brown (10YR 4/2) loamy fine sand, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable; moderately alkaline; violent effervescence; clear smooth boundary.

AC—6 to 12 inches; grayish brown (10YR 5/2) loamy fine sand, dark grayish brown (10YR 4/2) moist; weak fine granular structure; slightly hard, very friable; very strongly alkaline; violent effervescence; clear smooth boundary.

C1—12 to 20 inches; grayish brown (10YR 5/2) loamy fine sand, dark grayish brown (10YR 4/2) moist; single grain; slightly hard, very friable; very strongly alkaline; strong effervescence; gradual wavy boundary.

C2—20 to 29 inches; light brownish gray (10YR 6/2) loamy fine sand, grayish brown (10YR 5/2) moist; few fine faint brownish yellow (10YR 6/6) mottles; single grain; slightly hard, very friable; very strongly alkaline; strong effervescence; gradual wavy boundary.

C3—29 to 47 inches; light gray (10YR 7/2) loamy fine sand, brown (10YR 5/3) moist; few fine faint brownish yellow (10YR 6/6) mottles; single grain; slightly hard, very friable; strongly alkaline; violent effervescence; gradual wavy boundary.

C4—47 to 60 inches; very pale brown (10YR 7/3) loamy fine sand, brown (10YR 5/3) moist; few fine faint brownish yellow (10YR 6/6) mottles; single grain; slightly hard, very friable; strongly alkaline; violent effervescence.

Range in Characteristics

Depth to mottles: 17 to 40 inches
Depth to carbonates: 0 to 10 inches
Thickness of the solum: 3 to 21 inches

A horizon:
- Value—4 to 6 (3 to 5 moist)
- Chroma—1 or 2
- Texture—loamy fine sand, loamy sand, fine sand, or sand
- Electrical conductivity—2 to 8 mmhos/cm
- Sodium adsorption ratio—13 to 20

AC horizon:
- Value—5 to 7 (4 to 6 moist)
- Chroma—1 or 2 (dry or moist)
- Texture—loamy fine sand, loamy sand, fine sand, or sand
- Electrical conductivity—2 to 8 mmhos/cm
- Sodium adsorption ratio—13 to 20

C horizon:
- Hue—10YR or 2.5Y
- Value—6 to 8 (5 to 7 moist)
- Chroma—1 to 3
- Texture—loamy fine sand, loamy sand, fine sand, or sand with strata of fine sandy loam, loam, or loamy very fine sand
- Electrical conductivity—2 to 8 mmhos/cm
- Sodium adsorption ratio—1 to 10

Formation of the Soils

This section describes how the factors of soil formation have affected the development of soils in Sioux County. Soil forms through processes that act on deposited or accumulated geologic material. The characteristics of the soil at any given point are determined by the physical and mineralogical composition of the parent material; the climate under which the soil material has accumulated and existed since accumulation; the plant and animal life on and in the soil; the relief, or lay of the land; and the length of time that the forces of soil formation have acted on the soil material.

Climate and plant and animal life, chiefly plants, are active factors of soil formation. They act on the parent material that has accumulated through the weathering of rocks and slowly change it into a natural body that has genetically related horizons. The effects of climate and plant and animal life are conditioned by relief. The parent material affects the kind of soil profile that forms and, in extreme cases, determines it almost entirely. Finally, time is needed for the transformation of the parent material into a soil. The time required may be much or little, but some time is always required for differentiation of soil horizons. Usually, a long time is required for the development of distinct horizons.

The factors of soil formation are so closely interrelated in their effects on the soil that few generalizations can be made regarding the effect of any one factor unless conditions are specified for the other four.

Parent Material

The soils in Sioux County formed in material weathered from the underlying geologic formations or in material that was transported by wind and water. The Pierre Formation is the most extensive shale formation in the county. It is a black to olive gray, platy clay shale that has layers of bentonite. This type of shale is exposed in the northern part of the county. It is of marine origin. It was covered by deposits and later exposed as a result of erosion. The marine-deposited sediments weathered to fine textured soil material. Kyle, Pierre, and Samsil soils formed in material weathered from shale. Kyle soils also formed in clayey alluvial sediments.

The Chadron Formation overlies the Pierre Formation. It consists mostly of bentonitic, greenish gray, clayey, alkaline shale. It is channel sandstone locally at the base. Norrest and Orella soils formed in material weathered in place from the Chadron Formation. In some areas weathered material has been transported and deposited as colluvial and alluvial sediments on foot slopes and stream terraces. Bufton soils formed in this transported material and in material weathered in place from the Chadron Formation. Salinity and alkalinity are moderate or strong in many areas of material weathered from the Chadron Formation.

The Brule Formation overlies the Chadron Formation. It consists of brown to greenish gray siltstone that has layers of volcanic ash and sand. It is soft, massive material that weathers rapidly. Epping, Thirtynine, and Mitchell soils formed in material weathered in place from the Brule Formation. Mitchell soils also formed in material transported by water and gravity to foot slopes. Soils that formed in material weathered from the Brule Formation are generally silty, but Thirtynine soils formed in material containing slightly more clay and have a subsoil of silty clay loam. The Chadron and Brule Formations are widely exposed on the lower slopes north of the Pine Ridge area. The Brule Formation also is exposed on the breaks to the Platte River.

Ridgetops and knolls in some areas of the Brule Formation are capped by cemented, limy sandstone or gravellike material. Schamber soils formed in this material.

The uppermost exposure of consolidated bedrock in Sioux County is the Arikaree Group, which is sandstone of Tertiary age. This sandstone ranges from gray or light brownish gray to pinkish gray. It is massive and has layers of compacted silt and clay. Hard sandstone ledges and concretions that are pipelike or potatolike in shape are common. Busher, Canyon, Oglala, and Tassel soils formed in material weathered from sandstone. Bayard, Bridget, Ponderosa, and Vetal soils formed in colluvial and alluvial material weathered from sandstone. Soils that formed in material weathered from sandstone are extensive in the Pine Ridge area and extend southward through Sioux County.

Wind-deposited silty material, or loess, is in some areas of the county. The mantle of loess generally is less than 6 feet thick. Most of the loess in the county mantles

sandstone. Keith soils formed in loess. Alliance soils formed in a layer of loamy loess and in the underlying sandstone residuum.

Soils that formed in sandy eolian material are in the southern part of the county. The wind has worked the sandy material into low hummocks and dunes. Valent soils formed in this material. The sandy eolian material is mixed with silty material in some areas. Jayem and Sarben soils formed in these areas.

Recent alluvium is on stream terraces and bottom land. It consists of sediments washed from uplands onto flood plains or deposited by water from flooding streams. Alluvium is clayey, loamy, or sandy. The texture of the soils that formed in alluvium is closely related to the texture of the parent material. In Sioux County the oldest alluvium is on the higher terraces along the major streams and their tributaries. Alice and Tripp soils formed in alluvium on stream terraces. Alice soils formed in alluvium of sandy loam, and Tripp soils formed in alluvium of very fine sandy loam.

The most recent alluvium is in areas along upland drainageways where fresh material is still being deposited after heavy rains. Soils that formed in recent alluvium are characterized by minimal profile development. Bankard, Glenberg, and Craft soils formed in recent alluvium. In some areas silty and sandy alluvium is underlain by a water table at a depth of 1.5 to 3.0 feet. Las Animas soils formed in this material.

Climate

Climate influences vegetation, the activity of micro-organisms in the soil, and the physical condition of the soil. Rainfall, changes in temperature, and the wind directly affect weathering and soil formation. The climate of Sioux County is semiarid and continental. The average annual precipitation is about 17 inches, and the average annual temperature is about 44 degrees F. The average growing season is about 120 days. The prevailing wind is from the east-southeast from May to September and from the west-northwest during the remainder of the year.

Rainwater moves through the soil, carrying clay colloids downward from the surface and leaching soluble salts downward in the profile. The surface flow of water from heavy rains continuously detaches, mixes, transports, and redeposits unconsolidated material of many kinds. Glenberg, Las Animas, and other alluvial soils are examples of soils that formed in sediments deposited by water.

The amount of moisture and the prevailing temperature during the growing season affect the amount of vegetation, which is the principal source of organic matter in soils. These factors also affect the chemical processes and activities of micro-organisms that convert organic matter into humus. Alternating periods of freezing and thawing and of wetting and drying speed the mechanical and chemical weathering processes and improve the physical condition of the soil.

Wind transfers soil material from one place to another. It also mixes, sorts, and thins or thickens the surface layer, causing changes in the physical properties of this layer. Hot winds in summer have a drying effect on the soil. The deposits of loess and sandy material in the county are examples of the importance of wind as a soil-forming agent. Both the gently sloping landscape in areas of the silty Keith soils and the hummocks and dunes in areas of the sandy Valent soils can be attributed to wind activity.

As a result of disturbance of the soils by human activities, hard rains have eroded the surface layer and lowered the organic matter content and fertility of many soils in the county. The wind has eroded many of the unprotected surfaces, especially in areas of moderately coarse textured and coarse textured soils, and has removed part or all of the organic matter.

Plant and Animal Life

After the weathering and deposition of parent material, bacteria, fungi, amoebas, and other simple forms of plant and animal life invade the soil. After a time, more complex forms of life begin to develop. Plants and animals living on and in the soil produce organic matter, which influences the physical and chemical properties of the soil. The other four soil-forming factors affect the kind and amount of plant and animal life that lives on or in the soil.

The soils in Sioux County formed under short prairie grasses. The decomposition of these grasses and of their roots adds organic matter to the soils. The fibrous root system of the grasses penetrates the soils and helps to form a friable surface layer and a permeable subsoil. These features enhance the flow of water into the soils and increase soil porosity. An increase in porosity allows greater movement of air in the soils and stimulates the activity of bacteria and burrowing animals. Grasses are a prime factor in the stabilization of dunes in the sandhills.

When plants decay, micro-organisms act on the plant litter, forming humus, a source of nutrients. Some bacteria take in nitrogen from the air and use it for their own growth. When these bacteria die, the nitrogen becomes available to plants. Insects, earthworms, and small borrowing animals influence soil formation by mixing the organic and mineral parts of the soil together. The borrowing action of these animals stirs the soil and mixes in fresh nutrients, which hasten the formation of organic matter. In areas of poorly drained soils, which are poorly aerated, micro-organisms and earthworms act slowly because of a low supply of air. Consequently, plant litter

decays more slowly than it does on the better drained soils.

The accumulation of organic matter gradually darkens the surface layer of the soils. Vetal soils have a thick, dark surface layer, and Valent, Lisco, and Norrest soils have a thin, dark surface layer.

Human activities have a major effect on soil formation. Because of cropping sequences, drainage systems, irrigation, and summer fallow, the relationships among soil, water, and erosion that existed for several thousand years have changed. Removing the grass cover has exposed the fertile surface layer to erosion. Drainage systems have increased the rates of chemical activity and weathering in poorly drained soils. Irrigation and summer fallow have increased the moisture supply and the rates of chemical weathering and water movement.

Relief

Relief influences soil formation mainly through its effect on drainage, runoff, and vegetation. The slope gradient, the shape of the surface, and the permeability of the soil determine the rate of runoff, the internal drainage, and the moisture content of the soils. Internal drainage and availability of moisture are important factors in the formation of soil horizons.

The nearly level and gently sloping soils on uplands in the county are characterized by stronger profile development than the steeper soils. More moisture is absorbed by the nearly level and gently sloping soils, less water runs off the surface, and water percolates deeper into the profile. Consequently, lime, plant nutrients, and clay particles are leached to a greater extent in these soils, and distinct horizons form. The nearly level and gently sloping Keith and Alliance soils have fairly well developed profiles.

On steep slopes where runoff is rapid and little moisture penetrates the surface, the rate of soil formation is slower than that in the soils on the gentler slopes. The rate at which erosion removes the surface soil is almost as rapid the rate of soil formation. Lime and other elements are not leached so great a depth as they are in the less sloping soils. Because the soils on ridges and hilltops are more exposed to air currents than the soils in the lower areas, they are more susceptible to the loss of moisture through evaporation. The steep Tassel soils show little evidence of profile development other than a slightly darkened, thin surface layer.

Soils on bottom land, such as the well drained Craft and Glenberg soils, have very little relief, but their position on the landscape has an influence on soil formation in the young parent material. Some of these soils have a high water table, which affects the decomposition of organic matter, soil temperature, and alkalinity. Lisco soils, for example, are affected by alkalinity and a high water table. Some of the soils on bottom land are subject to flooding and to repeated deposition of sediments. All of these influences have an effect on the kind and amount of vegetation and on soil formation.

Soils in the sandhills are not so much affected by slope, runoff, and internal drainage as they are by erosion and the resistance of the sandy material to chemical weathering. Valent soils are an example.

Time

Time is needed for soil formation. The length of time needed depends on the influence of the other four soil-forming factors, especially the parent material.

Immature soils do not have well defined horizons because they have been exposed to soil-forming processes for only a short time. Craft soils, which are on bottom land, show little evidence of profile development because they have been in place only a short time and receive additional soil material during periods of flooding. The addition of this material does not favor soil-forming processes. Valent soils also are immature. The eolian material in which they formed has been in place only a short time, and chemical weathering has been slow.

The older immature soils in the county have a darkened surface layer but do not have a well developed subsoil. Bridget soils are an example. They formed in alluvial and colluvial material at the base of hills and have been in place a fairly long time.

Mature soils have well defined horizons and have reached an equilibrium with their environment. They have been in place long enough for the parent material to be altered by climate, relief, and plant and animal life. Keith and Alliance are examples of soils that have been in place a long time. They have a well developed subsoil.

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Glossary

ABC soil. A soil having an A, a B, and a C horizon.

AC soil. A soil having only an A and a C horizon. Commonly, such soil formed in recent alluvium or on steep, rocky slopes.

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alkali (sodic) soil. A soil having so high a degree of alkalinity (pH 8.5 or higher) or so high a percentage of exchangeable sodium (15 percent or more of the total exchangeable bases), or both, that plant growth is restricted.

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

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Association, soil. A group of soils or miscellaneous areas 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:

Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	more than 12

Badland. Steep or very steep, commonly nonstony, barren land dissected by many intermittent drainage channels. Badland is most common in semiarid and arid regions where streams are entrenched in soft geologic material. Local relief generally ranges from 25 to 500 feet. Runoff potential is very high, and geologic erosion is active.

Base saturation. The degree to which material having cation-exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, and K), expressed as a percentage of the total cation-exchange capacity.

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 flooding.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Capillary water. Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Catsteps. Very small, irregular terraces on steep hillsides, especially in pasture, formed by the trampling of cattle or the slippage of saturated soil.

Chiseling. Tillage with an implement having one or more soil-penetrating points that shatter or loosen hard, compacted layers to a depth below normal plow depth.

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.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Claypan. A slowly permeable soil horizon that contains much more clay than the horizons above it. A claypan is commonly hard when dry and plastic or stiff when wet.

Climax plant community. The stabilized plant community on a particular site. The plant cover reproduces itself

and does not change so long as the environment remains the same.

Coarse textured soil. Sand or loamy sand.

Colluvium. Soil material or rock fragments, or both, moved by creep, slide, or local wash and deposited at the base of steep slopes.

Complex slope. Irregular or variable slope. Planning or establishing terraces, diversions, and other water-control structures on a complex slope is difficult.

Complex, soil. A map unit of two or more kinds of soil or miscellaneous areas in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas.

Concretions. Cemented bodies with crude internal symmetry organized around a point, a line, or a plane. They typically take the form of concentric layers visible to the naked eye. Calcium carbonate, iron oxide, and manganese oxide are common compounds making up concretions. If formed in place, concretions of iron oxide or manganese oxide are generally considered a type of redoximorphic concentration.

Conservation tillage. A tillage system that does not invert the soil and that leaves a protective amount of crop residue on the surface throughout the year.

Consistence, soil. Refers to the degree of cohesion and adhesion of soil material and its resistance to deformation when ruptured. Consistence includes resistance of soil material to rupture and to penetration; plasticity, toughness, and stickiness of puddled soil material; and the manner in which the soil material behaves when subject to compression. Terms describing consistence are defined in the "Soil Survey Manual."

Contour stripcropping. Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Decreasers. The most heavily grazed climax range plants. Because they are the most palatable, they are the first to be destroyed by overgrazing.

Deferred grazing. Postponing grazing or resting grazing land for a prescribed period.

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of wet periods under conditions similar to those under which the soil formed. Alterations of the water regime by human activities, either through drainage or irrigation, are not a consideration unless they have significantly changed the morphology of the soil. Seven classes of natural soil drainage are recognized—*excessively drained, somewhat excessively drained, well drained, moderately well drained, somewhat poorly drained, poorly drained,* and *very poorly drained.* These classes are defined in the "Soil Survey Manual."

Drainage, surface. Runoff, or surface flow of water, from an area.

Eolian soil material. Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.
Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.
Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of human or animal activities or of a catastrophe in nature, such as a fire, that exposes the surface.

Excess fines (in tables). Excess silt and clay in the soil. The soil does not provide a source of gravel or sand for construction purposes.

Excess salt (in tables). Excess water-soluble salts in the soil that restrict the growth of most plants.

Excess sodium (in tables). Excess exchangeable sodium in the soil. The resulting poor physical properties restrict the growth of plants.

Fast intake (in tables). The rapid movement of water into the soil.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Fibric soil material (peat). The least decomposed of all

organic soil material. Peat contains a large amount of well preserved fiber that is readily identifiable according to botanical origin. Peat has the lowest bulk density and the highest water content at saturation of all organic soil material.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity.*

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Foot slope. The inclined surface at the base of a hill.

Forb. Any herbaceous plant not a grass or a sedge.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock as much as 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

Green manure crop (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water. Water filling all the unblocked pores of the material below the water table.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Hemic soil material (mucky peat). Organic soil material intermediate in degree of decomposition between the less decomposed fibric material and the more decomposed sapric material.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the "Soil Survey Manual." The major horizons of mineral soil are as follows:

O horizon.—An organic layer of fresh and decaying plant residue.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

E horizon.—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics, such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying soil material. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, an Arabic numeral, commonly a 2, precedes the letter C.

Cr horizon.—Soft, consolidated bedrock beneath the soil.

R layer.—Consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon, but it can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff potential. The soil properties that influence this potential are those that affect the minimum rate of water infiltration on a bare soil during periods after prolonged wetting when the soil is not frozen. These properties are depth to a seasonal high water table, the infiltration rate and permeability after prolonged wetting, and depth to a very slowly permeable layer. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff.

Increasers. Species in the climax vegetation that increase in amount as the more desirable plants are reduced by close grazing. Increasers commonly are the shorter plants and the less palatable to livestock.

Infiltration. The downward entry of water into the

immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Intake rate. The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation application. The rate of water intake, in inches per hour, is expressed as follows:

Less than 0.2	very low
0.2 to 0.4	low
0.4 to 0.75	moderately low
0.75 to 1.25	moderate
1.25 to 1.75	moderately high
1.75 to 2.5	high
More than 2.5	very high

Invaders. On range, plants that encroach into an area and grow after the climax vegetation has been reduced by grazing. Generally, plants invade following disturbance of the surface.

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are:
Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.
Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.
Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.
Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.
Drip (or trickle).—Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.
Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.
Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.
Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.
Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

Leaching. The removal of soluble material from soil or other material by percolating water.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loess. Fine grained material, dominantly of silt-sized particles, deposited by the wind.

Low strength. The soil is not strong enough to support loads.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Moderately coarse textured soil. Coarse sandy loam, sandy loam, or fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, or silty clay loam.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Descriptive terms are as follows: abundance—*few, common,* and *many;* size—*fine, medium,* and *coarse;* and contrast—*faint, distinct,* and *prominent.* The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium,* from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse,* more than 15 millimeters (about 0.6 inch).

Munsell notation. A designation of color by degrees of three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with hue of 10YR, value of 6, and chroma of 4.

Neutral soil. A soil having a pH value of 6.6 to 7.3. (See Reaction, soil.)

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Organic matter. Plant and animal residue in the soil in various stages of decomposition.

Parent material. The unconsolidated organic and mineral material in which soil forms.

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The downward movement of water through the soil.

Percs slowly (in tables). The slow movement of water through the soil adversely affects the specified use.

Permeability. The quality of the soil that enables water or air to move downward through the profile. The rate at which a saturated soil transmits water is accepted as a measure of this quality. In soil physics, the rate is referred to as "saturated hydraulic conductivity," which is defined in the "Soil Survey Manual." In line with conventional usage in the engineering profession and with traditional usage in published soil surveys, this rate of flow continues to be expressed as "permeability." Terms describing permeability, measured in inches per hour, are as follows:

Very slow	less than 0.06 inch
Slow	0.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management, such as slope, stoniness, and flooding.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Ponding. Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

Poor filter (in tables). Because of rapid or very rapid permeability, the soil may not adequately filter effluent from a waste disposal system.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Range condition. The present composition of the plant community on a range site in relation to the potential natural plant community for that site. Range condition is expressed as excellent, good, fair, or poor on the basis of how much the present plant community has departed from the potential.

Rangeland. Land on which the potential natural vegetation is predominantly grasses, grasslike plants, forbs, or shrubs suitable for grazing or browsing. It includes natural grasslands, savannas, many wetlands, some deserts, tundras, and areas that support certain forb and shrub communities.

Range site. An area of rangeland where climate, soil, and relief are sufficiently uniform to produce a distinct natural plant community. A range site is the product of all the environmental factors responsible for its development. It is typified by an association of species that differ from those on other range sites in kind or proportion of species or total production.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degrees of acidity or alkalinity, expressed as pH values, are:

Extremely acid	below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Moderately acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Saline soil. A soil containing soluble salts in an amount that impairs growth of plants. A saline soil does not contain excess exchangeable sodium.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-sized particles.

Sapric soil material (muck). The most highly

decomposed of all organic soil material. Muck has the least amount of plant fiber, the highest bulk density, and the lowest water content at saturation of all organic soil material.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Shrink-swell (in tables). The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance. The classes of slope in this survey are nearly level, 0 to 1 percent or 0 to 2 percent; very gently sloping, 1 to 3 percent; gently sloping, 3 to 6 percent; strongly sloping, 6 to 9 percent; moderately steep, 9 to 20 percent (9 to 24 percent in the sandhills); steep, 20 to 30 percent (more than 24 percent in the sandhills); and very steep, more than 30 percent.

Slope (in tables). Slope is great enough that special practices are required to ensure satisfactory performance of the soil for a specific use.

Slow intake (in tables). The slow movement of water into the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.6 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes, in millimeters, of separates recognized in the United States are as follows:

Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the material below the solum. The living roots and plant and animal activities are largely confined to the solum.

Stripcropping. Growing crops in a systematic arrangement of strips or bands that provide vegetative barriers to soil blowing and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grain* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Stubble mulch. Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from soil blowing and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Substratum. The part of the soil below the solum.

Subsurface layer. Any surface soil horizon (A, E, AB, or EB) below the surface layer.

Summer fallow. The tillage of uncropped land during the summer to control weeds and allow storage of moisture in the soil for the growth of a later crop. A practice common in semiarid regions, where annual precipitation is not enough to produce a crop every year. Summer fallow is frequently practiced before planting winter grain.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Surface soil. The A, E, AB, and EB horizons, considered collectively. It includes all subdivisions of these horizons.

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior. Soils are recognized as taxadjuncts only when one or more of their characteristics are slightly outside the range defined for the family of the series for which the soils are named.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet. A terrace in a field generally is built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay.* The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). Otherwise suitable soil material that is too thin for the specified use.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Too arid (in tables). The soil is dry most of the time, and vegetation is difficult to establish.

Upland. Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Tables

TABLE 1.--TEMPERATURE AND PRECIPITATION

(Recorded in the period 1951-87 at Harrison, Nebraska)

Month	Temperature						Precipitation				
				2 years in 10 will have--		Average		2 years in 10 will have--		Average	
	Average daily maximum	Average daily minimum	Average daily	Maximum temperature higher than--	Minimum temperature lower than--	number of growing degree days*	Average	Less than--	More than--	number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January-----	32.7	8.9	20.8	57	-23	2	0.40	0.17	0.61	1	7.9
February----	37.6	13.8	25.7	62	-17	11	.56	.20	.86	1	9.2
March-------	43.1	19.1	31.1	70	-9	37	1.07	.42	1.61	3	12.7
April-------	54.2	28.5	41.4	80	7	143	2.03	1.04	2.90	4	10.0
May---------	64.9	39.0	51.9	86	19	382	3.11	1.57	4.44	6	1.3
June--------	76.1	48.5	62.3	96	31	669	2.95	1.53	4.19	6	.2
July--------	85.0	54.8	69.9	100	41	992	2.31	1.19	3.29	5	.0
August------	83.7	52.7	68.2	98	38	867	1.23	.63	1.75	3	.0
September---	73.1	42.0	57.6	94	21	533	1.46	.41	2.31	3	.9
October-----	61.0	31.5	46.2	84	11	248	.99	.32	1.59	2	3.7
November----	44.4	19.5	32.0	70	-8	43	.66	.26	.99	2	7.4
December----	35.9	12.3	24.1	61	-18	7	.52	.22	.79	1	8.5
Yearly:											
Average---	57.7	30.9	44.3	---	---	---	---	---	---	---	---
Extreme---	105	-33	---	100	-26	---	---	---	---	---	---
Total-----	---	---	---	---	---	3,864	17.28	14.35	19.91	37	61.7

* 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 (40 degrees F).

TABLE 2.--FREEZE DATES IN SPRING AND FALL

(Recorded in the period 1951-87 at Harrison, Nebraska)

Probability	Temperature		
	24 °F or lower	28 °F or lower	32 °F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	May 14	May 30	June 8
2 years in 10 later than--	May 9	May 24	June 3
5 years in 10 later than--	Apr. 29	May 13	May 22
First freezing temperature in fall:			
1 year in 10 earlier than--	Sept. 19	Sept. 13	Sept. 6
2 years in 10 earlier than--	Sept. 25	Sept. 18	Sept. 10
5 years in 10 earlier than--	Oct. 6	Sept. 27	Sept. 19

TABLE 3.--GROWING SEASON

(Recorded in the period 1951-87 at Harrison, Nebraska)

Probability	Daily minimum temperature during growing season		
	Higher than 24 °F	Higher than 28 °F	Higher than 32 °F
	Days	Days	Days
9 years in 10	135	114	98
8 years in 10	144	121	105
5 years in 10	159	136	118
2 years in 10	175	150	131
1 year in 10	183	157	138

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

Map symbol	Soil name	Acres	Percent
Ab	Alice fine sandy loam, 0 to 1 percent slopes	2,850	0.2
AbB	Alice fine sandy loam, 1 to 3 percent slopes	2,710	0.2
AbC	Alice fine sandy loam, 3 to 6 percent slopes	1,090	0.1
AcB	Alliance loam, 1 to 3 percent slopes	1,780	0.1
AcC	Alliance loam, 3 to 6 percent slopes	1,180	0.1
ArB	Arvada loam, 0 to 3 percent slopes	9,560	0.7
AwD	Ashollow loamy very fine sand, 3 to 9 percent slopes	30,680	2.3
AwE	Ashollow loamy very fine sand, 9 to 20 percent slopes	7,700	0.6
Ba	Badland	11,430	0.9
BbB	Bahl clay, 0 to 6 percent slopes	100	*
Bc	Bankard loamy fine sand, 0 to 2 percent slopes, occasionally flooded	1,660	0.1
Bd	Bankard loamy fine sand, channeled, 0 to 2 percent slopes	2,550	0.2
Be	Bayard fine sandy loam, 0 to 1 percent slopes	100	*
BeB	Bayard fine sandy loam, 1 to 3 percent slopes	1,420	0.1
BeC	Bayard fine sandy loam, 3 to 6 percent slopes	4,160	0.3
Bh	Bigwinder fine sandy loam, 0 to 1 percent slopes	1,150	0.1
BoG	Blueridge gravelly loamy sand, 20 to 50 percent slopes	3,530	0.3
BpE	Blueridge-Bayard complex, 6 to 20 percent slopes	11,160	0.8
BrC	Bridget very fine sandy loam, 3 to 6 percent slopes	1,350	0.1
BrD	Bridget very fine sandy loam, 6 to 9 percent slopes	2,630	0.2
BrF	Bridget very fine sandy loam, 9 to 30 percent slopes	2,700	0.2
Bs	Bufton clay loam, 0 to 1 percent slopes	4,040	0.3
BsB	Bufton clay loam, 1 to 3 percent slopes	16,140	1.2
BsD	Bufton clay loam, 3 to 9 percent slopes	28,670	2.2
BsE	Bufton clay loam, 9 to 20 percent slopes	7,090	0.5
BuB	Busher loamy very fine sand, 0 to 3 percent slopes	8,990	0.7
BuC	Busher loamy very fine sand, 3 to 6 percent slopes	34,280	2.6
BuD	Busher loamy very fine sand, 6 to 9 percent slopes	9,920	0.7
BwC	Busher-Phiferson complex, 0 to 6 percent slopes	760	0.1
BxC	Busher-Tassel complex, 0 to 6 percent slopes	29,360	2.2
BxE	Busher-Tassel complex, 6 to 20 percent slopes	131,960	10.1
Cr	Craft loam, 0 to 2 percent slopes	2,650	0.2
Cs	Craft loam, 0 to 2 percent slopes, occasionally flooded	1,370	0.1
Ct	Craft loam, channeled, 0 to 2 percent slopes	5,140	0.4
DpB	Draknab loamy fine sand, 0 to 3 percent slopes	10	*
EpF	Epping silt loam, 3 to 30 percent slopes	4,570	0.3
EsG	Epping-Badland complex, 3 to 50 percent slopes	8,160	0.6
Fu	Fluvaquents, sandy, 0 to 1 percent slopes	350	*
Go	Glenberg fine sandy loam, 0 to 2 percent slopes	2,060	0.2
Gp	Glenberg fine sandy loam, channeled, 0 to 2 percent slopes	7,590	0.6
HsC	Hisle-Slickspots complex, 0 to 6 percent slopes	2,550	0.2
In	Interior silty clay, channeled, 0 to 2 percent slopes	3,970	0.3
JmB	Jayem loamy very fine sand, 0 to 3 percent slopes	44,340	3.3
JmC	Jayem loamy very fine sand, 3 to 6 percent slopes	20,910	1.6
JmD	Jayem loamy very fine sand, 6 to 9 percent slopes	2,540	0.2
KeB	Keith loam, 1 to 3 percent slopes	760	0.1
KeC	Keith loam, 3 to 6 percent slopes	880	0.1
Ky	Kyle silty clay, 0 to 1 percent slopes	2,890	0.2
KyC	Kyle silty clay, 1 to 6 percent slopes	7,250	0.5
La	Las Animas fine sandy loam, 0 to 2 percent slopes, occasionally flooded	2,690	0.2
Lb	Las Animas fine sandy loam, channeled, 0 to 2 percent slopes	360	*
Lc	Las Animas-Lisco complex, 0 to 2 percent slopes, occasionally flooded	4,970	0.4
Ld	Lisco very fine sandy loam, 0 to 2 percent slopes, occasionally flooded	2,160	0.2
Lh	Lohmiller silty clay loam, 0 to 2 percent slopes	590	*
Lo	Lohmiller silty clay loam, channeled, 0 to 2 percent slopes	4,740	0.4
Ls	Lohmiller silty clay, 0 to 2 percent slopes, occasionally flooded	1,790	0.1
Mr	Mitchell very fine sandy loam, 0 to 1 percent slopes	1,130	0.1
MrB	Mitchell very fine sandy loam, 1 to 3 percent slopes	5,400	0.4
MrC	Mitchell very fine sandy loam, 3 to 6 percent slopes	2,960	0.2
Mt	Mitchell silt loam, 0 to 1 percent slopes	1,560	0.1
MtB	Mitchell silt loam, 1 to 3 percent slopes	1,700	0.1
MtC	Mitchell silt loam, 3 to 6 percent slopes	3,350	0.3

See footnote at end of table.

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

Map symbol	Soil name	Acres	Percent
MtD	Mitchell silt loam, 6 to 9 percent slopes	1,590	0.1
MtE	Mitchell silt loam, 9 to 20 percent slopes	3,730	0.3
MxD	Mitchell-Epping complex, 3 to 9 percent slopes	2,540	0.2
MxF	Mitchell-Epping complex, 9 to 30 percent slopes	4,360	0.3
NrB	Norrest clay loam, 1 to 3 percent slopes	1,190	0.1
NrD	Norrest clay loam, 3 to 9 percent slopes	2,450	0.2
OgB	Oglala very fine sandy loam, 1 to 3 percent slopes	19,770	1.5
OgC	Oglala very fine sandy loam, 3 to 6 percent slopes	13,260	1.0
OgD	Oglala very fine sandy loam, 6 to 9 percent slopes	1,170	0.1
OnD	Oglala-Canyon complex, 3 to 9 percent slopes	52,230	3.9
OnF	Oglala-Canyon complex, 9 to 30 percent slopes	36,550	2.8
OpD	Olney loam, 3 to 9 percent slopes	3,370	0.3
OrF	Orella clay, 1 to 30 percent slopes	5,820	0.4
OsG	Orella-Badland complex, 3 to 50 percent slopes	7,710	0.6
OwB	Otero loamy very fine sand, 0 to 3 percent slopes	20,750	1.6
Pa	Pathfinder loamy fine sand, 0 to 2 percent slopes	500	*
PhF	Phiferson-Tassel-Rock outcrop complex, 6 to 30 percent slopes	1,140	0.1
PrC	Pierre clay, 1 to 6 percent slopes	5,950	0.4
PrE	Pierre clay, 6 to 20 percent slopes	39,170	3.0
PsD	Ponderosa loamy very fine sand, 6 to 9 percent slopes	2,510	0.2
PsE	Ponderosa loamy very fine sand, 9 to 20 percent slopes	5,590	0.4
PtF	Ponderosa-Tassel-Vetal complex, 6 to 30 percent slopes	23,900	1.8
RkG	Rock outcrop-Tassel complex, 9 to 70 percent slopes	14,130	1.1
SbF	Samsil-Pierre complex, 3 to 30 percent slopes	37,820	2.9
ScG	Samsil-Rock outcrop complex, 9 to 50 percent slopes	3,000	0.2
SdD	Sarben loamy very fine sand, 3 to 9 percent slopes	23,070	1.7
SdF	Sarben loamy very fine sand, 9 to 30 percent slopes	2,190	0.2
SeB	Sarben-Busher complex, 0 to 3 percent slopes	1,130	0.1
SeD	Sarben-Busher complex, 3 to 9 percent slopes	530	*
SfB	Satanta very fine sandy loam, 1 to 3 percent slopes	4,710	0.4
SfC	Satanta very fine sandy loam, 3 to 6 percent slopes	1,480	0.1
Sg	Savo silty clay loam, 0 to 2 percent slopes	1,360	0.1
SgC	Savo silty clay loam, 2 to 6 percent slopes	760	0.1
SrF	Schamber gravelly sandy loam, 3 to 30 percent slopes	2,960	0.2
Ss	Scoville fine sand, 0 to 1 percent slopes	3,470	0.3
SsB	Scoville fine sand, 1 to 3 percent slopes	2,700	0.2
Su	Scoville loamy fine sand, 0 to 1 percent slopes	3,530	0.3
SuB	Scoville loamy fine sand, 1 to 3 percent slopes	1,720	0.1
SxE	Skilak silty clay loam, 6 to 20 percent slopes	1,160	0.1
TbG	Tassel-Ashollow-Rock outcrop complex, 9 to 60 percent slopes	63,320	4.8
TgF	Tassel-Busher-Rock outcrop complex, 6 to 30 percent slopes	49,490	3.7
TrG	Tassel-Ponderosa-Rock outcrop association, 9 to 70 percent slopes	93,770	7.1
TtB	Thirtynine loam, 1 to 3 percent slopes	5,350	0.4
TtC	Thirtynine loam, 3 to 6 percent slopes	5,800	0.4
TtD	Thirtynine loam, 6 to 9 percent slopes	6,950	0.5
Tv	Tripp very fine sandy loam, 0 to 1 percent slopes	4,510	0.3
TvB	Tripp very fine sandy loam, 1 to 3 percent slopes	1,230	0.1
VaB	Valent fine sand, 0 to 3 percent slopes	3,080	0.2
VaD	Valent fine sand, 3 to 9 percent slopes	30,540	2.3
VaE	Valent fine sand, rolling	42,680	3.2
VaF	Valent complex, rolling and hilly	24,850	1.9
VbB	Valent loamy fine sand, 0 to 3 percent slopes	18,390	1.4
VbD	Valent loamy fine sand, 3 to 9 percent slopes	64,970	4.9
VcB	Vetal fine sandy loam, 0 to 3 percent slopes	500	*
VgB	Vetal very fine sandy loam, 1 to 3 percent slopes	14,760	1.1
VgC	Vetal very fine sandy loam, 3 to 6 percent slopes	8,020	0.6
WhB	Wildhorse loamy fine sand, 0 to 3 percent slopes	1,480	0.1
	Water, undifferentiated	126	*
	Total	1,324,876	100.0

* Less than 0.1 percent.

TABLE 5.--PRIME FARMLAND

(Only the soils considered prime farmland are listed. Urban or built-up areas of the soils listed are not considered prime farmland. If a soil is prime farmland only under certain conditions, the conditions are specified in parentheses after the soil name)

Map symbol	Soil name
Ab	Alice fine sandy loam, 0 to 1 percent slopes (where irrigated)
AbB	Alice fine sandy loam, 1 to 3 percent slopes (where irrigated)
AbC	Alice fine sandy loam, 3 to 6 percent slopes (where irrigated)
AcB	Alliance loam, 1 to 3 percent slopes (where irrigated)
AcC	Alliance loam, 3 to 6 percent slopes (where irrigated)
Be	Bayard fine sandy loam, 0 to 1 percent slopes (where irrigated)
BeB	Bayard fine sandy loam, 1 to 3 percent slopes (where irrigated)
BeC	Bayard fine sandy loam, 3 to 6 percent slopes (where irrigated)
BrC	Bridget very fine sandy loam, 3 to 6 percent slopes (where irrigated)
Bs	Bufton clay loam, 0 to 1 percent slopes (where irrigated)
BsB	Bufton clay loam, 1 to 3 percent slopes (where irrigated)
Cr	Craft loam, 0 to 2 percent slopes (where irrigated)
Cs	Craft loam, 0 to 2 percent slopes, occasionally flooded (where irrigated)
Go	Glenberg fine sandy loam, 0 to 2 percent slopes (where irrigated)
KeB	Keith loam, 1 to 3 percent slopes (where irrigated)
KeC	Keith loam, 3 to 6 percent slopes (where irrigated)
La	Las Animas fine sandy loam, 0 to 2 percent slopes, occasionally flooded (where irrigated)
Lh	Lohmiller silty clay loam, 0 to 2 percent slopes (where irrigated)
Mr	Mitchell very fine sandy loam, 0 to 1 percent slopes (where irrigated)
MrB	Mitchell very fine sandy loam, 1 to 3 percent slopes (where irrigated)
MrC	Mitchell very fine sandy loam, 3 to 6 percent slopes (where irrigated)
Mt	Mitchell silt loam, 0 to 1 percent slopes (where irrigated)
MtB	Mitchell silt loam, 1 to 3 percent slopes (where irrigated)
MtC	Mitchell silt loam, 3 to 6 percent slopes (where irrigated)
OgB	Oglala very fine sandy loam, 1 to 3 percent slopes (where irrigated)
OgC	Oglala very fine sandy loam, 3 to 6 percent slopes (where irrigated)
SfB	Satanta very fine sandy loam, 1 to 3 percent slopes (where irrigated)
SfC	Satanta very fine sandy loam, 3 to 6 percent slopes (where irrigated)
Sg	Savo silty clay loam, 0 to 2 percent slopes (where irrigated)
SgC	Savo silty clay loam, 2 to 6 percent slopes (where irrigated)
TtB	Thirtynine loam, 1 to 3 percent slopes (where irrigated)
TtC	Thirtynine loam, 3 to 6 percent slopes (where irrigated)
Tv	Tripp very fine sandy loam, 0 to 1 percent slopes (where irrigated)
TvB	Tripp very fine sandy loam, 1 to 3 percent slopes (where irrigated)
VgB	Vetal very fine sandy loam, 1 to 3 percent slopes (where irrigated)
VgC	Vetal very fine sandy loam, 3 to 6 percent slopes (where irrigated)

TABLE 6.--CAPABILITY CLASSES AND SUBCLASSES

(All soils are assigned to nonirrigated capability subclasses (N). Only potentially irrigable soils are assigned to irrigated subclasses (I). Miscellaneous areas are excluded. Absence of an entry indicates no acreage)

Class	Total acreage	Major management concerns (Subclass)			
		Erosion (e)	Wetness (w)	Soil problem (s)	Climate (c)
		Acres	Acres	Acres	Acres
I (N)	---	---	---	---	---
(I)	5,570	---	---	---	---
II (N)	56,530	49,590	1,370	---	5,570
(I)	72,870	71,500	1,370	---	---
III (N)	144,072	126,340	7,462	4,040	6,230
(I)	151,532	140,030	7,462	4,040	---
IV (N)	280,604	275,954	1,660	2,990	---
(I)	361,574	356,524	1,660	3,390	---
V (N)	---	---	---	---	---
VI (N)	639,055	420,037	25,500	193,518	---
VII (N)	136,573	41,516	---	95,057	---
VIII (N)	67,909	---	350	67,559	---

TABLE 7.--LAND CAPABILITY AND YIELDS PER ACRE OF CROPS

(Yields in the N columns are for nonirrigated soils; those in the I columns are for irrigated soils. Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil)

Soil name and map symbol	Land capability		Winter wheat		Alfalfa hay		Corn		Dry beans		Sugar beets	
	N	I	N	I	N	I	N	I	N	I	N	I
			Bu	Bu	Tons	Tons	Bu	Bu	Bu	Bu	Tons	Tons
Ab---------- Alice	IIIe	IIe	40	---	1.6	5.5	---	135	---	40	---	25
AbB---------- Alice	IIIe	IIe	37	---	1.5	5.0	---	130	---	37	---	23
AbC---------- Alice	IVe	IIIe	35	---	1.4	4.5	---	125	---	35	---	21
AcB---------- Alliance	IIe	IIe	42	---	1.6	5.5	---	135	---	35	---	22
AcC---------- Alliance	IIIe	IIIe	36	---	1.3	5.0	---	120	---	31	---	19
ArB---------- Arvada	VIs	---	---	---	---	---	---	---	---	---	---	---
AwD---------- Ashollow	IVe	IVe	26	---	1.2	4.2	---	100	---	27	---	18
AwE---------- Ashollow	VIe	---	---	---	---	---	---	---	---	---	---	---
Ba---------- Badland	VIIIs	---	---	---	---	---	---	---	---	---	---	---
BbB---------- Bahl	IVs	---	---	---	1.5	---	---	---	---	---	---	---
Bc---------- Bankard	IVw	IVw	20	---	---	3.7	---	90	---	25	---	17
Bd---------- Bankard	VIw	---	---	---	---	---	---	---	---	---	---	---
Be---------- Bayard	IIIe	IIe	40	---	1.6	5.5	---	135	---	40	---	25
BeB---------- Bayard	IIIe	IIe	35	---	1.4	4.5	---	125	---	35	---	21
BeC---------- Bayard	IVe	IIIe	33	---	1.3	4.3	---	122	---	31	---	19
Bh---------- Bigwinder	VIw	---	---	---	---	---	---	---	---	---	---	---
BoG---------- Blueridge	VIIs	---	---	---	---	---	---	---	---	---	---	---
BpE---------- Blueridge-------- Bayard----------	VIs VIe	---	---	---	---	---	---	---	---	---	---	---
BrC---------- Bridget	IIIe	IIIe	35	---	2.0	5.3	30	120	---	32	---	20

TABLE 7.--LAND CAPABILITY AND YIELDS PER ACRE OF CROPS--Continued

Soil name and map symbol	Land capability		Winter wheat		Alfalfa hay		Corn		Dry beans		Sugar beets	
	N	I	N	I	N	I	N	I	N	I	N	I
			Bu	Bu	Tons	Tons	Bu	Bu	Bu	Bu	Tons	Tons
BrD---------- Bridget	IVe	IVe	30	---	1.5	4.0	---	110	---	29	---	18
BrF---------- Bridget	VIe	---	---	---	---	---	---	---	---	---	---	---
Bs---------- Bufton	IIIs	IIIs	28	---	1.8	4.5	---	---	---	---	---	---
BsB---------- Bufton	IIIe	IIIe	26	---	1.5	4.3	---	---	---	---	---	---
BsD---------- Bufton	IVe	IVe	23	---	1.5	3.8	---	---	---	---	---	---
BsE---------- Bufton	VIe	---	---	---	---	---	---	---	---	---	---	---
BuB---------- Busher	IIIe	IIIe	34	---	1.4	4.4	---	120	---	30	---	19
BuC---------- Busher	IVe	IVe	30	---	1.2	4.1	---	108	---	26	---	17
BuD---------- Busher	IVe	IVe	25	---	1.1	4.0	---	100	---	22	---	15
BwC---------- Busher-Phiferson	IVe	IVe	---	---	---	4.2	---	---	---	---	---	---
BxC----------			---	---	---	---	---	100	---	20	---	14
Busher----------	IVe	IVe										
Tassel----------	VIs	---										
BxE----------		---	---	---	---	---	---	---	---	---	---	---
Busher----------	VIe											
Tassel----------	VIs											
Cr---------- Craft	IIc	I	45	---	2.0	6.0	---	145	---	48	---	30
Cs---------- Craft	IIw	IIw	40	---	2.0	5.5	---	140	---	45	---	28
Ct---------- Craft	VIw	---	---	---	---	---	---	---	---	---	---	---
DpB---------- Draknab	IVe	IVe	---	---	1.5	2.5	---	---	---	---	---	---
EpF---------- Epping	VIs	---	---	---	---	---	---	---	---	---	---	---
EsG----------		---	---	---	---	---	---	---	---	---	---	---
Epping----------	VIs											
Badland----------	VIIIs											
Fu---------- Fluvaquents	VIIIw	---	---	---	---	---	---	---	---	---	---	---
Go---------- Glenberg	IIIe	IIe	36	---	1.7	5.0	---	130	---	35	---	23

TABLE 7.--LAND CAPABILITY AND YIELDS PER ACRE OF CROPS--Continued

Soil name and map symbol	Land capability		Winter wheat		Alfalfa hay		Corn		Dry beans		Sugar beets	
	N	I	N	I	N	I	N	I	N	I	N	I
			Bu	Bu	Tons	Tons	Bu	Bu	Bu	Bu	Tons	Tons
Gp---------- Glenberg	VIw	---	---	---	---	---	---	---	---	---	---	---
HsC----------		---	---	---	---	---	---	---	---	---	---	---
Hisle----------	VIs											
Slickspots--------	VIIIs											
In---------- Interior	VIw	---	---	---	---	---	---	---	---	---	---	---
JmB---------- Jayem	IIIe	IIIe	36	50	1.5	5.0	25	130	---	35	---	23
JmC---------- Jayem	IVe	IVe	30	45	1.3	4.5	20	125	---	31	---	19
JmD---------- Jayem	IVe	IVe	28	---	1.1	3.7	---	110	---	28	---	17
KeB---------- Keith	IIe	IIe	45	70	1.5	5.8	---	130	---	45	---	26
KeC---------- Keith	IIIe	IIIe	40	---	1.3	4.8	40	120	---	40	---	22
Ky---------- Kyle	IVs	IVs	25	---	1.2	4.0	---	---	---	---	---	---
KyC---------- Kyle	IVe	---	22	---	1.1	3.5	---	---	---	---	---	---
La---------- Las Animas	IIIw	IIIw	33	---	3.0	5.0	---	115	---	32	---	21
Lb---------- Las Animas	VIw	---	---	---	---	---	---	---	---	---	---	---
Lc----------		---	---	---	---	---	---	---	---	---	---	---
Las Animas-------	IIIw	IIIw										
Lisco----------	VIs	---										
Ld---------- Lisco	VIs	---	---	---	---	---	---	---	---	---	---	---
Lh---------- Lohmiller	IIIc	IIIe	37	---	1.7	4.0	---	---	---	---	---	---
Lo---------- Lohmiller	VIw	---	---	---	---	---	---	---	---	---	---	---
Ls---------- Lohmiller	IIIw	IIIw	35	---	1.7	3.6	---	---	---	---	---	---
Mr---------- Mitchell	IIIc	IIe	40	---	1.8	5.6	---	140	---	40	---	29
MrB---------- Mitchell	IIIe	IIe	36	---	1.7	5.2	---	130	---	37	---	24
MrC---------- Mitchell	IIIe	IIIe	30	---	1.5	4.7	---	120	---	32	---	20

TABLE 7.--LAND CAPABILITY AND YIELDS PER ACRE OF CROPS--Continued

Soil name and map symbol	Land capability		Winter wheat		Alfalfa hay		Corn		Dry beans		Sugar beets	
	N	I	N	I	N	I	N	I	N	I	N	I
			Bu	Bu	Tons	Tons	Bu	Bu	Bu	Bu	Tons	Tons
Mt---------- Mitchell	IIc	I	40	---	2.0	5.4	---	---	---	---	---	---
MtB---------- Mitchell	IIe	IIe	36	---	1.8	5.2	---	---	---	---	---	---
MtC---------- Mitchell	IIIe	IIIe	32	---	1.6	4.7	---	---	---	---	---	---
MtD---------- Mitchell	IVe	IVe	28	---	1.4	4.1	---	---	---	---	---	---
MtE---------- Mitchell	VIe	---	---	---	---	---	---	---	---	---	---	---
MxD----------			25	---	1.2	3.8	---	100	---	27	---	16
Mitchell----------	IVe	IVe										
Epping----------	VIs	---										
MxF----------			---	---	---	---	---	---	---	---	---	---
Mitchell----------	VIe	---										
Epping----------	VIs	---										
NrB---------- Norrest	IIIe	IIIe	23	---	1.4	3.8	---	---	---	---	---	---
NrD---------- Norrest	IVe	IVe	20	---	1.2	3.3	---	---	---	---	---	---
OgB---------- Oglala	IIe	IIe	40	---	1.5	4.5	29	130	---	40	---	25
OgC---------- Oglala	IIIe	IIIe	37	---	1.4	4.0	28	120	---	36	---	21
OgD---------- Oglala	IVe	IVe	35	---	1.3	3.7	21	110	---	30	---	18
OnD----------			27	---	1.5	3.7	---	108	---	27	---	16
Oglala----------	IVe	IVe										
Canyon----------	VIs	---										
OnF----------		---	---	---	---	---	---	---	---	---	---	---
Oglala----------	VIe											
Canyon----------	VIs											
OpD---------- Olney	IVe	IIIe	35	---	1.5	3.0	---	---	---	---	---	---
OrF---------- Orella	VIs	---	---	---	---	---	---	---	---	---	---	---
OsG----------		---	---	---	---	---	---	---	---	---	---	---
Orella----------	VIs											
Badland----------	VIIIs											
OwB---------- Otero	IVe	IIIe	34	---	1.5	5.0	---	125	---	34	---	23
Pa---------- Pathfinder	VIs	IVs	---	---	---	4.4	---	85	---	---	---	21

TABLE 7.--LAND CAPABILITY AND YIELDS PER ACRE OF CROPS--Continued

Soil name and map symbol	Land capability		Winter wheat		Alfalfa hay		Corn		Dry beans		Sugar beets	
	N	I	N	I	N	I	N	I	N	I	N	I
			Bu	Bu	Tons	Tons	Bu	Bu	Bu	Bu	Tons	Tons
PhF----------		---	---	---	---	---	---	---	---	---	---	---
Phiferson--------	IVe											
Tassel-----------	VIs											
Rock outcrop-----	VIIIs											
PrC----------	IVe	---	25	---	1.2	3.7	---	---	---	---	---	---
Pierre												
PrE----------	VIe	---	---	---	---	---	---	---	---	---	---	---
Pierre												
PsD----------	IVe	IVe	27	---	1.0	4.0	---	---	---	---	---	---
Ponderosa												
PsE----------	VIe	---	---	---	---	---	---	---	---	---	---	---
Ponderosa												
PtF----------		---	---	---	---	---	---	---	---	---	---	---
Ponderosa--------	VIe											
Tassel-----------	VIs											
Vetal------------	IVe											
RkG----------		---	---	---	---	---	---	---	---	---	---	---
Rock outcrop-----	VIIIs											
Tassel-----------	VIs											
SbF----------		---	---	---	---	---	---	---	---	---	---	---
Samsil-----------	VIs											
Pierre-----------	VIe											
ScG----------		---	---	---	---	---	---	---	---	---	---	---
Samsil-----------	VIs											
Rock outcrop-----	VIIIs											
SdD----------	IVe	IVe	22	---	1.2	3.5	---	105	---	27	---	16
Sarben												
SdF----------	VIe	---	---	---	---	---	---	---	---	---	---	---
Sarben												
SeB----------	IIIe	IIIe	27	---	1.2	3.8	---	---	---	---	---	---
Sarben-Busher												
SeD----------	IVe	IVe	24	---	1.1	3.7	---	---	---	---	---	---
Sarben-Busher												
SfB----------	IIe	IIe	40	---	1.7	5.3	---	130	---	34	---	22
Satanta												
SfC----------	IIIe	IIIe	35	---	1.3	4.8	---	115	---	30	---	18
Satanta												
Sg----------	IIc	I	40	---	1.5	5.0	44	---	---	---	---	---
Savo												
SgC----------	IIe	IIe	35	---	1.4	4.6	41	---	---	---	---	---
Savo												
SrF----------	VIs	---	---	---	---	---	---	---	---	---	---	---
Schamber												
Ss, SsB----------	VIe	IVe	---	---	---	3.5	---	95	---	25	---	---
Scoville												

TABLE 7.--LAND CAPABILITY AND YIELDS PER ACRE OF CROPS--Continued

Soil name and map symbol	Land capability		Winter wheat		Alfalfa hay		Corn		Dry beans		Sugar beets	
	N	I	N	I	N	I	N	I	N	I	N	I
			Bu	Bu	Tons	Tons	Bu	Bu	Bu	Bu	Tons	Tons
Su, SuB---------- Scoville	IVe	IVe	25	---	---	4.0	---	100	---	30	---	15
SxE---------- Skilak	VIe	---	---	---	---	---	---	---	---	---	---	---
TbG----------		---	---	---	---	---	---	---	---	---	---	---
Tassel----------	VIIs											
Ashollow---------	VIe											
Rock outcrop-----	VIIIs											
TgF----------		---	---	---	---	---	---	---	---	---	---	---
Tassel----------	VIs											
Busher----------	VIe											
Rock outcrop-----	VIIIs											
TrG----------		---	---	---	---	---	---	---	---	---	---	---
Tassel----------	VIIs											
Ponderosa--------	VIIe											
Rock outcrop-----	VIIIs											
TtB---------- Thirtynine	IIe	IIe	40	---	2.0	5.0	---	---	---	---	---	---
TtC---------- Thirtynine	IIIe	IIIe	38	---	1.8	4.6	---	---	---	---	---	---
TtD---------- Thirtynine	IVe	IVe	36	---	1.6	4.4	---	---	---	---	---	---
Tv---------- Tripp	IIIc	IIe	39	---	2.0	5.6	---	140	---	41	---	27
TvB---------- Tripp	IIIe	IIe	38	---	1.9	5.3	---	130	---	37	---	24
VaB---------- Valent	VIe	IVe	---	---	---	3.5	---	100	---	25	---	14
VaD---------- Valent	VIe	IVe	---	---	---	3.5	---	100	---	25	---	14
VaE---------- Valent	VIe	---	---	---	---	---	---	---	---	---	---	---
VaF----------		---	---	---	---	---	---	---	---	---	---	---
Valent, rolling--	VIe											
Valent, hilly----	VIIe											
VbB---------- Valent	VIe	IVe	---	---	---	3.7	---	105	---	27	---	17
VbD---------- Valent	VIe	IVe	---	---	---	3.3	---	100	---	26	---	16
VcB---------- Vetal	IIIe	IIe	37	---	1.8	5.0	40	135	---	---	---	---
VgB---------- Vetal	IIe	IIe	40	---	2.5	6.0	42	145	---	45	---	30
VgC---------- Vetal	IIIe	IIIe	38	---	2.0	5.3	38	140	---	41	---	27

TABLE 7.--LAND CAPABILITY AND YIELDS PER ACRE OF CROPS--Continued

Soil name and map symbol	Land capability		Winter wheat		Alfalfa hay		Corn		Dry beans		Sugar beets	
	N	I	N	I	N	I	N	I	N	I	N	I
			Bu	Bu	Tons	Tons	Bu	Bu	Bu	Bu	Tons	Tons
WhB---------- Wildhorse	VIs	---	---	---	---	---	---	---	---	---	---	---

TABLE 8.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES

Soil name and map symbol	Range site	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
Ab, AbB, AbC---------- Alice	Sandy - Veg. Zone 1------------	Favorable	2,300	Prairie sandreed----------	20
		Normal	1,600	Needleandthread----------	15
		Unfavorable	1,100	Blue grama----------	15
				Threadleaf sedge----------	10
				Little bluestem----------	10
				Sand dropseed----------	5
				Prairie junegrass----------	5
				Western wheatgrass----------	5
				Sand bluestem----------	5
AcB, AcC---------- Alliance	Silty - Veg. Zone 1------------	Favorable	2,500	Western wheatgrass----------	25
		Normal	1,700	Blue grama----------	20
		Unfavorable	1,000	Needleandthread----------	20
				Buffalograss----------	5
				Little bluestem----------	5
				Sedge----------	5
				Green needlegrass----------	5
ArB---------- Arvada	Panspots - Veg. Zone 1--------	Favorable	650	Western wheatgrass----------	40
		Normal	500	Blue grama----------	15
		Unfavorable	250	Inland saltgrass----------	15
				Greasewood----------	10
				Alkali sacaton----------	5
				Birdfoot sagebrush----------	5
AwD, AwE---------- Ashollow	Sandy - Veg. Zone 1------------	Favorable	2,300	Prairie sandreed----------	25
		Normal	1,600	Blue grama----------	20
		Unfavorable	1,200	Needleandthread----------	15
				Little bluestem----------	10
				Sand bluestem----------	10
				Sedge----------	10
Ba---------- Badland	None - Veg. Zone 1------------	Favorable	0		
		Normal	0		
		Unfavorable	0		
BbB---------- Bahl	Clayey - Veg. Zone 1----------	Favorable	1,000	Western wheatgrass----------	50
		Normal	750	Green needlegrass----------	20
		Unfavorable	450	Buffalograss----------	5
				Sandberg bluegrass----------	5
				Bottlebrush squirreltail------	5
				Birdfoot sagebrush----------	5
				Greasewood----------	5
Bc---------- Bankard	Sandy Lowland - Veg. Zone 1---	Favorable	2,800	Prairie sandreed----------	20
		Normal	2,100	Sand bluestem----------	20
		Unfavorable	1,300	Little bluestem----------	20
				Needleandthread----------	10
				Blue grama----------	5
				Sand dropseed----------	5
				Switchgrass----------	5
				Sedge----------	5
Bd---------- Bankard	Shallow to Gravel - Veg. Zone 1.	Favorable	900	Blue grama----------	30
		Normal	700	Needleandthread----------	10
		Unfavorable	400	Fendler threeawn----------	10
				Prairie sandreed----------	5
				Sand bluestem----------	5
				Sand dropseed----------	5
				Sedge----------	5
				Little bluestem----------	5
				Buffalograss----------	5

TABLE 8.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
Be, BeB, BeC------- Bayard	Sandy - Veg. Zone 1-----------	Favorable Normal Unfavorable	2,300 1,600 1,100	Prairie sandreed---------- Blue grama---------- Needleandthread---------- Sand bluestem---------- Little bluestem---------- Indian ricegrass---------- Threadleaf sedge----------	30 15 15 10 10 5 5
Bh---------- Bigwinder	Wet Land - Veg. Zone 1--------	Favorable Normal Unfavorable	4,500 4,000 3,500	Prairie cordgrass---------- Nebraska sedge---------- Bluejoint reedgrass---------- Slender wheatgrass---------- Northern reedgrass---------- Canada wildrye----------	40 15 10 10 10 5
BoG---------- Blueridge	Shallow to Gravel - Veg. Zone 1.	Favorable Normal Unfavorable	--- --- ---	Blue grama---------- Sand dropseed---------- Needleandthread---------- Sand bluestem---------- Little bluestem---------- Prairie sandreed----------	30 10 10 5 5 5
BpE: Blueridge---------	Shallow to Gravel - Veg. Zone 1.	Favorable Normal Unfavorable	900 700 400	Blue grama---------- Sand dropseed---------- Needleandthread---------- Sand bluestem---------- Little bluestem---------- Prairie sandreed----------	30 10 10 5 5 5
Bayard----------	Sandy - Veg. Zone 1-----------	Favorable Normal Unfavorable	2,300 1,600 1,100	Prairie sandreed---------- Blue grama---------- Needleandthread---------- Sand bluestem---------- Little bluestem---------- Indian ricegrass---------- Threadleaf sedge----------	30 15 15 10 10 5 5
BrC, BrD, BrF------ Bridget	Silty - Veg. Zone 1-----------	Favorable Normal Unfavorable	2,500 1,700 1,000	Needleandthread---------- Blue grama---------- Western wheatgrass---------- Threadleaf sedge---------- Buffalograss---------- Little bluestem---------- Big bluestem---------- Sideoats grama----------	20 20 20 10 5 5 5 5
Bs, BsB, BsD, BsE-- Bufton	Clayey - Veg. Zone 1----------	Favorable Normal Unfavorable	2,000 1,700 1,100	Western wheatgrass---------- Blue grama---------- Threadleaf sedge---------- Green needlegrass---------- Buffalograss----------	50 15 10 10 5
BuB, BuC, BuD------ Busher	Sandy - Veg. Zone 1-----------	Favorable Normal Unfavorable	2,300 1,600 1,200	Prairie sandreed---------- Needleandthread---------- Blue grama---------- Sand bluestem---------- Little bluestem---------- Threadleaf sedge---------- Indian ricegrass----------	30 15 15 10 10 5 5

TABLE 8.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
BwC:					
Busher	Sandy - Veg. Zone 1	Favorable	2,300	Prairie sandreed	30
		Normal	1,600	Needleandthread	15
		Unfavorable	1,200	Blue grama	15
				Sand bluestem	10
				Little bluestem	10
				Threadleaf sedge	5
				Indian ricegrass	5
Phiferson	Sandy - Veg. Zone 1	Favorable	1,800	Needleandthread	35
		Normal	1,400	Prairie sandreed	15
		Unfavorable	800	Little bluestem	10
				Thickspike wheatgrass	10
				Blue grama	5
				Threadleaf sedge	5
				Silver sagebrush	5
				Indian ricegrass	5
BxC, BxE:					
Busher	Sandy - Veg. Zone 1	Favorable	2,300	Prairie sandreed	30
		Normal	1,600	Needleandthread	15
		Unfavorable	1,200	Blue grama	15
				Sand bluestem	10
				Little bluestem	10
				Threadleaf sedge	5
				Indian ricegrass	5
Tassel	Shallow Limy - Veg. Zone 1	Favorable	1,000	Blue grama	25
		Normal	700	Little bluestem	15
		Unfavorable	500	Western wheatgrass	15
				Needleandthread	10
				Threadleaf sedge	10
				Sand bluestem	5
				Sideoats grama	5
				Bluegrass	5
Cr Craft	Silty Lowland - Veg. Zone 1	Favorable	2,800	Western wheatgrass	25
		Normal	2,400	Blue grama	15
		Unfavorable	2,000	Needleandthread	15
				Green needlegrass	10
				Sedge	10
				Big bluestem	5
				Little bluestem	5
Cs, Ct Craft	Silty Overflow - Veg. Zone 1	Favorable	3,000	Western wheatgrass	25
		Normal	2,800	Big bluestem	20
		Unfavorable	2,500	Little bluestem	15
				Blue grama	10
				Needleandthread	10
				Sedge	5
DpB Draknab	Sandy Lowland - Veg. Zone 1	Favorable	3,000	Green needlegrass	15
		Normal	2,300	Needleandthread	10
		Unfavorable	1,600	Slender wheatgrass	10
				Western wheatgrass	10
				Basin wildrye	10
				Sandberg bluegrass	5
				Prairie junegrass	5
				Silver sagebrush	5
				Cottonwood	5
				Western snowberry	5

TABLE 8.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
EpF---------- Epping	Shallow Limy - Veg. Zone 1----	Favorable	1,000	Blue grama----------	20
		Normal	700	Needleandthread----------	15
		Unfavorable	500	Threadleaf sedge----------	10
				Sideoats grama----------	10
				Western wheatgrass----------	10
				Little bluestem----------	10
				Buffalograss----------	5
				Prairie sandreed----------	5
EsG:					
Epping----------	Shallow Limy - Veg. Zone 1----	Favorable	1,000	Blue grama----------	20
		Normal	700	Needleandthread----------	15
		Unfavorable	500	Threadleaf sedge----------	10
				Sideoats grama----------	10
				Western wheatgrass----------	10
				Little bluestem----------	10
				Buffalograss----------	5
				Prairie sandreed----------	5
Badland----------	None - Veg. Zone 1----------	Favorable	0		
		Normal	0		
		Unfavorable	0		
Fu---------- Fluvaquents	None - Veg. Zone 1----------	Favorable	---		
		Normal	---		
		Unfavorable	---		
Go, Gp---------- Glenberg	Sandy Lowland - Veg. Zone 1---	Favorable	2,800	Little bluestem----------	20
		Normal	2,100	Prairie sandreed----------	20
		Unfavorable	1,300	Sand bluestem----------	20
				Needleandthread----------	10
				Blue grama----------	10
				Switchgrass----------	5
HsC:					
Hisle----------	Panspots - Veg. Zone 1--------	Favorable	800	Western wheatgrass----------	35
		Normal	600	Blue grama----------	15
		Unfavorable	400	Inland saltgrass----------	10
				Alkali sacaton----------	10
				Sandberg bluegrass----------	10
				Buffalograss----------	5
				Needleandthread----------	5
Slickspots--------	None - Veg. Zone 1----------	Favorable	---		
		Normal	---		
		Unfavorable	---		
In---------- Interior	Saline Lowland - Veg. Zone 1--	Favorable	1,800	Alkali sacaton----------	30
		Normal	1,500	Western wheatgrass----------	20
		Unfavorable	100	Blue grama----------	15
				Inland saltgtass----------	15
				Sedge----------	10
				Slender wheatgrass----------	5

TABLE 8.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
JmB, JmC, JmD------ Jayem	Sandy - Veg. Zone 1----------	Favorable	2,300	Prairie sandreed----------	20
		Normal	1,600	Blue grama----------	15
		Unfavorable	1,100	Needleandthread----------	15
				Little bluestem----------	10
				Threadleaf sedge----------	10
				Sand bluestem----------	10
				Fringed sagebrush----------	5
				Sand dropseed----------	5
				Western wheatgrass----------	5
				Indian ricegrass----------	5
KeB, KeC---------- Keith	Silty - Veg. Zone 1----------	Favorable	3,300	Blue grama----------	20
		Normal	2,500	Needleandthread----------	20
		Unfavorable	1,700	Western wheatgrass----------	15
				Little bluestem----------	10
				Buffalograss----------	5
				Sedge----------	5
				Big bluestem----------	5
				Sideoats grama----------	5
				Green needlegrass----------	5
Ky, KyC---------- Kyle	Clayey - Veg. Zone 1----------	Favorable	2,300	Western wheatgrass----------	50
		Normal	1,900	Green needlegrass----------	25
		Unfavorable	1,300	Sideoats grama----------	10
				Blue grama----------	5
				Buffalograss----------	5
La---------- Las Animas	Subirrigated - Veg. Zone 1----	Favorable	5,000	Little bluestem----------	20
		Normal	4,500	Big bluestem----------	15
		Unfavorable	3,250	Indiangrass----------	10
				Sedge----------	10
				Prairie cordgrass----------	10
				Switchgrass----------	5
				Kentucky bluegrass----------	5
				Western wheatgrass----------	5
				Slender wheatgrass----------	5
				Plains bluegrass----------	5
Lb---------- Las Animas	Subirrigated - Veg. Zone 1----	Favorable	4,500	Little bluestem----------	25
		Normal	4,000	Big bluestem----------	20
		Unfavorable	3,200	Prairie cordgrass----------	15
				Indiangrass----------	10
				Plains bluegrass----------	5
				Sedge----------	5
				Rush----------	5
				Switchgrass----------	5
Lc:					
Las Animas--------	Subirrigated - Veg. Zone 1----	Favorable	5,000	Little bluestem----------	20
		Normal	4,500	Big bluestem----------	15
		Unfavorable	3,250	Indiangrass----------	10
				Sedge----------	10
				Prairie cordgrass----------	10
				Switchgrass----------	5
				Kentucky bluegrass----------	5
				Western wheatgrass----------	5
				Slender wheatgrass----------	5
				Plains bluegrass----------	5

TABLE 8.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
Lc:					
Lisco	Saline Subirrigated - Veg. Zone 1.	Favorable	3,800	Alkali sacaton	40
		Normal	3,400	Western wheatgrass	20
		Unfavorable	3,000	Inland saltgrass	15
				Blue grama	5
				Sedge	5
				Plains bluegrass	5
Ld	Saline Subirrigated - Veg. Zone 1.	Favorable	3,800	Alkali sacaton	40
Lisco		Normal	3,400	Western wheatgrass	20
		Unfavorable	3,000	Inland saltgrass	15
				Blue grama	5
				Sedge	5
				Plains bluegrass	5
Lh	Clayey Overflow - Veg. Zone 1	Favorable	2,600	Western wheatgrass	50
Lohmiller		Normal	2,200	Green needlegrass	30
		Unfavorable	1,500	Blue grama	10
				Buffalograss	5
Lo	Clayey Overflow - Veg. Zone 1	Favorable	3,500	Big bluestem	35
Lohmiller		Normal	2,800	Western wheatgrass	15
		Unfavorable	2,000	Switchgrass	15
				Western snowberry	10
				Green needlegrass	10
				Blue grama	5
				Slender wheatgrass	5
				Sideoats grama	5
Ls	Clayey Overflow - Veg. Zone 1	Favorable	2,800	Western wheatgrass	40
Lohmiller		Normal	2,000	Green needlegrass	20
		Unfavorable	1,200	Switchgrass	15
				Big bluestem	10
				Blue grama	5
				Fourwing saltbush	5
Mr, MrB, MrC, Mt, MtB, MtC, MtD, MtE	Limy Upland - Veg. Zone 1	Favorable	2,000	Blue grama	20
Mitchell		Normal	1,300	Sideoats grama	15
		Unfavorable	700	Needleandthread	10
				Threadleaf sedge	10
				Little bluestem	10
				Western wheatgrass	10
				Buffalograss	5
				Prairie sandreed	5
MxD, MxF:					
Mitchell	Limy Upland - Veg. Zone 1	Favorable	2,000	Blue grama	20
		Normal	1,300	Sideoats grama	15
		Unfavorable	700	Needleandthread	10
				Threadleaf sedge	10
				Little bluestem	10
				Western wheatgrass	10
				Buffalograss	5
				Prairie sandreed	5

TABLE 8.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
MxD, MxF:					
Epping	Shallow Limy - Veg. Zone 1	Favorable	1,000	Blue grama	20
		Normal	700	Needleandthread	15
		Unfavorable	500	Threadleaf sedge	10
				Sideoats grama	10
				Western wheatgrass	10
				Little bluestem	10
				Buffalograss	5
				Prairie sandreed	5
NrB, NrD	Clayey - Veg. Zone 1	Favorable	2,000	Western wheatgrass	50
Norrest		Normal	1,300	Green needlegrass	20
		Unfavorable	700	Blue grama	15
				Sedge	5
				Buffalograss	5
OgB, OgC, OgD	Silty - Veg. Zone 1	Favorable	3,300	Western wheatgrass	20
Oglala		Normal	2,500	Blue grama	15
		Unfavorable	1,700	Little bluestem	15
				Needleandthread	15
				Green needlegrass	10
				Big bluestem	5
				Sideoats grama	5
				Sedge	5
OnD, OnF:					
Oglala	Silty - Veg. Zone 1	Favorable	3,300	Western wheatgrass	20
		Normal	2,500	Blue grama	15
		Unfavorable	1,700	Little bluestem	15
				Needleandthread	15
				Green needlegrass	10
				Big bluestem	5
				Sideoats grama	5
				Sedge	5
Canyon	Shallow Limy - Veg. Zone 1	Favorable	1,000	Blue grama	25
		Normal	700	Little bluestem	15
		Unfavorable	500	Western wheatgrass	15
				Threadleaf sedge	10
				Needleandthread	10
				Sideoats grama	5
				Sand bluestem	5
				Bluegrass	5
OpD	Silty - Veg. Zone 1	Favorable	2,000	Blue grama	25
Olney		Normal	1,500	Prairie sandreed	25
		Unfavorable	800	Sideoats grama	10
				Needleandthread	10
				Sand dropseed	5
				Western wheatgrass	5
				Sedge	5
				Thickspike wheatgrass	5
OrF	Saline Upland - Veg. Zone 1	Favorable	700	Western wheatgrass	40
Orella		Normal	500	Blue grama	20
		Unfavorable	300	Buffalograss	10
				Green needlegrass	10
				Sandberg bluegrass	5
				Common pricklypear	5

TABLE 8.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
OsG:					
Orella	Saline Upland - Veg. Zone 1	Favorable	700	Western wheatgrass	40
		Normal	500	Blue grama	20
		Unfavorable	300	Buffalograss	10
				Green needlegrass	10
				Sandberg bluegrass	5
				Common pricklypear	5
Badland	None - Veg. Zone 1	Favorable	0		
		Normal	0		
		Unfavorable	0		
OwB	Sandy - Veg. Zone 1	Favorable	2,300	Prairie sandreed	25
Otero		Normal	1,500	Blue grama	20
		Unfavorable	1,200	Needleandthread	10
				Threadleaf sedge	10
				Little bluestem	10
				Western wheatgrass	5
				Sand bluestem	5
				Sideoats grama	5
Pa	Saline Lowland - Veg. Zone 1	Favorable	2,300	Alkali sacaton	30
Pathfinder		Normal	1,500	Inland saltgrass	15
		Unfavorable	700	Western wheatgrass	15
				Blue grama	10
				Slender wheatgrass	5
				Sand dropseed	5
				Sedge	5
				Buffalograss	5
PhF:					
Phiferson	Sandy - Veg. Zone 1	Favorable	1,800	Needleandthread	35
		Normal	1,400	Prairie sandreed	15
		Unfavorable	800	Little bluestem	10
				Thickspike wheatgrass	10
				Blue grama	5
				Threadleaf sedge	5
				Silver sagebrush	5
				Indian ricegrass	5
Tassel	Shallow Limy - Veg. Zone 1	Favorable	1,000	Blue grama	25
		Normal	700	Little bluestem	15
		Unfavorable	500	Western wheatgrass	15
				Needleandthread	10
				Threadleaf sedge	10
				Sand bluestem	5
				Sideoats grama	5
				Bluegrass	5
Rock outcrop	None - Veg. Zone 1	Favorable	0		
		Normal	0		
		Unfavorable	0		
PrC, PrE	Clayey - Veg. Zone 1	Favorable	2,200	Western wheatgrass	55
Pierre		Normal	1,800	Green needlegrass	20
		Unfavorable	1,200	Sideoats grama	10
				Blue grama	5
				Buffalograss	5

TABLE 8.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
PsD, PsE---------- Ponderosa	Sandy - Veg. Zone 1----------	Favorable	2,300	Prairie sandreed----------	20
		Normal	1,600	Little bluestem----------	15
		Unfavorable	1,200	Needleandthread----------	15
				Blue grama----------	10
				Green needlegrass----------	10
				Sedge----------	10
				Sand bluestem----------	5
PtF:					
Ponderosa---------	Sandy - Veg. Zone 1----------	Favorable	2,300	Prairie sandreed----------	20
		Normal	1,600	Little bluestem----------	15
		Unfavorable	1,200	Needleandthread----------	15
				Blue grama----------	10
				Green needlegrass----------	10
				Sedge----------	10
				Sand bluestem----------	5
Tassel----------	Shallow Limy - Veg. Zone 1----	Favorable	1,000	Blue grama----------	25
		Normal	700	Little bluestem----------	15
		Unfavorable	500	Western wheatgrass----------	15
				Needleandthread----------	10
				Threadleaf sedge----------	10
				Sand bluestem----------	5
				Sideoats grama----------	5
				Bluegrass----------	5
Vetal----------	Sandy - Veg. Zone 1----------	Favorable	2,300	Prairie sandreed----------	30
		Normal	1,500	Little bluestem----------	15
		Unfavorable	1,200	Blue grama----------	15
				Needleandthread----------	10
				Sand bluestem----------	10
				Western wheatgrass----------	5
RkG:					
Rock outcrop------	None - Veg. Zone 1----------	Favorable	0		
		Normal	0		
		Unfavorable	0		
Tassel----------	Shallow Limy - Veg. Zone 1----	Favorable	1,000	Blue grama----------	25
		Normal	700	Little bluestem----------	15
		Unfavorable	500	Western wheatgrass----------	15
				Needleandthread----------	10
				Threadleaf sedge----------	10
				Sand bluestem----------	5
				Sideoats grama----------	5
				Bluegrass----------	5
SbF:					
Samsil----------	Shallow Clay - Veg. Zone 1----	Favorable	1,400	Little bluestem----------	25
		Normal	1,200	Western wheatgrass----------	25
		Unfavorable	800	Sideoats grama----------	15
				Green needlegrass----------	10
				Blue grama----------	10
				Sedge----------	5
Pierre----------	Clayey - Veg. Zone 1----------	Favorable	2,200	Western wheatgrass----------	55
		Normal	1,800	Green needlegrass----------	20
		Unfavorable	1,200	Sideoats grama----------	10
				Blue grama----------	5
				Buffalograss----------	5

TABLE 8.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
ScG:					
Samsil	Shallow Clay - Veg. Zone 1	Favorable	1,400	Little bluestem	25
		Normal	1,200	Western wheatgrass	25
		Unfavorable	800	Sideoats grama	15
				Green needlegrass	10
				Blue grama	10
				Sedge	5
Rock outcrop	None - Veg. Zone 1	Favorable	0		
		Normal	0		
		Unfavorable	0		
SdD	Sandy - Veg. Zone 1	Favorable	3,000	Prairie sandreed	20
Sarben		Normal	2,600	Needleandthread	20
		Unfavorable	2,200	Little bluestem	15
				Blue grama	10
				Sand bluestem	10
				Sand sagebrush	5
				Western wheatgrass	5
				Sedge	5
SdF	Sandy - Veg. Zone 1	Favorable	2,300	Prairie sandreed	30
Sarben		Normal	1,900	Needleandthread	15
		Unfavorable	1,500	Blue grama	15
				Little bluestem	10
				Sedge	10
				Sand bluestem	5
				Sand sagebrush	5
				Western wheatgrass	5
SeB, SeD:					
Sarben	Sandy - Veg. Zone 1	Favorable	3,000	Prairie sandreed	20
		Normal	2,600	Needleandthread	20
		Unfavorable	2,200	Little bluestem	15
				Blue grama	10
				Sand bluestem	10
				Sand sagebrush	5
				Western wheatgrass	5
				Sedge	5
Busher	Sandy - Veg. Zone 1	Favorable	2,300	Prairie sandreed	30
		Normal	1,600	Needleandthread	15
		Unfavorable	1,200	Blue grama	15
				Sand bluestem	10
				Little bluestem	10
				Threadleaf sedge	5
				Indian ricegrass	5
SfB, SfC	Silty - Veg. Zone 1	Favorable	3,200	Blue grama	20
Satanta		Normal	2,500	Western wheatgrass	20
		Unfavorable	1,800	Litle bluestem	15
				Needleandthread	15
				Sideoats grama	10
Sg, SgC	Silty - Veg. Zone 1	Favorable	2,700	Western wheatgrass	40
Savo		Normal	2,300	Green needlegrass	20
		Unfavorable	1,600	Needleandthread	10
				Blue grama	10
				Sideoats grama	10

TABLE 8.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
SrF---------- Schamber	Shallow to Gravel - Veg. Zone 1.	Favorable	1,100	Blue grama----------	25
		Normal	900	Sedge----------	25
		Unfavorable	600	Needleandthread----------	20
				Sideoats grama----------	15
Ss, SsB, Su, SuB--- Scoville	Sandy - Veg. Zone 1----------	Favorable	2,300	Prairie sandreed----------	25
		Normal	1,600	Blue grama----------	15
		Unfavorable	1,100	Needleandthread----------	15
				Sand bluestem----------	10
				Little bluestem----------	10
				Threadleaf sedge----------	10
SxE---------- Skilak	Limy Upland - Veg. Zone 1-----	Favorable	1,450	Western wheatgrass----------	35
		Normal	1,100	Green needlegrass----------	20
		Unfavorable	600	Blue grama----------	10
				Buffalograss----------	5
				Cusick bluegrass----------	5
				Big sagebrush----------	5
TbG:					
Tassel----------	Shallow Limy - Veg. Zone 1----	Favorable	1,000	Blue grama----------	25
		Normal	700	Little bluestem----------	15
		Unfavorable	500	Western wheatgrass----------	15
				Needleandthread----------	10
				Threadleaf sedge----------	10
				Sand bluestem----------	5
				Sideoats grama----------	5
				Bluegrass----------	5
Ashollow----------	Sandy - Veg. Zone 1----------	Favorable	2,300	Prairie sandreed----------	25
		Normal	1,600	Blue grama----------	20
		Unfavorable	1,200	Needleandthread----------	15
				Little bluestem----------	10
				Sand bluestem----------	10
				Sedge----------	10
Rock outcrop------	None - Veg. Zone 1----------	Favorable	0		
		Normal	0		
		Unfavorable	0		
TgF:					
Tassel----------	Shallow Limy - Veg. Zone 1----	Favorable	1,000	Blue grama----------	25
		Normal	700	Little bluestem----------	15
		Unfavorable	500	Western wheatgrass----------	15
				Needleandthread----------	10
				Threadleaf sedge----------	10
				Sand bluestem----------	5
				Sideoats grama----------	5
				Bluegrass----------	5
Busher----------	Sandy - Veg. Zone 1----------	Favorable	2,300	Prairie sandreed----------	30
		Normal	1,600	Needleandthread----------	15
		Unfavorable	1,200	Blue grama----------	15
				Sand bluestem----------	10
				Little bluestem----------	10
				Threadleaf sedge----------	5
				Indian ricegrass----------	5
Rock outcrop------	None - Veg. Zone 1----------	Favorable	0		
		Normal	0		
		Unfavorable	0		

TABLE 8.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
TrG:					
Tassel	Shallow Limy - Veg. Zone 1	Favorable	1,000	Blue grama	25
		Normal	700	Little bluestem	15
		Unfavorable	500	Western wheatgrass	15
				Needleandthread	10
				Threadleaf sedge	10
				Sand bluestem	5
				Sideoats grama	5
				Bluegrass	5
Ponderosa	Sandy - Veg. Zone 1	Favorable	2,000	Ponderosa pine	15
		Normal	1,400	Little bluestem	10
		Unfavorable	700	Green needlegrass	10
				Prairie sandreed	10
				Sand bluestem	10
				Sedge	10
				Sideoats grama	10
				Blue grama	5
				Needleandthread	5
Rock outcrop	None - Veg. Zone 1	Favorable	0		
		Normal	0		
		Unfavorable	0		
TtB, TtC, TtD----- Thirtynine	Silty - Veg. Zone 1	Favorable	2,500	Western wheatgrass	25
		Normal	1,700	Blue grama	20
		Unfavorable	1,000	Needleandthread	20
				Green needlegrass	10
				Little bluestem	5
				Sideoats grama	5
				Sedge	5
Tv, TvB----- Tripp	Silty - Veg. Zone 1	Favorable	2,500	Needleandthread	20
		Normal	1,700	Blue grama	20
		Unfavorable	1,000	Western wheatgrass	20
				Threadleaf sedge	10
				Little bluestem	5
				Buffalograss	5
				Green needlegrass	5
				Sideoats grama	5
VaB----- Valent	Sandy - Veg. Zone 1	Favorable	1,900	Prairie sandreed	25
		Normal	1,600	Blue grama	15
		Unfavorable	1,300	Needleandthread	15
				Little bluestem	10
				Threadleaf sedge	10
				Sand bluestem	5
				Sand dropseed	5
VaD, VaE----- Valent	Sands - Veg. Zone 1	Favorable	2,300	Prairie sandreed	25
		Normal	1,900	Sand bluestem	15
		Unfavorable	1,500	Little bluestem	15
				Needleandthread	15
				Blue grama	10
				Sand dropseed	5
VaF:					
Valent, rolling	Sands - Veg. Zone 1	Favorable	2,300	Prairie sandreed	25
		Normal	1,900	Sand bluestem	15
		Unfavorable	1,500	Little bluestem	15
				Needleandthread	15
				Blue grama	10
				Sand dropseed	5

TABLE 8.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
VaF:					
Valent, hilly-----	Choppy Sands - Veg. Zone 1----	Favorable	2,800	Sand bluestem----------	30
		Normal	2,400	Prairie sandreed----------	20
		Unfavorable	1,800	Little bluestem----------	15
				Switchgrass----------	10
				Blue grama----------	5
				Needleandthread----------	5
VbB----------	Sandy - Veg. Zone 1----------	Favorable	1,900	Prairie sandreed----------	25
Valent		Normal	1,600	Blue grama----------	15
		Unfavorable	1,300	Needleandthread----------	15
				Little bluestem----------	10
				Threadleaf sedge----------	10
				Sand bluestem----------	5
				Sand dropseed----------	5
VbD----------	Sands - Veg. Zone 1----------	Favorable	2,300	Prairie sandreed----------	25
Valent		Normal	1,900	Sand bluestem----------	15
		Unfavorable	1,500	Little bluestem----------	15
				Needleandthread----------	15
				Blue grama----------	10
				Sand dropseed----------	5
VcB, VgB, VgC------	Sandy - Veg. Zone 1----------	Favorable	2,300	Prairie sandreed----------	30
Vetal		Normal	1,500	Little bluestem----------	15
		Unfavorable	1,200	Blue grama----------	15
				Needleandthread----------	10
				Sand bluestem----------	10
				Western wheatgrass----------	5
WhB----------	Saline Subirrigated - Veg.	Favorable	3,200	Alkali sacaton----------	35
Wildhorse	Zone 1.	Normal	2,800	Inland saltgrass----------	15
		Unfavorable	2,400	Western wheatgrass----------	10
				Switchgrass----------	5
				Alkali cordgrass----------	5
				Slender wheatgrass----------	5
				Plains bluegrass----------	5
				Sedge----------	5

TABLE 9.--POTENTIAL PRODUCTIVITY FOR PONDEROSA PINE AND DEGREE OF LIMITATIONS OF WOODLAND SUITABILITY GROUPS

(The symbol > means more than; < means less than)

Woodland suitability group number and soil series	Potential productivity			Management concerns				
	Aspect	Site index	Approximate annual growth per acre at 80 years of age*	Erosion hazard	Seedling mortality	Plant competition	Equipment limitation	Windthrow hazard
Group 1---------- Ponderosa (moist)	North and east.	60-80	>65	Moderate or severe	Slight----	Slight-----	Moderate or severe	Slight.
Group 2---------- Canyon and Tassel (moist)	North and east.	40-49	40	Severe----	Slight or moderate.	Moderate---	Severe----	Severe.
Group 3---------- Ponderosa	South and west.	40-49	30	Moderate or severe	Moderate or severe	Moderate---	Severe----	Severe.
Group 4---------- Canyon and Tassel	South and west.	<40	<25	Severe----	Severe----	Severe-----	Severe----	Severe.

* Annual growth is expressed in cubic feet. Divide by 90 to convert to approximate cords; multiply by 6 to convert approximate board feet.

TABLE 10.--TREE PLANTING SITE PREPARATION GUIDE

Texture	Slope	Site preparation	
		Cropland	Grassland
Loamy or clayey--	Level--	Plant directly into site; do not destroy the existing crop residue; check for hardpan (see footnotes 1, 2, and 3).	Summer fallow the entire site 1 year prior to planting (see footnote 4); plant directly into site; do not destroy dead grass residue; check for hardpan (see footnotes 1 and 2).
Sandy----	Level--	Sow a cover crop late in summer if the soil will be bare over winter; plant directly into site or into cover crop; do not destroy the existing crop residue (see footnotes 2 and 3).	Summer fallow 4- to 8-foot strips 1 year prior to planting (see footnote 4); plant directly into the strips; do not destroy dead grass residue (see footnote 2).
Loamy or clayey--	Sloping	Plant directly into site; do not destroy the existing crop resudue (see footnotes 2 and 3); if possible, plant on the contour; check for hardpan.	Summer fallow the entire site 1 year prior to planting (see footnote 5); plant directly into site; do not destroy dead grass residue (see footnote 6); if possible, plant on the contour.
Sandy----	Sloping	Sow a cover crop late in summer if the soil will be bare over winter; plant directly into site or into cover crop; do not destroy the existing crop resudue (see footnotes 2 and 3); if possible, plant on the contour.	Summer fallow 4- to 8-foot strips 1 year prior to planting (see footnote 5); plant directly into the strips; do not destroy dead grass resudue (see footnote 6); if possible, plant on the contour.

[1] The soil may have a hardpan as a result of farming, grazing, or soil geology, especially if the texture is loamy or clayey. Check for hardpan and deep chisel the subsoil during the fall prior to planting.

[2] Till the soil lightly or treat with labeled postemergence herbicide prior to planting if weeds are beginning to emerge.

[3] Check for herbicide carry-over via cooperator records or soil analysis. Avoid planting on cropland that has been treated with nonlabeled, residual herbicide during the prior growing season.

[4] Fallow either mechanically (tillage) or chemically (no-till) with labeled postemergence herbicide.

[5] Fallow chemically (no-till) with labeled postemergence herbicide.

[6] Treat with labeled postemergence herbicide prior to planting if weeds are beginning to emerge.

TABLE 11.--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 height, in feet, of--				
	<8	8-15	16-25	26-35	>35
Ab, AbB, AbC------ Alice	American plum, Siberian peashrub, skunkbush sumac, lilac.	Eastern redcedar, Rocky Mountain juniper, Russian-olive.	Ponderosa pine, green ash, honeylocust, hackberry.	Siberian elm------	---
AcB, AcC---------- Alliance	American plum, lilac, Siberian peashrub.	Rocky Mountain juniper, hackberry, Russian-olive.	Eastern redcedar, ponderosa pine, Austrian pine, Scotch pine, jack pine.	Siberian elm------	---
ArB--------------- Arvada	Rocky Mountain juniper, Siberian peashrub, skunkbush sumac, Tatarian honeysuckle.	Ponderosa pine, Russian-olive, Siberian elm.	---	---	---
AwD, AwE---------- Ashollow	Siberian peashrub, skunkbush sumac, lilac, silver buffaloberry.	Eastern redcedar, Rocky Mountain juniper, ponderosa pine, black locust, hackberry, green ash, honeylocust, Russian-olive.	Siberian elm------	---	---
Ba. Badland					
BbB--------------- Bahl	Common chokecherry, lilac, Peking cotoneaster.	Eastern redcedar, ponderosa pine, Rocky Mountain juniper, green ash, honeylocust, Russian-olive, Siberian peashrub.	Siberian elm------	---	---
Bc, Bd------------ Bankard	---	Eastern redcedar, Rocky Mountain juniper.	Ponderosa pine, Austrian pine, jack pine.	---	---
Be, BeB, BeC------ Bayard	American plum, skunkbush sumac, lilac, Siberian peashrub.	Eastern redcedar, Russian mulberry, Rocky Mountain juniper.	Ponderosa pine, green ash, hackberry, honeylocust.	Siberian elm------	---
Bh---------------- Bigwinder	---	---	---	Golden willow, cottonwood.	---
BoG. Blueridge					
BpE: Blueridge.					

TABLE 11.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
BpE: Bayard	---	Eastern redcedar, Austrian pine, jack pine.	Ponderosa pine, Scotch pine.	---	---
BrC, BrD, BrF. Bridget	Skunkbush sumac, lilac, American plum.	Hackberry, Rocky Mountain juniper, Russian-olive, Siberian peashrub.	Ponderosa pine, green ash, eastern redcedar, honeylocust.	Siberian elm	---
Bs, BsB, BsD, BsE- Bufton	Siberian peashrub, lilac, American plum.	Eastern redcedar, Rocky Mountain juniper, ponderosa pine, green ash, Russian-olive, Manchurian crabapple.	Siberian elm, honeylocust.	---	---
BuB, BuC, BuD Busher	Lilac, American plum, Siberian peashrub, skunkbush sumac.	Eastern redcedar, Rocky Mountain juniper, Russian-olive.	Ponderosa pine, green ash, honeylocust, hackberry.	Siberian elm	---
BwC: Busher	Lilac, American plum, Siberian peashrub, skunkbush sumac.	Eastern redcedar, Rocky Mountain juniper, Russian-olive.	Ponderosa pine, green ash, honeylocust, hackberry.	Siberian elm	---
Phiferson.					
BxC: Busher	Lilac, American plum, Siberian peashrub, skunkbush sumac.	Eastern redcedar, Rocky Mountain juniper, Russian-olive.	Ponderosa pine, green ash, honeylocust, hackberry.	Siberian elm	---
Tassel.					
BxE: Busher	---	Eastern redcedar, Rocky Mountain juniper, Austrian pine, jack pine.	Ponderosa pine	---	---
Tassel.					
Cr, Cs Craft	American plum	Lilac	Eastern redcedar, blue spruce, ponderosa pine, Russian-olive, hackberry, green ash.	Siberian elm, honeylocust.	Eastern cottonwood.
Ct. Craft					

TABLE 11.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
DpB. Draknab					
EpF. Epping					
EsG: Epping.					
Badland.					
Fu. Fluvaquents					
Go, Gp. Glenberg					
HsC: Hisle.					
Slickspots.					
In. Interior					
JmB, JmC, JmD----- Jayem	Siberian peashrub, skunkbush sumac, common chokecherry, Amur honeysuckle, lilac.	Eastern redcedar, Russian-olive, Rocky Mountain juniper.	Siberian elm, ponderosa pine, green ash, honeylocust.	---	---
KeB, KeC---------- Keith	Common chokecherry, American plum, lilac.	Hackberry, Manchurian crabapple, Russian-olive, green ash, Rocky Mountain juniper, Siberian peashrub.	Ponderosa pine, honeylocust.	Siberian elm------	---
Ky, KyC---------- Kyle	Golden currant, Siberian peashrub, American plum, lilac.	Ponderosa pine, green ash, Rocky Mountain juniper, Russian-olive, common chokecherry, eastern redcedar.	Siberian elm------	---	---
La---------- Las Animas	Lilac, American plum.	Rocky Mountain juniper, Tatarian honeysuckle.	Eastern redcedar, green ash, ponderosa pine, hackberry, honeylocust.	Golden willow, Siberian elm.	Eastern cottonwood.
Lb. Las Animas					

TABLE 11.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
Lc: Las Animas-------	Lilac, American plum.	Rocky Mountain juniper, Tatarian honeysuckle.	Eastern redcedar, green ash, ponderosa pine, hackberry, honeylocust.	Golden willow, Siberian elm.	Eastern cottonwood.
Lisco.					
Ld. Lisco					
Lh---------- Lohmiller	Peking cotoneaster, American plum.	Blue spruce, Siberian peashrub, common chokecherry, eastern redcedar.	Golden willow, ponderosa pine, green ash, Manchurian crabapple.	---	Eastern cottonwood.
Lo, Ls---------- Lohmiller	Siberian peashrub, Peking cotoneaster.	Manchurian crabapple, eastern redcedar, common chokecherry.	Blue spruce, green ash, ponderosa pine, golden willow.	---	Eastern cottonwood.
Mr, MrB, MrC, Mt, MtB, MtC, MtD, MtE---------- Mitchell	Siberian peashrub, silver buffaloberry, skunkbush sumac.	Eastern redcedar, Rocky Mountain juniper, ponderosa pine, Russian-olive, hackberry, honeylocust, green ash.	Siberian elm------	---	---
MxD: Mitchell---------	Siberian peashrub, silver buffaloberry, skunkbush sumac.	Eastern redcedar, Rocky Mountain juniper, ponderosa pine, Russian-olive, hackberry, honeylocust, green ash.	Siberian elm------	---	---
Epping.					
MxF: Mitchell.					
Epping.					
NrB, NrD---------- Norrest	Siberian peashrub, Peking cotoneaster, skunkbush sumac, lilac.	Russian-olive, hackberry, eastern redcedar, Rocky Mountain juniper.	Siberian elm, ponderosa pine, honeylocust, green ash.	---	---

TABLE 11.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
OgB, OgC, OgD----- Oglala	American plum, lilac.	Manchurian crabapple, common chokecherry, Siberian peashrub.	Ponderosa pine, honeylocust, hackberry, Russian-olive, green ash, Rocky Mountain juniper.	Siberian elm------	---
OnD, OnF: Oglala----------	American plum, lilac.	Manchurian crabapple, common chokecherry, Siberian peashrub.	Ponderosa pine, honeylocust, hackberry, Russian-olive, green ash, Rocky Mountain juniper.	Siberian elm------	---
Canyon.					
OpD---------- Olney	---	Ponderosa pine, eastern redcedar, Russian-olive.	Siberian elm------	---	---
OrF. Orella					
OsG: Orella.					
Badland.					
OwB---------- Otero	Siberian peashrub, silver buffaloberry, skunkbush sumac, Tatarian honeysuckle.	Eastern redcedar, Rocky Mountain juniper, ponderosa pine, green ash, Russian-olive, black locust.	Honeylocust, Siberian elm.	---	---
Pa---------- Pathfinder	Eastern redcedar, Rocky Mountain juniper, Siberian peashrub, silver buffaloberry, skunkbush sumac, lilac.	Ponderosa pine, green ash, Russian-olive, Siberian elm.	---	---	---
PhF: Phiferson.					
Tassel.					
Rock outcrop.					
PrC, PrE---------- Pierre	Siberian peashrub, golden currant, American plum, lilac.	Ponderosa pine, green ash, Rocky Mountain juniper, Russian-olive, common chokecherry, eastern redcedar.	Siberian elm------	---	---

TABLE 11.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
PsD, PsE---------- Ponderosa	Siberian peashrub, skunkbush sumac, American plum, lilac.	Eastern redcedar, Russian-olive, Rocky Mountain juniper.	Green ash, hackberry, Siberian elm, ponderosa pine, honeylocust.	---	---
PtF: Ponderosa.					
Tassel.					
Vetal----------	American plum, skunkbush sumac, lilac, Siberian peashrub.	Eastern redcedar, Rocky Mountain juniper, Russian-olive.	Ponderosa pine, green ash, honeylocust, hackberry.	Siberian elm------	---
RkG: Rock outcrop.					
Tassel.					
SbF: Samsil.					
Pierre----------	Siberian peashrub, golden currant, American plum, lilac.	Ponderosa pine, green ash, Rocky Mountain juniper, Russian-olive, common chokecherry, eastern redcedar.	Siberian elm------	---	---
ScG: Samsil.					
Rock outcrop.					
SdD---------- Sarben	---	Eastern redcedar, Rocky Mountain juniper.	Ponderosa pine----	---	---
SdF. Sarben					
SeB: Sarben----------	Amur honeysuckle, American plum, common chokecherry, lilac.	Russian mulberry, Rocky Mountain juniper.	Eastern redcedar, ponderosa pine, hackberry, green ash, honeylocust.	Siberian elm------	---
Busher----------	Lilac, American plum, Siberian peashrub, skunkbush sumac.	Eastern redcedar, Rocky Mountain juniper, Russian-olive.	Ponderosa pine, green ash, honeylocust, hackberry.	Siberian elm------	---
SeD: Sarben----------	---	Eastern redcedar, Rocky Mountain juniper.	Ponderosa pine----	---	---

TABLE 11.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
SeD:					
Busher	Lilac, American plum, Siberian peashrub, skunkbush sumac.	Eastern redcedar, Rocky Mountain juniper, Russian-olive.	Ponderosa pine, green ash, honeylocust, hackberry.	Siberian elm	---
SfB, SfC Satanta	---	Autumn-olive, Rocky Mountain juniper, common chokecherry, American plum, Tatarian honeysuckle.	Eastern redcedar, green ash, black locust, hackberry, ponderosa pine, honeylocust.	Siberian elm	---
Sg, SgC Savo	American plum, lilac.	Manchurian crabapple, Rocky Mountain juniper, common chokecherry, Siberian peashrub.	Ponderosa pine, honeylocust, hackberry, Russian-olive, green ash.	Siberian elm	---
SrF. Schamber					
Ss, SsB Scoville	---	Eastern redcedar, Rocky Mountain juniper, Austrian pine, jack pine.	Ponderosa pine	---	---
Su, SuB Scoville	American plum, Siberian peashrub, skunkbush sumac, lilac.	Eastern redcedar, Rocky Mountain juniper, Russian-olive.	Ponderosa pine, green ash, honeylocust, hackberry.	Siberian elm	---
SxE Skilak	---	Russian-olive, eastern redcedar, Rocky Mountain juniper, caragana, lilac.	Green ash, ponderosa pine.	Siberian elm	---
TbG: Tassel.					
Ashollow	Siberian peashrub, skunkbush sumac, lilac, silver buffaloberry.	Eastern redcedar, Rocky Mountain juniper, ponderosa pine, black locust, hackberry, green ash, honeylocust, Russian-olive.	Siberian elm	---	---
Rock outcrop.					
TgF: Tassel.					
Busher	---	Eastern redcedar, Rocky Mountain juniper, Austrian pine, jack pine.	Ponderosa pine	---	---

TABLE 11.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
TgF: Rock outcrop.					
TrG: Tassel.					
Ponderosa.					
Rock outcrop.					
TtB, TtC, TtD----- Thirtynine	American plum, Amur honeysuckle, lilac.	Russian-olive, Rocky Mountain juniper, common chokecherry.	Austrian pine, eastern redcedar, green ash, honeylocust, ponderosa pine, hackberry.	---	---
Tv, TvB---------- Tripp	Lilac, skunkbush sumac, American plum.	Rocky Mountain juniper, Russian-olive, hackberry, Siberian peashrub.	Ponderosa pine, honeylocust, green ash, eastern redcedar.	Siberian elm------	---
VaB, VaD, VaE----- Valent	---	Eastern redcedar, Rocky Mountain juniper, Austrian pine, jack pine.	Ponderosa pine----	---	---
VaF: Valent, rolling--	---	Eastern redcedar, Rocky Mountain juniper, Austrian pine, jack pine.	Ponderosa pine----	---	---
Valent, hilly----	---	Eastern redcedar, Rocky Mountain juniper, Austrian pine, jack pine.	Ponderosa pine----	---	---
VbB, VbD---------- Valent	---	Eastern redcedar, Rocky Mountain juniper, Austrian pine, jack pine.	Ponderosa pine----	---	---
VcB, VgB, VgC----- Vetal	American plum, skunkbush sumac, lilac, Siberian peashrub.	Eastern redcedar, Rocky Mountain juniper, Russian-olive.	Ponderosa pine, green ash, honeylocust, hackberry.	Siberian elm------	---
WhB. Wildhorse					

TABLE 12.--RECREATIONAL DEVELOPMENT

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe")

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
Ab Alice	Slight	Slight	Slight	Slight.
AbB, AbC Alice	Slight	Slight	Moderate: slope.	Slight.
AcB, AcC Alliance	Moderate: dusty.	Moderate: dusty.	Moderate: slope, dusty.	Moderate: dusty.
ArB Arvada	Severe: excess sodium.	Severe: excess sodium.	Severe: excess sodium.	Moderate: dusty.
AwD Ashollow	Slight	Slight	Severe: slope.	Slight.
AwE Ashollow	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
Ba Badland	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.
BbB Bahl	Moderate: too clayey.	Moderate: too clayey.	Moderate: slope, too clayey.	Moderate: too clayey.
Bc Bankard	Severe: flooding.	Moderate: too sandy.	Moderate: too sandy, flooding.	Moderate: too sandy.
Bd Bankard	Severe: flooding.	Moderate: flooding, too sandy.	Severe: flooding.	Moderate: too sandy, flooding.
Be Bayard	Slight	Slight	Slight	Slight.
BeB, BeC Bayard	Slight	Slight	Moderate: slope.	Slight.
Bh Bigwinder	Severe: flooding, wetness.	Moderate: flooding, wetness.	Severe: wetness, flooding.	Moderate: wetness, flooding.
BoG Blueridge	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.
BpE: Blueridge	Moderate: slope, too sandy.	Moderate: slope, too sandy.	Severe: slope.	Moderate: too sandy.
Bayard	Moderate: slope, dusty.	Moderate: slope, dusty.	Severe: slope.	Moderate: dusty.

TABLE 12.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
BrC---- Bridget	Moderate: dusty.	Moderate: dusty.	Moderate: slope, dusty.	Moderate: dusty.
BrD---- Bridget	Moderate: dusty.	Moderate: dusty.	Severe: slope.	Moderate: dusty.
BrF---- Bridget	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope, dusty.
Bs---- Bufton	Slight----	Slight----	Slight----	Severe: erodes easily.
BsB---- Bufton	Slight----	Slight----	Moderate: slope.	Severe: erodes easily.
BsD---- Bufton	Slight----	Slight----	Severe: slope.	Severe: erodes easily.
BsE---- Bufton	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.
BuB---- Busher	Slight----	Slight----	Slight----	Slight.
BuC---- Busher	Slight----	Slight----	Moderate: slope.	Slight.
BuD---- Busher	Slight----	Slight----	Severe: slope.	Slight.
BwC:				
Busher----	Slight----	Slight----	Moderate: slope.	Slight.
Phiferson----	Slight----	Slight----	Moderate: slope, depth to rock.	Slight.
BxC:				
Busher----	Slight----	Slight----	Moderate: slope.	Slight.
Tassel----	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Slight.
BxE:				
Busher----	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
Tassel----	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Slight.
Cr---- Craft	Severe: flooding.	Moderate: dusty.	Slight----	Moderate: dusty.
Cs---- Craft	Severe: flooding.	Moderate: dusty.	Moderate: flooding.	Moderate: dusty.

TABLE 12.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
Ct Craft	Severe: flooding.	Moderate: flooding.	Severe: flooding.	Moderate: flooding.
DpB Draknab	Severe: flooding.	Slight	Slight	Slight.
EpF Epping	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: erodes easily.
EsG: Epping	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, erodes easily.
Badland	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.
Fu Fluvaquents	Severe: flooding, ponding.	Severe: ponding.	Severe: ponding, flooding.	Severe: ponding.
Go Glenberg	Severe: flooding.	Slight	Moderate: small stones.	Slight.
Gp Glenberg	Severe: flooding.	Moderate: flooding.	Severe: flooding.	Moderate: flooding.
HsC: Hisle	Severe: excess sodium.	Severe: excess sodium.	Severe: excess sodium.	Moderate: dusty.
Slickspots	Severe: percs slowly, excess salt.	Severe: excess salt, percs slowly.	Severe: percs slowly, excess salt.	Severe: too clayey.
In Interior	Severe: flooding.	Moderate: flooding, too clayey.	Severe: flooding.	Moderate: too clayey, flooding.
JmB Jayem	Slight	Slight	Moderate: small stones.	Slight.
JmC Jayem	Slight	Slight	Moderate: slope, small stones.	Slight.
JmD Jayem	Slight	Slight	Severe: slope.	Slight.
KeB, KeC Keith	Moderate: dusty.	Moderate: dusty.	Moderate: slope, dusty.	Moderate: dusty.
Ky Kyle	Moderate: percs slowly, too clayey.	Moderate: too clayey, percs slowly.	Moderate: too clayey, percs slowly.	Severe: erodes easily.
KyC Kyle	Moderate: percs slowly, too clayey.	Moderate: too clayey, percs slowly.	Moderate: slope, too clayey, percs slowly.	Severe: erodes easily.

TABLE 12.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
La Las Animas	Severe: flooding.	Moderate: wetness.	Moderate: wetness, flooding.	Moderate: wetness.
Lb Las Animas	Severe: flooding.	Moderate: flooding, wetness.	Severe: flooding.	Moderate: wetness, flooding.
Lc: Las Animas	Severe: flooding.	Moderate: wetness.	Moderate: wetness, flooding.	Moderate: wetness.
Lisco	Severe: flooding, excess sodium.	Severe: excess sodium.	Severe: excess sodium.	Moderate: wetness.
Ld Lisco	Severe: flooding, excess sodium.	Severe: excess sodium.	Severe: excess sodium.	Moderate: wetness.
Lh Lohmiller	Severe: flooding.	Slight	Slight	Slight.
Lo Lohmiller	Severe: flooding.	Moderate: flooding.	Severe: flooding.	Moderate: flooding.
Ls Lohmiller	Severe: flooding.	Moderate: too clayey.	Moderate: flooding.	Moderate: too clayey.
Mr Mitchell	Moderate: dusty.	Moderate: dusty.	Moderate: dusty.	Severe: erodes easily.
MrB, MrC Mitchell	Moderate: dusty.	Moderate: dusty.	Moderate: slope, dusty.	Severe: erodes easily.
Mt Mitchell	Moderate: dusty.	Moderate: dusty.	Moderate: dusty.	Severe: erodes easily.
MtB, MtC Mitchell	Moderate: dusty.	Moderate: dusty.	Moderate: slope, dusty.	Severe: erodes easily.
MtD Mitchell	Moderate: dusty.	Moderate: dusty.	Severe: slope.	Severe: erodes easily.
MtE Mitchell	Moderate: slope, dusty.	Moderate: slope, dusty.	Severe: slope.	Severe: erodes easily.
MxD: Mitchell	Moderate: dusty.	Moderate: dusty.	Severe: slope.	Severe: erodes easily.
Epping	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: erodes easily.
MxF: Mitchell	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.

TABLE 12.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
MxF:				
Epping	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: erodes easily.
NrB	Slight	Slight	Moderate: slope, depth to rock.	Severe: erodes easily.
Norrest				
NrD	Slight	Slight	Severe: slope.	Severe: erodes easily.
Norrest				
OgB, OgC	Moderate: dusty.	Moderate: dusty.	Moderate: slope, dusty.	Moderate: dusty.
Oglala				
OgD	Moderate: dusty.	Moderate: dusty.	Severe: slope.	Moderate: dusty.
Oglala				
OnD:				
Oglala	Moderate: dusty.	Moderate: dusty.	Severe: slope.	Moderate: dusty.
Canyon	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: erodes easily.
OnF:				
Oglala	Moderate: slope, dusty.	Moderate: slope, dusty.	Severe: slope.	Moderate: dusty.
Canyon	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: erodes easily.
OpD	Moderate: dusty.	Moderate: dusty.	Moderate: slope, dusty.	Moderate: dusty.
Olney				
OrF	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Moderate: slope.
Orella				
OsG:				
Orella	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Moderate: slope.
Badland	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.
OwB	Slight	Slight	Slight	Slight.
Otero				
Pa	Severe: flooding.	Moderate: excess salt.	Moderate: excess salt.	Slight.
Pathfinder				
PhF:				
Phiferson	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.

TABLE 12.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
PhF:				
Tassel	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Moderate: slope.
Rock outcrop	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Moderate: slope.
PrC Pierre	Moderate: percs slowly, too clayey.	Moderate: too clayey, percs slowly.	Moderate: slope, too clayey, depth to rock.	Severe: erodes easily.
PrE Pierre	Moderate: slope, percs slowly, too clayey.	Moderate: slope, too clayey, percs slowly.	Severe: slope.	Severe: erodes easily.
PsD Ponderosa	Slight	Slight	Severe: slope.	Slight.
PsE Ponderosa	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
PtF:				
Ponderosa	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.
Tassel	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Moderate: slope.
Vetal	Slight	Slight	Severe: slope.	Slight.
RkG:				
Rock outcrop	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.
Tassel	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.
SbF:				
Samsil	Severe: slope, thin layer, area reclaim.	Severe: slope, thin layer, area reclaim.	Severe: slope, thin layer, area reclaim.	Severe: erodes easily.
Pierre	Moderate: slope, percs slowly, too clayey.	Moderate: slope, too clayey, percs slowly.	Severe: slope.	Severe: erodes easily.
ScG:				
Samsil	Severe: slope, thin layer, area reclaim.	Severe: slope, thin layer, area reclaim.	Severe: slope, thin layer, area reclaim.	Severe: slope, erodes easily.

TABLE 12.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
ScG:				
Rock outcrop	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.
SdD:				
Sarben	Slight	Slight	Severe: slope.	Slight.
SdF:				
Sarben	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.
SeB:				
Sarben	Slight	Slight	Slight	Slight.
Busher	Slight	Slight	Slight	Slight.
SeD:				
Sarben	Slight	Slight	Severe: slope.	Slight.
Busher	Slight	Slight	Severe: slope.	Slight.
SfB, SfC:				
Satanta	Moderate: dusty.	Moderate: dusty.	Moderate: slope, dusty.	Moderate: dusty.
Sg:				
Savo	Slight	Slight	Slight	Slight.
SgC:				
Savo	Slight	Slight	Moderate: slope.	Slight.
SrF:				
Schamber	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope.
Ss, SsB:				
Scoville	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.
Su:				
Scoville	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.
SuB:				
Scoville	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope, too sandy.	Moderate: too sandy.
SxE:				
Skilak	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.
TbG:				
Tassel	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.
Ashollow	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.
Rock outcrop	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.

TABLE 12.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
TgF:				
Tassel	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Moderate: slope.
Busher	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
Rock outcrop	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Moderate: slope.
TrG:				
Tassel	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.
Ponderosa	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Rock outcrop	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.
TtB, TtC Thirtynine	Moderate: dusty.	Moderate: dusty.	Moderate: slope, dusty.	Moderate: dusty.
TtD Thirtynine	Moderate: dusty.	Moderate: dusty.	Severe: slope.	Moderate: dusty.
Tv Tripp	Moderate: dusty.	Moderate: dusty.	Moderate: dusty.	Moderate: dusty.
TvB Tripp	Moderate: dusty.	Moderate: dusty.	Moderate: slope, dusty.	Moderate: dusty.
VaB Valent	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.
VaD Valent	Severe: too sandy.	Severe: too sandy.	Severe: slope, too sandy.	Severe: too sandy.
VaE Valent	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: too sandy.
VaF:				
Valent, rolling	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: too sandy.
Valent, hilly	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: too sandy, slope.
VbB Valent	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.
VbD Valent	Moderate: too sandy.	Moderate: too sandy.	Severe: slope.	Moderate: too sandy.

TABLE 12.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
VcB---------- Vetal	Slight----------	Slight----------	Slight----------	Slight.
VgB, VgC---------- Vetal	Slight----------	Slight----------	Moderate: slope.	Slight.
WhB---------- Wildhorse	Severe: excess sodium.	Severe: excess sodium.	Severe: excess sodium.	Moderate: wetness, too sandy.

TABLE 13.--WILDLIFE HABITAT

(See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated)

Soil name and map symbol	Potential for habitat elements								Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
Ab, AbB---------- Alice	Fair	Good	Good	Good	Good	Fair	Poor	Very poor.	Good	Good	Very poor.	Fair.
AbC---------- Alice	Fair	Good	Good	Good	Good	Fair	Poor	Very poor.	Good	Good	Very poor.	Fair.
AcB, AcC---------- Alliance	Good	Good	Good	Good	Good	Good	Very poor.	Poor	Good	Good	Poor	Good.
ArB---------- Arvada	Very poor.	Very poor.	Poor	---	---	Very poor.	Poor	Very poor.	Very poor.	---	Very poor.	Very poor.
AwD---------- Ashollow	Fair	Good	Good	Good	Good	Fair	Very poor.	Very poor.	Good	Good	Very poor.	Fair.
AwE---------- Ashollow	Poor	Fair	Good	Good	Good	Fair	Very poor.	Very poor.	Fair	Good	Very poor.	Fair.
Ba---------- Badland	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
BbB. Bahl												
Bc---------- Bankard	Poor	Fair	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Good	Very poor.	Fair.
Bd---------- Bankard	Poor	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.	Fair.
Be, BeB, BeC------- Bayard	Fair	Good	Good	Good	Good	Fair	Poor	Very poor.	Good	Fair	Very poor.	Fair.
Bh---------- Bigwinder	Poor	Poor	Fair	Fair	Fair	Fair	Good	Good	Poor	Good	Good	Fair.
BoG---------- Blueridge	Very poor.	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
BpE: Blueridge---------	Poor	Poor	Poor	Poor	Poor	Poor	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Poor.
Bayard----------	Poor	Fair	Good	Good	Good	Fair	Poor	Very poor.	Good	Good	Very poor.	Fair.
BrC, BrD---------- Bridget	Fair	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.	Good.
BrF---------- Bridget	Poor	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.	Good.
Bs, BsB, BsD------- Bufton	Fair	Good	Good	Fair	Good	Fair	Very poor.	Very poor.	Good	Fair	Very poor.	Good.
BsE---------- Bufton	Poor	Fair	Fair	Fair	Good	Poor	Very poor.	Very poor.	Fair	Fair	Very poor.	Fair.

TABLE 13.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements								Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herba-ceous plants	Hard-wood trees	Conif-erous plants	Shrubs	Wetland plants	Shallow water areas	Open-land wild-life	Wood-land wild-life	Wetland wild-life	Range-land wild-life
BuB, BuC, BuD------ Busher	Fair	Good	Good	Fair	Poor	Good	Very poor.	Very poor.	Good	Fair	Very poor.	Good.
BwC: Busher----------	Fair	Good	Good	Fair	Poor	Good	Very poor.	Very poor.	Good	Fair	Very poor.	Good.
Phiferson.												
BxC: Busher----------	Fair	Good	Good	Fair	Poor	Good	Very poor.	Very poor.	Good	Fair	Very poor.	Good.
Tassel----------	Poor	Poor	Poor	Fair	Fair	Poor	Very poor.	Very poor.	Poor	Fair	Very poor.	Poor.
BxE: Busher----------	Poor	Fair	Fair	Poor	Poor	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.	Fair.
Tassel----------	Poor	Poor	Poor	Fair	Fair	Poor	Very poor.	Very poor.	Poor	Fair	Very poor.	Poor.
Cr, Cs---------- Craft	Good	Good	Good	Good	Good	Fair	Poor	Very poor.	Good	Good	Very poor.	Fair.
Ct---------- Craft	Poor	Poor	Good	Good	Good	Fair	Poor	Very poor.	Poor	Good	Very poor.	Fair.
DpB---------- Draknab	Poor	Fair	Fair	Fair	---	Fair	---	---	Fair	---	---	Fair.
EpF---------- Epping	Poor	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.	Fair.
EsG: Epping----------	Poor	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.	Fair.
Badland----------	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
Fu---------- Fluvaquents	Very poor.	Very poor.	Poor	Very poor.	Very poor.	Very poor.	Good	Good	Very poor.	Very poor.	Good	Very poor.
Go---------- Glenberg	Good	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.	Good.
Gp---------- Glenberg	Poor	Poor	Fair	Good	Good	Good	Poor	Very poor.	Poor	Good	Very poor.	Good.
HsC: Hisle----------	Very poor.	Very poor.	Poor	Poor	Very poor.	---	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Poor.
Slickspots--------	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
In---------- Interior	Poor	Fair	Fair	Poor	Very poor.	---	Very poor.	Very poor.	Poor	Very poor.	Very poor.	Fair.

TABLE 13.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements								Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herba-ceous plants	Hard-wood trees	Conif-erous plants	Shrubs	Wetland plants	Shallow water areas	Open-land wild-life	Wood-land wild-life	Wetland wild-life	Range-land wild-life
JmB, JmC---------- Jayem	Fair	Good	Fair	Good	Good	Fair	Poor	Very poor.	Fair	Good	Very poor.	Fair.
JmD---------- Jayem	Fair	Good	Fair	Good	Good	Fair	Poor	Very poor.	Fair	Good	Very poor.	Fair.
KeB---------- Keith	Good	Good	Good	Fair	Fair	Good	Very poor.	Very poor.	Good	Fair	Very poor.	Good.
KeC---------- Keith	Fair	Good	Good	Fair	Fair	Good	Very poor.	Very poor.	Good	Fair	Very poor.	Good.
Ky, KyC---------- Kyle	Poor	Fair	Good	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Very poor.	Good.
La---------- Las Animas	Fair	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair	Good.
Lb---------- Las Animas	Poor	Poor	Fair	Good	Good	Good	Good	Good	Poor	Fair	Good	Fair.
Lc:												
Las Animas--------	Fair	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair	Good.
Lisco----------	Poor	Poor	Very poor.	Fair	Fair	Fair	Fair	Poor	Poor	Fair	Poor	Poor.
Ld---------- Lisco	Poor	Poor	Very poor.	Fair	Fair	Fair	Fair	Poor	Poor	Fair	Poor	Poor.
Lh---------- Lohmiller	Good	Good	Good	Poor	Poor	Very poor.	Very poor.	Very poor.	Good	Poor	Very poor.	Good.
Lo---------- Lohmiller	Very poor.	Good	Fair	Good	Poor	Fair	Very poor.	Very poor.	Poor	Good	Very poor.	Fair.
Ls---------- Lohmiller	Fair	Good	Fair	Good	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.	Fair.
Mr, MrB, MrC------- Mitchell	Fair	Good	Fair	Good	Good	Good	Poor	Very poor.	Fair	Good	Very poor.	Fair.
Mt, MtB---------- Mitchell	Good	Good	Fair	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.	Fair.
MtC, MtD---------- Mitchell	Fair	Good	Fair	Good	Good	Good	Poor	Very poor.	Fair	Good	Very poor.	Fair.
MtE---------- Mitchell	Poor	Fair	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.	Fair.
MxD:												
Mitchell----------	Fair	Good	Fair	Good	Good	Good	Poor	Very poor.	Fair	Good	Very poor.	Fair.
Epping----------	Poor	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.	Fair.
MxF:												
Mitchell----------	Poor	Fair	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.	Fair.

TABLE 13.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements								Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
MxF:												
Epping	Poor	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.	Fair.
NrB--- Norrest	Fair	Good	Fair	Good	Good	Fair	Poor	Very poor.	Fair	Good	Very poor.	Fair.
NrD--- Norrest	Fair	Good	Fair	Good	Good	Fair	Poor	Very poor.	Fair	Good	Very poor.	Fair.
OgB, OgC, OgD--- Oglala	Fair	Good	Good	Good	Good	Fair	Poor	Very poor.	Fair	Good	Very poor.	Fair.
OnD:												
Oglala	Fair	Good	Good	Good	Good	Fair	Poor	Very poor.	Fair	Good	Very poor.	Fair.
Canyon	Poor	Poor	Fair	Poor	Poor	Poor	Very poor.	Very poor.	Poor	Fair	Very poor.	Fair.
OnF:												
Oglala	Poor	Fair	Good	Good	Good	Fair	Poor	Very poor.	Fair	Good	Very poor.	Fair.
Canyon	Poor	Poor	Fair	Poor	Poor	Poor	Very poor.	Very poor.	Poor	Fair	Very poor.	Fair.
OpD--- Olney	Poor	Fair	Fair	---	---	Fair	Poor	Very poor.	Fair	---	Very poor.	Fair.
OrF--- Orella	Poor	Poor	Poor	Poor	Fair	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.	Poor.
OsG:												
Orella	Poor	Poor	Poor	Poor	Fair	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.	Poor.
Badland	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
OwB--- Otero	Fair	Good	Good	Good	Good	Fair	Poor	Very poor.	Good	Good	Very poor.	Fair.
Pa--- Pathfinder	Poor	Fair	Fair	Very poor.	Very poor.	Fair	Very poor.	Very poor.	Fair	Very poor.	Very poor.	Fair.
PhF: Phiferson.												
Tassel	Poor	Poor	Poor	Fair	Fair	Poor	Very poor.	Very poor.	Poor	Fair	Very poor.	Poor.
Rock outcrop	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
PrC--- Pierre	Poor	Fair	Good	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Very poor.	Good.
PrE--- Pierre	Very poor.	Very poor.	Good	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Good.

TABLE 13.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements								Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herba-ceous plants	Hard-wood trees	Conif-erous plants	Shrubs	Wetland plants	Shallow water areas	Open-land wild-life	Wood-land wild-life	Wetland wild-life	Range-land wild-life
PsD, PsE---------- Ponderosa	Poor	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.	Fair.
PtF:												
Ponderosa---------	Poor	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.	Fair.
Tassel----------	Poor	Poor	Poor	Fair	Fair	Poor	Very poor.	Very poor.	Poor	Fair	Very poor.	Poor.
Vetal----------	Poor	Good	Good	Good	Good	Good	Poor	Very poor.	Fair	Good	Very poor.	Good.
RkG:												
Rock outcrop------	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
Tassel----------	Very poor.	Very poor.	Poor	Fair	Fair	Poor	Very poor.	Very poor.	Very poor.	Fair	Very poor.	Poor.
SbF:												
Samsil----------	Very poor.	Very poor.	Fair	Poor	Very poor.	---	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Fair.
Pierre----------	Very poor.	Very poor.	Good	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Good.
ScG:												
Samsil----------	Very poor.	Very poor.	Fair	Poor	Very poor.	---	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Fair.
Rock outcrop------	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
SdD---------- Sarben	Fair	Good	Good	Fair	Fair	Good	Very poor.	Very poor.	Good	Fair	Very poor.	Good.
SdF---------- Sarben	Poor	Fair	Fair	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Fair	Very poor.	Fair.
SeB, SeD:												
Sarben----------	Fair	Good	Good	Fair	Fair	Good	Very poor.	Very poor.	Good	Fair	Very poor.	Good.
Busher----------	Fair	Good	Good	Fair	Poor	Good	Very poor.	Very poor.	Good	Fair	Very poor.	Good.
SfB---------- Satanta	Good	Good	Fair	Good	Good	Fair	Poor	Very poor.	Good	Good	Very poor.	Fair.
SfC---------- Satanta	Fair	Good	Fair	Good	Good	Fair	Poor	Very poor.	Fair	Good	Very poor.	Fair.
Sg, SgC---------- Savo	Good	Good	Good	Good	Very poor.	Very poor.	Very poor.	Very poor.	Good	Very poor.	Very poor.	Good.
SrF---------- Schamber	Very poor.	Very poor.	Poor	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Poor.
Ss, SsB---------- Scoville	Poor	Fair	Fair	Fair	Fair	Poor	Very poor.	Very poor.	Fair	Fair	Very poor.	Very poor.

TABLE 13.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements								Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herba-ceous plants	Hard-wood trees	Conif-erous plants	Shrubs	Wetland plants	Shallow water areas	Open-land wild-life	Wood-land wild-life	Wetland wild-life	Range-land wild-life
Su, SuB---------- Scoville	Fair	Good	Fair	Fair	Fair	Poor	Very poor.	Very poor.	Fair	Fair	Very poor.	Very poor.
SxE---------- Skilak	Poor	Poor	Fair	Good	Good	Poor	Very poor.	Poor	Poor	Fair	Very poor.	Very poor.
TbG:												
Tassel----------	Very poor.	Very poor.	Poor	Fair	Fair	Poor	Very poor.	Very poor.	Very poor.	Fair	Very poor.	Poor.
Ashollow----------	Poor	Fair	Good	Good	Good	Fair	Very poor.	Very poor.	Fair	Good	Very poor.	Fair.
Rock outcrop------	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
TgF:												
Tassel----------	Poor	Poor	Poor	Fair	Fair	Poor	Very poor.	Very poor.	Poor	Fair	Very poor.	Poor.
Busher----------	Poor	Fair	Fair	Poor	Poor	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.	Fair.
Rock outcrop------	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
TrG:												
Tassel----------	Very poor.	Very poor.	Poor	Fair	Fair	Poor	Very poor.	Very poor.	Very poor.	Fair	Very poor.	Poor.
Ponderosa---------	Very poor.	Very poor.	Fair	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.	Poor.
Rock outcrop------	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
TtB---------- Thirtynine	Good	Good	Good	Good	Good	Fair	Poor	Very poor.	Good	Good	Very poor.	Good.
TtC, TtD---------- Thirtynine	Fair	Good	Good	Good	Good	Fair	Poor	Very poor.	Good	Good	Very poor.	Fair.
Tv, TvB---------- Tripp	Fair	Good	Fair	Good	Good	Fair	Poor	Very poor.	Fair	Good	Very poor.	Fair.
VaB, VaD, VaE------ Valent	Poor	Fair	Fair	Poor	Poor	Poor	Very poor.	Very poor.	Fair	Poor	Very poor.	Fair.
VaF:												
Valent, rolling---	Poor	Fair	Fair	Poor	Poor	Poor	Very poor.	Very poor.	Fair	Poor	Very poor.	Fair.
Valent, hilly-----	Very poor.	Very poor.	Fair	Poor	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.	Fair.
VbB---------- Valent	Fair	Good	Fair	Poor	Fair	Fair	Very poor.	Very poor.	Fair	Poor	Very poor.	Fair.
VbD---------- Valent	Poor	Fair	Fair	Poor	Poor	Poor	Very poor.	Very poor.	Fair	Poor	Very poor.	Fair.

TABLE 13.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements								Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
VcB---------- Vetal	Fair	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.	Good.
VgB---------- Vetal	Good	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.	Good.
VgC---------- Vetal	Fair	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.	Good.
WhB---------- Wildhorse	Poor	Poor	Fair	Very poor.	Very poor.	Poor	Fair	Fair	Poor	Poor	Fair	Poor.

TABLE 14.--BUILDING SITE DEVELOPMENT

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
Ab, AbB---------- Alice	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Moderate: frost action.	Moderate: droughty.
AbC---------- Alice	Severe: cutbanks cave.	Slight---------	Slight---------	Moderate: slope.	Moderate: frost action.	Moderate: droughty.
AcB---------- Alliance	Slight---------	Slight---------	Slight---------	Slight---------	Moderate: frost action.	Slight.
AcC---------- Alliance	Slight---------	Slight---------	Slight---------	Moderate: slope.	Moderate: frost action.	Slight.
ArB---------- Arvada	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Severe: excess sodium.
AwD---------- Ashollow	Slight---------	Slight---------	Slight---------	Moderate: slope.	Slight---------	Slight.
AwE---------- Ashollow	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.
Ba---------- Badland	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope, depth to rock.
BbB---------- Bahl	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Severe: too clayey.
Bc---------- Bankard	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: droughty, flooding.
Bd---------- Bankard	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.
Be, BeB---------- Bayard	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Moderate: frost action.	Slight.
BeC---------- Bayard	Severe: cutbanks cave.	Slight---------	Slight---------	Moderate: slope.	Moderate: frost action.	Slight.
Bh---------- Bigwinder	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding.	Severe: flooding.
BoG---------- Blueridge	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: droughty, slope.
BpE: Blueridge--------	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Severe: droughty.
Bayard----------	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: slope.

TABLE 14.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
BrC, BrD---------- Bridget	Slight---------	Slight---------	Slight---------	Moderate: slope.	Moderate: low strength.	Slight.
BrF---------- Bridget	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Bs, BsB, BsD------ Bufton	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Slight.
BsE---------- Bufton	Moderate: too clayey, slope.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength.	Moderate: slope.
BuB---------- Busher	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Slight---------	Slight.
BuC, BuD---------- Busher	Severe: cutbanks cave.	Slight---------	Slight---------	Moderate: slope.	Slight---------	Slight.
BwC: Busher----------	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Slight---------	Slight.
Phiferson--------	Severe: cutbanks cave.	Slight---------	Moderate: depth to rock.	Slight---------	Moderate: frost action.	Moderate: depth to rock.
BxC: Busher----------	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Slight---------	Slight.
Tassel----------	Severe: depth to rock.	Moderate: depth to rock.	Severe: depth to rock.	Moderate: slope, depth to rock.	Moderate: depth to rock.	Severe: depth to rock.
BxE: Busher----------	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.
Tassel----------	Severe: depth to rock.	Moderate: slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Moderate: depth to rock, slope.	Severe: depth to rock.
Cr---------- Craft	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.	Slight.
Cs---------- Craft	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.
Ct---------- Craft	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.
DpB---------- Draknab	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.	Moderate: droughty.
EpF---------- Epping	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope, depth to rock.
EsG: Epping----------	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope, depth to rock.

TABLE 14.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
EsG: Badland	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope, depth to rock.
Fu Fluvaquents	Severe: cutbanks cave, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: ponding, flooding.	Severe: ponding, flooding.
Go Glenberg	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding, frost action.	Moderate: droughty.
Gp Glenberg	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.
HsC: Hisle	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Severe: excess sodium.
Slickspots	Moderate: too clayey, wetness.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength, frost action.	Severe: excess salt, too clayey.
In Interior	Moderate: too clayey, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding.	Severe: flooding, too clayey.
JmB Jayem	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Slight.
JmC, JmD Jayem	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight	Slight.
KeB Keith	Slight	Slight	Slight	Slight	Moderate: low strength, frost action.	Slight.
KeC Keith	Slight	Slight	Slight	Moderate: slope.	Moderate: low strength, frost action.	Slight.
Ky, KyC Kyle	Severe: cutbanks cave.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Severe: too clayey.
La Las Animas	Severe: cutbanks cave, wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: flooding.	Moderate: wetness, flooding.
Lb Las Animas	Severe: cutbanks cave, wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: flooding, frost action.	Severe: flooding.
Lc: Las Animas	Severe: cutbanks cave, wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: flooding.	Moderate: wetness, flooding.

TABLE 14.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
Lc:						
Lisco	Severe: cutbanks cave, wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: flooding.	Severe: excess sodium.
Ld Lisco	Severe: cutbanks cave, wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: flooding.	Severe: excess sodium.
Lh Lohmiller	Moderate: too clayey.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: shrink-swell, low strength.	Slight.
Lo Lohmiller	Moderate: too clayey, flooding.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: shrink-swell, low strength, flooding.	Severe: flooding.
Ls Lohmiller	Moderate: too clayey, flooding.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: shrink-swell, low strength, flooding.	Severe: too clayey.
Mr, MrB Mitchell	Slight	Slight	Slight	Slight	Slight	Slight.
MrC Mitchell	Slight	Slight	Slight	Moderate: slope.	Slight	Slight.
Mt, MtB Mitchell	Slight	Slight	Slight	Slight	Slight	Slight.
MtC, MtD Mitchell	Slight	Slight	Slight	Moderate: slope.	Slight	Slight.
MtE Mitchell	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.
MxD:						
Mitchell	Slight	Slight	Slight	Moderate: slope.	Slight	Slight.
Epping	Severe: depth to rock.	Moderate: shrink-swell, depth to rock.	Severe: depth to rock.	Moderate: shrink-swell, slope, depth to rock.	Moderate: depth to rock, shrink-swell.	Severe: depth to rock.
MxF:						
Mitchell	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Epping	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope, depth to rock.
NrB, NrD Norrest	Moderate: depth to rock, too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Moderate: depth to rock.
OgB Oglala	Severe: cutbanks cave.	Slight	Slight	Slight	Moderate: frost action.	Slight.

TABLE 14.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
OgC, OgD---------- Oglala	Severe: cutbanks cave.	Slight---------	Slight---------	Moderate: slope.	Moderate: frost action.	Slight.
OnD:						
Oglala----------	Severe: cutbanks cave.	Slight---------	Slight---------	Moderate: slope.	Moderate: frost action.	Slight.
Canyon----------	Severe: depth to rock.	Moderate: depth to rock.	Severe: depth to rock.	Moderate: slope, depth to rock.	Moderate: depth to rock.	Severe: depth to rock.
OnF:						
Oglala----------	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: slope.
Canyon----------	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope, depth to rock.
OpD---------- Olney	Severe: cutbanks cave.	Slight---------	Slight---------	Moderate: slope.	Slight---------	Moderate: droughty.
OrF---------- Orella	Severe: depth to rock, slope.	Severe: shrink-swell, slope.	Severe: depth to rock, slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength, slope.	Severe: slope, depth to rock, too clayey.
OsG:						
Orella----------	Severe: depth to rock, slope.	Severe: shrink-swell, slope.	Severe: depth to rock, slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength, slope.	Severe: slope, depth to rock, too clayey.
Badland----------	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope, depth to rock.
OwB---------- Otero	Slight---------	Slight---------	Slight---------	Slight---------	Slight---------	Slight.
Pa---------- Pathfinder	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.	Moderate: excess salt, droughty.
PhF:						
Phiferson--------	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Tassel----------	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope, depth to rock.
Rock outcrop-----	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope, thin layer.
PrC---------- Pierre	Severe: cutbanks cave.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Severe: too clayey.

TABLE 14.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
PrE---------- Pierre	Severe: cutbanks cave.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength.	Severe: too clayey.
PsD---------- Ponderosa	Severe: cutbanks cave.	Slight---------	Slight---------	Moderate: slope.	Slight---------	Slight.
PsE---------- Ponderosa	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.
PtF:						
Ponderosa--------	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Tassel----------	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope, depth to rock.
Vetal----------	Severe: cutbanks cave.	Slight---------	Slight---------	Moderate: slope.	Moderate: frost action.	Slight.
RkG:						
Rock outcrop-----	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope, thin layer.
Tassel----------	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope, depth to rock.
SbF:						
Samsil----------	Severe: slope.	Severe: slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: slope, shrink-swell.	Severe: low strength, slope, shrink-swell.	Severe: slope, thin layer, too clayey.
Pierre----------	Severe: cutbanks cave.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength.	Severe: too clayey.
ScG:						
Samsil----------	Severe: slope.	Severe: slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: slope, shrink-swell.	Severe: low strength, slope, shrink-swell.	Severe: slope, thin layer, too clayey.
Rock outcrop-----	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope, thin layer.
SdD---------- Sarben	Severe: cutbanks cave.	Slight---------	Slight---------	Moderate: slope.	Slight---------	Moderate: droughty.
SdF---------- Sarben	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
SeB:						
Sarben----------	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Slight---------	Moderate: droughty.

TABLE 14.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
SeB:						
Busher	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Slight.
SeD:						
Sarben	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight	Moderate: droughty.
Busher	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight	Slight.
SfB Satanta	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, low strength.	Slight.
SfC Satanta	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, low strength.	Slight.
Sg, SgC Savo	Slight	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Slight.
SrF Schamber	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: droughty.
Ss, SsB, Su, SuB Scoville	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: droughty.
SxE Skilak	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
TbG:						
Tassel	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope, depth to rock.
Ashollow	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Rock outcrop	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope, thin layer.
TgF:						
Tassel	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope, depth to rock.
Busher	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.
Rock outcrop	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope, thin layer.
TrG:						
Tassel	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope, depth to rock.

TABLE 14.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
TrG:						
Ponderosa	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Rock outcrop	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope, thin layer.
TtB---------- Thirtynine	Slight	Moderate: shrink-swell.	Slight	Moderate: shrink-swell.	Severe: low strength.	Slight.
TtC, TtD---------- Thirtynine	Slight	Moderate: shrink-swell.	Slight	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
Tv, TvB---------- Tripp	Slight	Slight	Slight	Slight	Moderate: frost action.	Slight.
VaB---------- Valent	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: droughty.
VaD---------- Valent	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight	Moderate: droughty.
VaE---------- Valent	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
VaF:						
Valent, rolling	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Valent, hilly	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
VbB---------- Valent	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: droughty.
VbD---------- Valent	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight	Moderate: droughty.
VcB, VgB---------- Vetal	Severe: cutbanks cave.	Slight	Slight	Slight	Moderate: frost action.	Slight.
VgC---------- Vetal	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Moderate: frost action.	Slight.
WhB---------- Wildhorse	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, frost action.	Severe: excess sodium, droughty.

TABLE 15.--SANITARY FACILITIES

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "good," and other terms. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Ab, AbB, AbC--------- Alice	Slight-----------	Severe: seepage.	Moderate: too sandy.	Slight-----------	Good.
AcB, AcC------------ Alliance	Moderate: depth to rock, percs slowly.	Moderate: seepage, depth to rock, slope.	Severe: depth to rock.	Slight-----------	Fair: depth to rock.
ArB----------------- Arvada	Severe: percs slowly.	Slight-----------	Slight-----------	Slight-----------	Good.
AwD----------------- Ashollow	Slight-----------	Severe: seepage.	Slight-----------	Slight-----------	Good.
AwE----------------- Ashollow	Moderate: slope.	Severe: seepage, slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
Ba------------------ Badland	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, slope.
BbB----------------- Bahl	Severe: percs slowly.	Moderate: slope.	Slight-----------	Slight-----------	Poor: hard to pack.
Bc, Bd-------------- Bankard	Severe: flooding, poor filter.	Severe: seepage, flooding.	Severe: flooding, too sandy.	Severe: flooding.	Poor: seepage, too sandy.
Be, BeB, BeC-------- Bayard	Slight-----------	Severe: seepage.	Severe: seepage.	Severe: seepage.	Good.
Bh------------------ Bigwinder	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness, too sandy.	Severe: flooding, wetness.	Poor: too sandy, wetness.
BoG----------------- Blueridge	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: slope, too sandy.	Severe: slope.	Poor: seepage, too sandy, small stones.
BpE: Blueridge----------	Severe: poor filter.	Severe: seepage, slope.	Severe: too sandy.	Moderate: slope.	Poor: seepage, too sandy, small stones.
Bayard-------------	Moderate: slope.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Fair: slope.
BrC----------------- Bridget	Moderate: percs slowly.	Moderate: seepage, slope.	Slight-----------	Slight-----------	Good.
BrD----------------- Bridget	Moderate: percs slowly.	Severe: slope.	Slight-----------	Slight-----------	Good.

TABLE 15.--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
BrF---------- Bridget	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Bs---------- Bufton	Severe: percs slowly.	Slight----------	Slight----------	Slight----------	Poor: hard to pack.
BsB, BsD---------- Bufton	Severe: percs slowly.	Moderate: slope.	Slight----------	Slight----------	Poor: hard to pack.
BsE---------- Bufton	Severe: percs slowly.	Severe: slope.	Moderate: slope.	Moderate: slope.	Poor: hard to pack.
BuB, BuC---------- Busher	Moderate: depth to rock.	Severe: seepage.	Severe: depth to rock.	Slight----------	Fair: depth to rock, thin layer.
BuD---------- Busher	Moderate: depth to rock.	Severe: seepage, slope.	Severe: depth to rock.	Slight----------	Fair: depth to rock, thin layer.
BwC:					
Busher----------	Moderate: depth to rock.	Severe: seepage.	Severe: depth to rock.	Slight----------	Fair: depth to rock, thin layer.
Phiferson----------	Severe: depth to rock.	Severe: seepage, depth to rock.	Severe: depth to rock.	Slight----------	Poor: depth to rock.
BxC:					
Busher----------	Moderate: depth to rock.	Severe: seepage.	Severe: depth to rock.	Slight----------	Fair: depth to rock, thin layer.
Tassel----------	Severe: depth to rock.	Severe: seepage, depth to rock.	Severe: depth to rock.	Slight----------	Poor: depth to rock.
BxE:					
Busher----------	Moderate: depth to rock, slope.	Severe: seepage, slope.	Severe: depth to rock.	Moderate: slope.	Fair: depth to rock, slope, thin layer.
Tassel----------	Severe: depth to rock.	Severe: seepage, depth to rock, slope.	Severe: depth to rock.	Moderate: slope.	Poor: depth to rock.
Cr---------- Craft	Moderate: flooding, percs slowly.	Severe: seepage.	Moderate: flooding, too sandy.	Moderate: flooding.	Good.
Cs, Ct---------- Craft	Severe: flooding.	Severe: seepage, flooding.	Severe: flooding.	Severe: flooding.	Good.
DpB---------- Draknab	Severe: poor filter.	Severe: seepage.	Severe: too sandy.	Moderate: flooding.	Poor: seepage, too sandy.

TABLE 15.--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
EpF---------- Epping	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: depth to rock, slope.
EsG:					
Epping----------	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: depth to rock, slope.
Badland----------	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, slope.
Fu---------- Fluvaquents	Severe: flooding, ponding.	Severe: seepage, flooding, ponding.	Severe: flooding, ponding.	Severe: flooding, seepage, ponding.	Poor: ponding.
Go---------- Glenberg	Moderate: flooding.	Severe: seepage.	Severe: too sandy.	Moderate: flooding.	Poor: too sandy.
Gp---------- Glenberg	Severe: flooding.	Severe: seepage, flooding.	Severe: flooding, too sandy.	Severe: flooding.	Poor: too sandy.
HsC:					
Hisle----------	Severe: thin layer, seepage, percs slowly.	Severe: seepage.	Severe: seepage.	Slight----------	Poor: area reclaim, hard to pack, thin layer.
Slickspots---------	Severe: wetness, percs slowly.	Moderate: slope.	Severe: wetness, too clayey, excess salt.	Severe: wetness.	Poor: too clayey, excess salt.
In---------- Interior	Severe: flooding, percs slowly.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Good.
JmB, JmC---------- Jayem	Slight----------	Severe: seepage.	Moderate: too sandy.	Slight----------	Good.
JmD---------- Jayem	Slight----------	Severe: seepage, slope.	Moderate: too sandy.	Slight----------	Good.
KeB, KeC---------- Keith	Moderate: percs slowly.	Moderate: seepage, slope.	Slight----------	Slight----------	Good.
Ky---------- Kyle	Severe: percs slowly.	Slight----------	Slight----------	Slight----------	Poor: hard to pack.
KyC---------- Kyle	Severe: percs slowly.	Moderate: slope.	Slight----------	Slight----------	Poor: hard to pack.
La---------- Las Animas	Severe: flooding, wetness.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Fair: too sandy, wetness, thin layer.

TABLE 15.--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
Lb---------- Las Animas	Severe: flooding, wetness.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Fair: too sandy, wetness.
Lc: Las Animas----------	Severe: flooding, wetness.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Fair: too sandy, wetness, thin layer.
Lisco----------	Severe: flooding, wetness.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, wetness.	Poor: excess sodium.
Ld---------- Lisco	Severe: flooding, wetness.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, wetness.	Poor: excess sodium.
Lh---------- Lohmiller	Severe: percs slowly.	Slight----------	Moderate: flooding.	Moderate: flooding.	Poor: hard to pack.
Lo, Ls---------- Lohmiller	Severe: flooding, percs slowly.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Poor: hard to pack.
Mr---------- Mitchell	Moderate: percs slowly.	Moderate: seepage.	Slight----------	Slight----------	Good.
MrB, MrC---------- Mitchell	Moderate: percs slowly.	Moderate: seepage, slope.	Slight----------	Slight----------	Good.
Mt---------- Mitchell	Moderate: percs slowly.	Moderate: seepage.	Slight----------	Slight----------	Good.
MtB, MtC---------- Mitchell	Moderate: percs slowly.	Moderate: seepage, slope.	Slight----------	Slight----------	Good.
MtD---------- Mitchell	Moderate: percs slowly.	Severe: slope.	Slight----------	Slight----------	Good.
MtE---------- Mitchell	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
MxD: Mitchell----------	Moderate: percs slowly.	Moderate: seepage, slope.	Slight----------	Slight----------	Good.
Epping----------	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Slight----------	Poor: depth to rock.
MxF: Mitchell----------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.

TABLE 15.--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
MxF:					
Epping	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: depth to rock, slope.
NrB	Severe: depth to rock, percs slowly.	Severe: depth to rock.	Severe: depth to rock.	Slight	Poor: depth to rock, hard to pack.
NrD	Severe: depth to rock, percs slowly.	Severe: depth to rock, slope.	Severe: depth to rock.	Slight	Poor: depth to rock, hard to pack.
OgB, OgC	Moderate: depth to rock, percs slowly.	Moderate: seepage, depth to rock, slope.	Severe: depth to rock.	Slight	Fair: depth to rock, thin layer.
OgD	Moderate: depth to rock, percs slowly.	Severe: slope.	Severe: depth to rock.	Slight	Fair: depth to rock, thin layer.
OnD:					
Oglala	Moderate: depth to rock, percs slowly.	Moderate: seepage, depth to rock, slope.	Severe: depth to rock.	Slight	Fair: depth to rock, thin layer.
Canyon	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Slight	Poor: depth to rock.
OnF:					
Oglala	Moderate: depth to rock, percs slowly, slope.	Severe: slope.	Severe: depth to rock.	Moderate: slope.	Fair: depth to rock, slope, thin layer.
Canyon	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: depth to rock, slope.
OpD	Slight	Severe: seepage.	Moderate: too sandy.	Slight	Fair: too sandy.
OrF	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: depth to rock, hard to pack, slope.
OsG:					
Orella	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: depth to rock, hard to pack, slope.
Badland	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, slope.
OwB	Slight	Severe: seepage.	Slight	Slight	Good.
Otero					

TABLE 15.--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
Pa Pathfinder	Severe: poor filter.	Severe: seepage.	Severe: too sandy.	Moderate: flooding.	Poor: seepage, too sandy.
PhF: Phiferson	Severe: depth to rock, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: depth to rock, slope.
Tassel	Severe: depth to rock, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: depth to rock, slope.
Rock outcrop	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, slope.
PrC Pierre	Severe: depth to rock, percs slowly.	Severe: depth to rock.	Severe: depth to rock.	Slight	Poor: depth to rock.
PrE Pierre	Severe: depth to rock, percs slowly.	Severe: depth to rock, slope.	Severe: depth to rock.	Moderate: slope.	Poor: depth to rock.
PsD Ponderosa	Slight	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Good.
PsE Ponderosa	Moderate: slope.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Fair: slope.
PtF: Ponderosa	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: slope.
Tassel	Severe: depth to rock, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: depth to rock, slope.
Vetal	Slight	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Fair: thin layer.
RkG: Rock outcrop	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, slope.
Tassel	Severe: depth to rock, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: depth to rock, slope.

TABLE 15.--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
SbF:					
Samsil	Severe: thin layer, seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: slope.	Poor: area reclaim, hard to pack, slope.
Pierre	Severe: depth to rock, percs slowly.	Severe: depth to rock, slope.	Severe: depth to rock.	Moderate: slope.	Poor: depth to rock.
ScG:					
Samsil	Severe: thin layer, seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: slope.	Poor: area reclaim, hard to pack, slope.
Rock outcrop	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, slope.
SdD Sarben	Slight	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Good.
SdF Sarben	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: slope.
SeB, SeD:					
Sarben	Slight	Severe: seepage.	Severe: seepage.	Severe: seepage.	Good.
Busher	Moderate: depth to rock.	Severe: seepage.	Severe: depth to rock.	Slight	Fair: depth to rock, thin layer.
SfB, SfC Satanta	Moderate: percs slowly.	Severe: seepage.	Slight	Slight	Good.
Sg Savo	Severe: percs slowly.	Moderate: seepage.	Slight	Slight	Poor: hard to pack.
SgC Savo	Severe: percs slowly.	Moderate: seepage, slope.	Slight	Slight	Poor: hard to pack.
SrF Schamber	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: slope, too sandy.	Severe: slope.	Poor: seepage, too sandy, small stones.
Ss, SsB, Su, SuB Scoville	Severe: poor filter.	Severe: seepage.	Severe: too sandy.	Slight	Poor: seepage, too sandy.
SxE Skilak	Severe: slope.	Severe: seepage, slope.	Severe: slope.	Severe: slope.	Poor: slope.

TABLE 15.--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
TbG:					
Tassel	Severe: depth to rock, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: depth to rock, slope.
Ashollow	Severe: slope.	Severe: seepage, slope.	Severe: slope.	Severe: slope.	Poor: slope.
Rock outcrop	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, slope.
TgF:					
Tassel	Severe: depth to rock, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: depth to rock, slope.
Busher	Moderate: depth to rock, slope.	Severe: seepage, slope.	Severe: depth to rock.	Moderate: slope.	Fair: depth to rock, slope, thin layer.
Rock outcrop	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, slope.
TrG:					
Tassel	Severe: depth to rock, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: depth to rock, slope.
Ponderosa	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: slope.
Rock outcrop	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, slope.
TtB, TtC Thirtynine	Moderate: percs slowly.	Moderate: seepage, slope.	Slight	Slight	Good.
TtD Thirtynine	Moderate: percs slowly.	Severe: slope.	Slight	Slight	Good.
Tv Tripp	Moderate: percs slowly.	Moderate: seepage.	Slight	Slight	Good.
TvB Tripp	Moderate: percs slowly.	Moderate: seepage, slope.	Slight	Slight	Good.
VaB, VaD Valent	Severe: poor filter.	Severe: seepage.	Severe: too sandy.	Slight	Poor: seepage, too sandy.

TABLE 15.--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
VaE---------- Valent	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: slope, too sandy.	Severe: slope.	Poor: seepage, too sandy, slope.
VaF: Valent, rolling----	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: slope, too sandy.	Severe: slope.	Poor: seepage, too sandy, slope.
Valent, hilly------	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: slope, too sandy.	Severe: slope.	Poor: seepage, too sandy, slope.
VbB, VbD---------- Valent	Severe: poor filter.	Severe: seepage.	Severe: too sandy.	Slight----------	Poor: seepage, too sandy.
VcB, VgB, VgC------- Vetal	Slight----------	Severe: seepage.	Severe: seepage.	Severe: seepage.	Fair: thin layer.
WhB---------- Wildhorse	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy, excess sodium.

TABLE 16.--CONSTRUCTION MATERIALS

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," and other terms. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Ab, AbB, AbC---------- Alice	Good----------	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy.
AcB, AcC---------- Alliance	Fair: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
ArB---------- Arvada	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, excess sodium.
AwD---------- Ashollow	Good----------	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
AwE---------- Ashollow	Good----------	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, slope.
Ba---------- Badland	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, slope.
BbB---------- Bahl	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Bc, Bd---------- Bankard	Good----------	Probable----------	Improbable: too sandy.	Poor: area reclaim, too sandy.
Be, BeB, BeC---------- Bayard	Good----------	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy, small stones.
Bh---------- Bigwinder	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
BoG---------- Blueridge	Poor: slope.	Probable----------	Probable----------	Poor: area reclaim, too sandy, small stones.
BpE: Blueridge----------	Good----------	Probable----------	Probable----------	Poor: area reclaim, too sandy, small stones.
Bayard----------	Good----------	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy, small stones, slope.
BrC, BrD---------- Bridget	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
BrF---------- Bridget	Fair: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.

TABLE 16.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Bs, BsB, BsD, BsE----- Bufton	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
BuB, BuC, BuD--------- Busher	Fair: depth to rock, thin layer.	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy, small stones.
BwC:				
Busher----------	Fair: depth to rock, thin layer.	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy, small stones.
Phiferson----------	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Fair: depth to rock, small stones.
BxC:				
Busher----------	Fair: depth to rock, thin layer.	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy, small stones.
Tassel----------	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock.
BxE:				
Busher----------	Fair: depth to rock, thin layer.	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy, small stones, slope.
Tassel----------	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock.
Cr, Cs, Ct---------- Craft	Good----------	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy.
DpB---------- Draknab	Good----------	Probable----------	Improbable: too sandy.	Poor: too sandy.
EpF---------- Epping	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, slope.
EsG:				
Epping----------	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, slope.
Badland----------	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, slope.
Fu---------- Fluvaquents	Poor: wetness.	Probable----------	Improbable: too sandy.	Poor: wetness.
Go, Gp---------- Glenberg	Good----------	Improbable: excess fines.	Improbable: excess fines.	Poor: too sandy.

TABLE 16.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
HsC:				
Hisle	Poor: area reclaim, low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, excess salt, excess sodium.
Slickspots	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, excess salt.
In	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
JmB, JmC, JmD Jayem	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy, small stones.
KeB, KeC Keith	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Ky, KyC Kyle	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
La Las Animas	Fair: wetness.	Probable	Improbable: too sandy.	Fair: too sandy, small stones.
Lb Las Animas	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy, small stones.
Lc:				
Las Animas	Fair: wetness.	Probable	Improbable: too sandy.	Fair: too sandy, small stones.
Lisco	Fair: wetness.	Probable	Improbable: too sandy.	Poor: excess salt, excess sodium.
Ld Lisco	Fair: wetness.	Probable	Improbable: too sandy.	Poor: excess salt, excess sodium.
Lh Lohmiller	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Lo, Ls Lohmiller	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Mr, MrB, MrC, Mt, MtB, MtC, MtD Mitchell	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
MtE Mitchell	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.
MxD:				
Mitchell	Good	Improbable: excess fines.	Improbable: excess fines.	Good.

TABLE 16.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
MxD:				
Epping	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock.
MxF:				
Mitchell	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Epping	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, slope.
NrB, NrD Norrest	Poor: depth to rock, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
OgB, OgC, OgD Oglala	Poor: thin layer.	Improbable: excess fines.	Improbable: excess fines.	Good.
OnD:				
Oglala	Poor: thin layer.	Improbable: excess fines.	Improbable: excess fines.	Good.
Canyon	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock.
OnF:				
Oglala	Poor: thin layer.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.
Canyon	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, slope.
OpD Olney	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy, small stones.
OrF Orella	Poor: depth to rock, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, too clayey, excess salt.
OsG:				
Orella	Poor: depth to rock, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, too clayey, excess salt.
Badland	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, slope.
OwB Otero	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
Pa Pathfinder	Good	Probable	Improbable: too sandy.	Poor: too sandy.
PhF:				
Phiferson	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.

TABLE 16.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
PhF:				
Tassel	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, slope.
Rock outcrop	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, slope.
PrC, PrE Pierre	Poor: depth to rock, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
PsD Ponderosa	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy, small stones.
PsE Ponderosa	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy, small stones, slope.
PtF:				
Ponderosa	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Tassel	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, slope.
Vetal	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
RkG:				
Rock outcrop	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, slope.
Tassel	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, slope.
SbF:				
Samsil	Poor: area reclaim, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, too clayey, slope.
Pierre	Poor: depth to rock, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
ScG:				
Samsil	Poor: area reclaim, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, too clayey, slope.
Rock outcrop	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, slope.

TABLE 16.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
SdD---------- Sarben	Good----------	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy.
SdF---------- Sarben	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
SeB, SeD:				
Sarben----------	Good----------	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy.
Busher----------	Fair: depth to rock, thin layer.	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy, small stones.
SfB, SfC---------- Satanta	Good----------	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
Sg, SgC---------- Savo	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
SrF---------- Schamber	Fair: slope.	Probable----------	Probable----------	Poor: too sandy, small stones, area reclaim.
Ss, SsB, Su, SuB------ Scoville	Good----------	Probable----------	Improbable: too sandy.	Poor: too sandy.
SxE---------- Skilak	Fair: shrink-swell, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
TbG:				
Tassel----------	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, slope.
Ashollow----------	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Rock outcrop---------	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, slope.
TgF:				
Tassel----------	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, slope.
Busher----------	Fair: depth to rock, thin layer.	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy, small stones, slope.
Rock outcrop---------	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, slope.
TrG:				
Tassel----------	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, slope.

TABLE 16.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
TrG:				
Ponderosa	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Rock outcrop	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, slope.
TtB, TtC, TtD Thirtynine	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
Tv, TvB Tripp	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
VaB, VaD Valent	Good	Probable	Improbable: too sandy.	Poor: too sandy.
VaE Valent	Fair: slope.	Probable	Improbable: too sandy.	Poor: too sandy, slope.
VaF:				
Valent, rolling	Fair: slope.	Probable	Improbable: too sandy.	Poor: too sandy, slope.
Valent, hilly	Poor: slope.	Probable	Improbable: too sandy.	Poor: too sandy, slope.
VbB, VbD Valent	Good	Probable	Improbable: too sandy.	Poor: too sandy.
VcB, VgB, VgC Vetal	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
WhB Wildhorse	Fair: wetness.	Probable	Improbable: too sandy.	Poor: area reclaim, too sandy, excess sodium.

TABLE 17.--WATER MANAGEMENT

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
Ab, AbB---------- Alice	Severe: seepage.	Severe: piping.	Deep to water	Droughty, soil blowing.	Soil blowing---	Too arid, droughty.
AbC---------- Alice	Severe: seepage.	Severe: piping.	Deep to water	Slope, droughty, soil blowing.	Soil blowing---	Too arid, droughty.
AcB---------- Alliance	Moderate: seepage, depth to rock.	Severe: piping.	Deep to water	Favorable------	Erodes easily	Too arid, erodes easily.
AcC---------- Alliance	Moderate: seepage, depth to rock, slope.	Severe: piping.	Deep to water	Slope----------	Erodes easily	Too arid, erodes easily.
ArB---------- Arvada	Slight---------	Severe: excess sodium.	Deep to water	Droughty-------	Erodes easily	Too arid, excess sodium.
AwD---------- Ashollow	Severe: seepage.	Severe: piping.	Deep to water	Slope, fast intake, soil blowing.	Erodes easily, soil blowing.	Too arid, erodes easily.
AwE---------- Ashollow	Severe: seepage, slope.	Severe: piping.	Deep to water	Slope, fast intake, soil blowing.	Slope, erodes easily, soil blowing.	Too arid, slope, erodes easily.
Ba---------- Badland	Severe: depth to rock, slope.	Slight---------	Deep to water	Slope, depth to rock.	Slope, depth to rock.	Slope, depth to rock.
BbB---------- Bahl	Moderate: slope.	Moderate: hard to pack.	Deep to water	Slope, slow intake, percs slowly.	Erodes easily, percs slowly.	Too arid, erodes easily.
Bc, Bd---------- Bankard	Severe: seepage.	Severe: seepage, piping.	Deep to water	Droughty, fast intake, soil blowing.	Too sandy, soil blowing.	Too arid, droughty, rooting depth.
Be, BeB---------- Bayard	Severe: seepage.	Severe: piping.	Deep to water	Soil blowing---	Soil blowing---	Too arid.
BeC---------- Bayard	Severe: seepage.	Severe: piping.	Deep to water	Slope, soil blowing.	Soil blowing---	Too arid.
Bh---------- Bigwinder	Moderate: seepage.	Severe: piping, wetness.	Flooding, cutbanks cave.	Wetness, soil blowing, flooding.	Wetness, too sandy, soil blowing.	Wetness.
BoG---------- Blueridge	Severe: seepage, slope.	Severe: seepage, piping.	Deep to water	Slope, droughty, fast intake.	Slope, too sandy, soil blowing.	Too arid, slope, droughty.
BpE: Blueridge--------	Severe: seepage, slope.	Severe: seepage, piping.	Deep to water	Slope, droughty, fast intake.	Slope, too sandy, soil blowing.	Too arid, slope, droughty.

TABLE 17.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
BpE:						
Bayard	Severe: seepage, slope.	Severe: piping.	Deep to water	Slope, soil blowing.	Slope, soil blowing.	Too arid, slope.
BrC, BrD	Moderate: seepage, slope.	Severe: piping.	Deep to water	Slope, soil blowing.	Erodes easily, soil blowing.	Too arid, erodes easily.
BrF	Severe: slope.	Severe: piping.	Deep to water	Slope, soil blowing.	Slope, erodes easily, soil blowing.	Too arid, slope, erodes easily.
Bs, BsB	Slight	Moderate: hard to pack.	Deep to water	Percs slowly	Erodes easily, percs slowly.	Too arid, erodes easily.
BsD	Moderate: slope.	Moderate: hard to pack.	Deep to water	Slope, percs slowly.	Erodes easily, percs slowly.	Too arid, erodes easily.
BsE	Severe: slope.	Moderate: hard to pack.	Deep to water	Slope, percs slowly.	Slope, erodes easily, percs slowly.	Too arid, slope, erodes easily.
BuB	Severe: seepage.	Severe: piping.	Deep to water	Fast intake, soil blowing.	Soil blowing	Too arid.
BuC, BuD	Severe: seepage.	Severe: piping.	Deep to water	Slope, fast intake, soil blowing.	Soil blowing	Too arid.
BwC:						
Busher	Severe: seepage.	Severe: piping.	Deep to water	Slope, fast intake, soil blowing.	Soil blowing	Too arid.
Phiferson	Severe: seepage.	Severe: piping.	Deep to water	Slope, fast intake, soil blowing.	Depth to rock, soil blowing.	Too arid, depth to rock.
BxC:						
Busher	Severe: seepage.	Severe: piping.	Deep to water	Slope, fast intake, soil blowing.	Soil blowing	Too arid.
Tassel	Severe: depth to rock.	Slight	Deep to water	Slope, fast intake, soil blowing.	Depth to rock, soil blowing.	Too arid, depth to rock.
BxE:						
Busher	Severe: seepage, slope.	Severe: piping.	Deep to water	Slope, fast intake, soil blowing.	Slope, soil blowing.	Too arid, slope.
Tassel	Severe: depth to rock, slope.	Slight	Deep to water	Slope, fast intake, soil blowing.	Slope, depth to rock, soil blowing.	Too arid, slope, depth to rock.
Cr	Severe: seepage.	Severe: piping.	Deep to water	Favorable	Erodes easily	Too arid, erodes easily.
Cs, Ct	Severe: seepage.	Severe: piping.	Deep to water	Flooding	Erodes easily	Too arid, erodes easily.

TABLE 17.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
DpB---------- Draknab	Severe: seepage.	Severe: seepage, piping.	Deep to water	Droughty, fast intake, soil blowing.	Too sandy, soil blowing.	Too arid, droughty.
EpF---------- Epping	Severe: depth to rock, slope.	Severe: piping.	Deep to water	Slope, depth to rock.	Slope, depth to rock, erodes easily.	Too arid, slope, erodes easily.
EsG:						
Epping----------	Severe: depth to rock, slope.	Severe: piping.	Deep to water	Slope, depth to rock.	Slope, depth to rock, erodes easily.	Too arid, slope, erodes easily.
Badland----------	Severe: depth to rock, slope.	Slight---------	Deep to water	Slope, depth to rock.	Slope, depth to rock.	Slope, depth to rock.
Fu---------- Fluvaquents	Severe: seepage.	Severe: seepage, ponding.	Ponding, flooding.	Ponding, droughty, rooting depth.	Ponding, too sandy.	Wetness, droughty, rooting depth.
Go---------- Glenberg	Severe: seepage.	Severe: piping.	Deep to water	Droughty, soil blowing.	Too sandy------	Too arid, droughty.
Gp---------- Glenberg	Severe: seepage.	Severe: piping.	Deep to water	Droughty, soil blowing, flooding.	Too sandy------	Too arid, droughty.
HsC:						
Hisle----------	Moderate: seepage, slope.	Severe: hard to pack, excess sodium.	Deep to water	Slope, droughty, percs slowly.	Area reclaim, erodes easily.	Excess sodium, erodes easily.
Slickspots-------	Moderate: slope.	Severe: excess salt.	Deep to water	Slope, droughty, percs slowly.	Erodes easily, percs slowly.	Excess salt, erodes easily, percs slowly.
In---------- Interior	Moderate: seepage.	Moderate: piping.	Deep to water	Slow intake, percs slowly, flooding.	Erodes easily	Too arid, erodes easily, percs slowly.
JmB---------- Jayem	Severe: seepage.	Severe: piping.	Deep to water	Fast intake, soil blowing.	Soil blowing---	Too arid.
JmC, JmD---------- Jayem	Severe: seepage.	Severe: piping.	Deep to water	Slope, fast intake, soil blowing.	Soil blowing---	Too arid.
KeB---------- Keith	Moderate: seepage.	Severe: piping.	Deep to water	Favorable------	Erodes easily	Too arid, erodes easily.
KeC---------- Keith	Moderate: seepage, slope.	Severe: piping.	Deep to water	Slope----------	Erodes easily	Too arid, erodes easily.
Ky---------- Kyle	Slight---------	Severe: hard to pack.	Deep to water	Droughty, slow intake.	Erodes easily, percs slowly.	Too arid, erodes easily.
KyC---------- Kyle	Moderate: slope.	Severe: hard to pack.	Deep to water	Slope, droughty, slow intake.	Erodes easily, percs slowly.	Too arid, erodes easily.

TABLE 17.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
La Las Animas	Severe: seepage.	Severe: piping, wetness.	Flooding, cutbanks cave.	Wetness, soil blowing, flooding.	Wetness	Favorable.
Lb Las Animas	Severe: seepage.	Severe: piping, wetness.	Flooding, frost action, cutbanks cave.	Wetness, droughty, soil blowing.	Wetness, soil blowing.	Droughty, rooting depth.
Lc: Las Animas	Severe: seepage.	Severe: piping, wetness.	Flooding, cutbanks cave.	Wetness, soil blowing, flooding.	Erodes easily, wetness.	Erodes easily.
Lisco	Severe: seepage.	Severe: piping, wetness, excess sodium.	Flooding, cutbanks cave, excess salt.	Wetness, flooding.	Erodes easily, wetness, soil blowing.	Excess sodium, erodes easily.
Ld Lisco	Severe: seepage.	Severe: piping, wetness, excess sodium.	Flooding, cutbanks cave, excess salt.	Wetness, flooding.	Erodes easily, wetness, soil blowing.	Excess sodium, erodes easily.
Lh Lohmiller	Slight	Moderate: hard to pack.	Deep to water	Percs slowly	Erodes easily, percs slowly.	Too arid, erodes easily, percs slowly.
Lo Lohmiller	Slight	Moderate: thin layer, hard to pack.	Deep to water	Percs slowly, flooding.	Erodes easily, percs slowly.	Too arid, erodes easily, percs slowly.
Ls Lohmiller	Slight	Moderate: thin layer, hard to pack.	Deep to water	Slow intake, percs slowly, flooding.	Erodes easily, percs slowly.	Too arid, erodes easily, percs slowly.
Mr, MrB Mitchell	Moderate: seepage.	Severe: piping.	Deep to water	Soil blowing	Erodes easily, soil blowing.	Too arid, erodes easily.
MrC Mitchell	Moderate: seepage, slope.	Severe: piping.	Deep to water	Slope, soil blowing.	Erodes easily, soil blowing.	Too arid, erodes easily.
Mt, MtB Mitchell	Moderate: seepage.	Severe: piping.	Deep to water	Erodes easily	Erodes easily	Too arid, erodes easily.
MtC, MtD Mitchell	Moderate: seepage, slope.	Severe: piping.	Deep to water	Slope, erodes easily.	Erodes easily	Too arid, erodes easily.
MtE Mitchell	Severe: slope.	Severe: piping.	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Too arid, slope, erodes easily.
MxD: Mitchell	Moderate: seepage, slope.	Severe: piping.	Deep to water	Slope, soil blowing.	Erodes easily, soil blowing.	Too arid, erodes easily.
Epping	Severe: depth to rock.	Severe: piping.	Deep to water	Slope, soil blowing, depth to rock.	Depth to rock, erodes easily.	Too arid, erodes easily.

TABLE 17.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
MxF:						
Mitchell	Severe: slope.	Severe: piping.	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Too arid, slope, erodes easily.
Epping	Severe: depth to rock, slope.	Severe: piping.	Deep to water	Slope, depth to rock.	Slope, depth to rock, erodes easily.	Too arid, slope, erodes easily.
NrB	Moderate: depth to rock.	Moderate: thin layer, hard to pack.	Deep to water	Depth to rock, erodes easily.	Depth to rock, erodes easily.	Too arid, erodes easily.
NrD	Moderate: depth to rock, slope.	Moderate: thin layer, hard to pack.	Deep to water	Slope, depth to rock, erodes easily.	Depth to rock, erodes easily.	Too arid, erodes easily.
OgB	Moderate: seepage, depth to rock.	Severe: piping.	Deep to water	Soil blowing	Erodes easily, soil blowing.	Too arid, erodes easily.
OgC, OgD	Moderate: seepage, depth to rock, slope.	Severe: piping.	Deep to water	Slope, soil blowing.	Erodes easily, soil blowing.	Too arid, erodes easily.
OnD:						
Oglala	Moderate: seepage, depth to rock, slope.	Severe: piping.	Deep to water	Slope, soil blowing.	Erodes easily, soil blowing.	Too arid, erodes easily.
Canyon	Severe: depth to rock.	Slight	Deep to water	Slope, soil blowing, depth to rock.	Depth to rock, erodes easily.	Too arid, erodes easily.
OnF:						
Oglala	Severe: slope.	Severe: piping.	Deep to water	Slope, soil blowing.	Slope, erodes easily, soil blowing.	Too arid, slope, erodes easily.
Canyon	Severe: depth to rock, slope.	Slight	Deep to water	Slope, soil blowing, depth to rock.	Slope, depth to rock, erodes easily.	Too arid, slope, erodes easily.
OpD	Severe: seepage.	Severe: piping.	Deep to water	Slope, droughty.	Favorable	Too arid, droughty.
OrF	Severe: depth to rock, slope.	Severe: hard to pack.	Deep to water	Slope, droughty, slow intake.	Slope, depth to rock.	Too arid, slope.
OsG:						
Orella	Severe: depth to rock, slope.	Severe: hard to pack.	Deep to water	Slope, droughty, slow intake.	Slope, depth to rock.	Too arid, slope.
Badland	Severe: depth to rock, slope.	Slight	Deep to water	Slope, depth to rock.	Slope, depth to rock.	Slope, depth to rock.
OwB	Severe: seepage.	Severe: piping.	Deep to water	Fast intake, soil blowing.	Soil blowing	Too arid, rooting depth.

TABLE 17.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
Pa---------- Pathfinder	Severe: seepage.	Severe: seepage, piping.	Deep to water	Droughty, fast intake, soil blowing.	Too sandy, soil blowing.	Too arid, excess salt, droughty.
PhF:						
Phiferson--------	Severe: seepage, slope.	Severe: piping.	Deep to water	Slope, fast intake, soil blowing.	Slope, depth to rock, soil blowing.	Too arid, slope, depth to rock.
Tassel----------	Severe: depth to rock, slope.	Slight---------	Deep to water	Slope, fast intake, soil blowing.	Slope, depth to rock, soil blowing.	Too arid, slope, depth to rock.
Rock outcrop-----	Severe: depth to rock, slope.	Severe: area reclaim.	Deep to water	Slope, depth to rock.	Slope, depth to rock.	Slope, depth to rock.
PrC---------- Pierre	Moderate: depth to rock, slope.	Slight---------	Deep to water	Slope, droughty, slow intake.	Depth to rock, erodes easily.	Too arid, erodes easily.
PrE---------- Pierre	Severe: slope.	Slight---------	Deep to water	Slope, droughty, slow intake.	Slope, depth to rock, erodes easily.	Too arid, slope, erodes easily.
PsD---------- Ponderosa	Severe: seepage.	Severe: piping.	Deep to water	Slope, fast intake, soil blowing.	Erodes easily, soil blowing.	Too arid, erodes easily.
PsE---------- Ponderosa	Severe: seepage, slope.	Severe: piping.	Deep to water	Slope, fast intake, soil blowing.	Slope, erodes easily, soil blowing.	Too arid, slope, erodes easily.
PtF:						
Ponderosa--------	Severe: seepage, slope.	Severe: piping.	Deep to water	Slope, fast intake, soil blowing.	Slope, erodes easily, soil blowing.	Too arid, slope, erodes easily.
Tassel----------	Severe: depth to rock, slope.	Slight---------	Deep to water	Slope, fast intake, soil blowing.	Slope, depth to rock, soil blowing.	Too arid, slope, depth to rock.
Vetal----------	Severe: seepage.	Severe: piping.	Deep to water	Slope, soil blowing.	Soil blowing---	Favorable.
RkG:						
Rock outcrop-----	Severe: depth to rock, slope.	Severe: area reclaim.	Deep to water	Slope, depth to rock.	Slope, depth to rock.	Slope, depth to rock.
Tassel----------	Severe: depth to rock, slope.	Slight---------	Deep to water	Slope, fast intake, soil blowing.	Slope, depth to rock, soil blowing.	Too arid, slope, depth to rock.
SbF:						
Samsil----------	Severe: seepage, slope.	Severe: hard to pack, thin layer.	Deep to water	Slope, droughty, slow intake.	Slope, area reclaim, erodes easily.	Slope, erodes easily, droughty.
Pierre----------	Severe: slope.	Slight---------	Deep to water	Slope, droughty, slow intake.	Slope, depth to rock, erodes easily.	Too arid, slope, erodes easily.

TABLE 17.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
ScG:						
Samsil	Severe: seepage, slope.	Severe: hard to pack, thin layer.	Deep to water	Slope, droughty, slow intake.	Slope, area reclaim, erodes easily.	Slope, erodes easily, droughty.
Rock outcrop	Severe: depth to rock, slope.	Severe: area reclaim.	Deep to water	Slope, depth to rock.	Slope, depth to rock.	Slope, depth to rock.
SdD---Sarben	Severe: seepage.	Severe: piping.	Deep to water	Slope, droughty, soil blowing.	Soil blowing---	Rooting depth.
SdF---Sarben	Severe: seepage, slope.	Severe: piping.	Deep to water	Slope, droughty, soil blowing.	Slope, soil blowing.	Slope, rooting depth.
SeB:						
Sarben	Severe: seepage.	Severe: piping.	Deep to water	Droughty, soil blowing.	Soil blowing---	Rooting depth.
Busher	Severe: seepage.	Severe: piping.	Deep to water	Fast intake, soil blowing.	Soil blowing---	Too arid.
SeD:						
Sarben	Severe: seepage.	Severe: piping.	Deep to water	Slope, droughty, soil blowing.	Soil blowing---	Rooting depth.
Busher	Severe: seepage.	Severe: piping.	Deep to water	Slope, fast intake, soil blowing.	Soil blowing---	Too arid.
SfB---Satanta	Severe: seepage.	Severe: thin layer.	Deep to water	Soil blowing---	Soil blowing---	Too arid.
SfC---Satanta	Severe: seepage.	Severe: thin layer.	Deep to water	Slope, soil blowing.	Soil blowing---	Too arid.
Sg---Savo	Moderate: seepage.	Moderate: hard to pack.	Deep to water	Favorable---	Erodes easily	Too arid, erodes easily.
SgC---Savo	Moderate: seepage, slope.	Moderate: hard to pack.	Deep to water	Slope---	Erodes easily	Too arid, erodes easily.
SrF---Schamber	Severe: seepage, slope.	Severe: seepage.	Deep to water	Slope, droughty.	Slope, too sandy.	Too arid, slope, droughty.
Ss, SsB, Su, SuB--Scoville	Severe: seepage.	Severe: seepage, piping.	Deep to water	Droughty, fast intake, soil blowing.	Too sandy, soil blowing.	Too arid, droughty, rooting depth.
SxE---Skilak	Severe: seepage, slope.	Severe: piping.	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Too arid, slope, erodes easily.
TbG:						
Tassel	Severe: depth to rock, slope.	Slight---	Deep to water	Slope, fast intake, soil blowing.	Slope, depth to rock, soil blowing.	Too arid, slope, depth to rock.

TABLE 17.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
TbG:						
Ashollow	Severe: seepage, slope.	Severe: piping.	Deep to water	Slope, fast intake, soil blowing.	Slope, erodes easily, soil blowing.	Too arid, slope, erodes easily.
Rock outcrop	Severe: depth to rock, slope.	Severe: area reclaim.	Deep to water	Slope, depth to rock.	Slope, depth to rock.	Slope, depth to rock.
TgF:						
Tassel	Severe: depth to rock, slope.	Slight	Deep to water	Slope, fast intake, soil blowing.	Slope, depth to rock, soil blowing.	Too arid, slope, depth to rock.
Busher	Severe: seepage, slope.	Severe: piping.	Deep to water	Slope, fast intake, soil blowing.	Slope, soil blowing.	Too arid, slope.
Rock outcrop	Severe: depth to rock, slope.	Severe: area reclaim.	Deep to water	Slope, depth to rock.	Slope, depth to rock.	Slope, depth to rock.
TrG:						
Tassel	Severe: depth to rock, slope.	Slight	Deep to water	Slope, fast intake, soil blowing.	Slope, depth to rock, soil blowing.	Too arid, slope, depth to rock.
Ponderosa	Severe: seepage, slope.	Severe: piping.	Deep to water	Slope, fast intake, soil blowing.	Slope, erodes easily, soil blowing.	Too arid, slope, erodes easily.
Rock outcrop	Severe: depth to rock, slope.	Severe: area reclaim.	Deep to water	Slope, depth to rock.	Slope, depth to rock.	Slope, depth to rock.
TtB---- Thirtynine	Moderate: seepage.	Severe: piping.	Deep to water	Favorable	Erodes easily	Too arid, erodes easily.
TtC, TtD---- Thirtynine	Moderate: seepage, slope.	Severe: piping.	Deep to water	Slope----	Erodes easily	Too arid, erodes easily.
Tv, TvB---- Tripp	Moderate: seepage.	Severe: piping.	Deep to water	Soil blowing---	Erodes easily, soil blowing.	Too arid, erodes easily.
VaB---- Valent	Severe: seepage.	Severe: seepage, piping.	Deep to water	Droughty, fast intake.	Too sandy, soil blowing.	Too arid, droughty.
VaD---- Valent	Severe: seepage.	Severe: seepage, piping.	Deep to water	Slope, droughty, fast intake.	Too sandy, soil blowing.	Too arid, droughty.
VaE---- Valent	Severe: seepage, slope.	Severe: seepage, piping.	Deep to water	Slope, droughty, fast intake.	Slope, too sandy, soil blowing.	Too arid, slope, droughty.
VaF:						
Valent, rolling--	Severe: seepage, slope.	Severe: seepage, piping.	Deep to water	Slope, droughty, fast intake.	Slope, too sandy, soil blowing.	Too arid, slope, droughty.

TABLE 17.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
VaF: Valent, hilly----	Severe: seepage, slope.	Severe: seepage, piping.	Deep to water	Slope, droughty, fast intake.	Slope, too sandy, soil blowing.	Too arid, slope, droughty.
VbB---------- Valent	Severe: seepage.	Severe: seepage, piping.	Deep to water	Droughty, fast intake.	Too sandy, soil blowing.	Too arid, droughty.
VbD---------- Valent	Severe: seepage.	Severe: seepage, piping.	Deep to water	Slope, droughty, fast intake.	Too sandy, soil blowing.	Too arid, droughty.
VcB, VgB---------- Vetal	Severe: seepage.	Severe: piping.	Deep to water	Soil blowing---	Soil blowing---	Favorable.
VgC---------- Vetal	Severe: seepage.	Severe: piping.	Deep to water	Slope, soil blowing.	Soil blowing---	Favorable.
WhB---------- Wildhorse	Severe: seepage.	Severe: seepage, piping, wetness.	Cutbanks cave, excess sodium.	Wetness, droughty, fast intake.	Wetness, too sandy, soil blowing.	Excess salt, excess sodium, droughty.

TABLE 18.--ENGINEERING INDEX PROPERTIES

(The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated)

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO	3-10 inches	4	10	40	200		
	In				Pct					Pct	
Ab, AbB, AbC----- Alice	0-11	Fine sandy loam	SM, ML, SC-SM	A-4	0	100	95-100	95-100	45-60	20-30	NP-10
	11-26	Fine sandy loam, loamy very fine sand.	SM, ML, SC-SM, CL-ML	A-4	0	100	95-100	95-100	45-60	15-30	NP-10
	26-54	Fine sandy loam, very fine sandy loam, loamy very fine sand.	SM, ML, SC-SM, CL-ML	A-4	0	100	95-100	95-100	45-60	15-30	NP-10
	54-60	Loamy fine sand, loamy very fine sand, very fine sandy loam.	SM, ML, SC-SM, CL-ML	A-2, A-4	0	100	95-100	55-100	25-60	15-25	NP-10
AcB, AcC--------- Alliance	0-8	Loam----------	ML, CL, CL-ML	A-4, A-6	0	100	100	85-100	60-90	20-40	2-15
	8-18	Silty clay loam, silt loam, clay loam.	CL	A-7, A-6	0	100	100	90-100	70-100	30-50	10-25
	18-26	Silt loam, very fine sandy loam, loam.	ML, CL, CL-ML	A-4, A-6	0	100	100	95-100	60-90	20-40	2-15
	26-46	Very fine sandy loam, silt loam, loam.	ML, CL-ML, SM, SC	A-4	0-5	85-100	85-100	70-100	40-90	15-30	NP-10
	46-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
ArB---------- Arvada	0-1	Loam----------	CL-ML, CL	A-4, A-6	0	95-100	95-100	85-95	70-80	20-30	5-15
	1-23	Clay, silty clay loam, clay loam.	CL, CH	A-7	0	80-100	75-100	70-100	65-95	40-65	20-35
	23-60	Clay loam, silty clay loam, clay.	CL	A-7	0	80-100	75-100	70-100	55-90	40-50	15-25
AwD, AwE--------- Ashollow	0-15	Loamy very fine sand.	SM, ML, CL-ML, SC-SM	A-2, A-4	0	95-100	75-100	45-100	25-65	15-20	NP-5
	15-60	Loamy very fine sand.	SM, ML, CL-ML, SC-SM	A-2, A-4	0	95-100	75-100	45-100	25-65	15-20	NP-5
Ba---------- Badland	0-60	Unweathered bedrock.	---	---	0	---	---	---	---	---	---
BbB---------- Bahl	0-1	Clay----------	CL, CH	A-7	0	100	95-100	85-100	70-90	45-55	20-30
	1-14	Clay loam, clay	CL, CH	A-7	0	100	95-100	85-100	70-90	40-55	20-30
	14-60	Clay, silty clay	CL, CH	A-7	0	100	95-100	85-100	70-90	45-65	20-35
Bc---------- Bankard	0-4	Loamy fine sand	SM	A-2	0	95-100	90-100	50-90	15-35	<20	NP-5
	4-48	Stratified loamy fine sand to sand.	SM, SP-SM	A-2	0	95-100	75-100	60-80	10-25	<20	NP-5
	48-60	Stratified loamy fine sand to gravelly coarse sand.	SP, SP-SM, SM	A-2, A-3, A-1	0	90-100	50-100	20-75	0-20	<20	NP-5

TABLE 18.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	3-10 inches	4	10	40	200		
	In				Pct					Pct	
Bd---------- Bankard	0-7	Loamy fine sand	SM	A-2	0	95-100	90-100	50-90	15-35	<20	NP-5
	7-40	Stratified loamy fine sand to sand.	SM, SP-SM	A-2	0	95-100	75-100	60-80	10-25	<20	NP-5
	40-60	Stratified loamy fine sand to gravelly coarse sand.	SP, SP-SM, SM	A-2, A-3, A-1	0	90-100	50-100	20-75	0-20	<20	NP-5
Be, BeB, BeC----- Bayard	0-14	Fine sandy loam	SM, ML, SC-SM, CL-ML	A-2, A-4	0	95-100	90-100	45-85	25-55	15-25	3-10
	14-32	Fine sandy loam, loamy very fine sand, very fine sandy loam.	ML, SM, SC-SM, CL-ML	A-2, A-4	0	95-100	90-100	55-95	30-65	15-25	3-10
	32-60	Loamy fine sand	SM, SC-SM	A-2	0	95-100	90-100	50-80	15-35	15-20	NP-5
Bh---------- Bigwinder	0-4	Fine sandy loam	SM	A-2, A-4	0	100	95-100	70-90	30-40	<25	NP-5
	4-12	Stratified sandy loam to loam.	SM, ML	A-4	0	100	95-100	60-80	45-55	20-25	NP-5
	12-60	Stratified sand to sandy loam.	SM	A-2	0	95-100	90-100	50-80	25-35	<25	NP-5
BoG---------- Blueridge	0-3	Gravelly loamy sand.	SM, SC-SM, SP-SM	A-1, A-2	0-5	70-100	50-75	25-60	10-35	15-25	NP-5
	3-60	Very gravelly coarse sand, very gravelly sand, gravelly coarse sand.	SP, GP, GP-GM, SP-SM	A-1	0-5	30-60	25-50	10-30	0-10	15-20	NP
BpE:											
Blueridge-------	0-5	Loamy sand-------	SM, SC-SM, SP-SM	A-2, A-4, A-1	0	95-100	75-95	35-70	10-40	<20	NP-5
	5-60	Sand, coarse sand, gravelly coarse sand.	SP, SM, SP-SM	A-1, A-2, A-3	0-5	70-100	50-95	25-60	0-35	<20	NP
Bayard----------	0-8	Very fine sandy loam.	SM, ML, SC-SM, CL-ML	A-2, A-4	0	95-100	90-100	75-95	30-65	15-25	3-10
	8-23	Fine sandy loam, loamy very fine sand, very fine sandy loam.	ML, SM, SC-SM, CL-ML	A-2, A-4	0	95-100	90-100	55-95	30-65	15-25	3-10
	23-60	Loamy fine sand	SM, SC-SM	A-2	0	95-100	90-100	50-80	15-35	15-20	NP-5
BrC, BrD, BrF---- Bridget	0-8	Very fine sandy loam.	ML, CL-ML, CL, SM	A-4	0	95-100	95-100	75-100	45-65	20-35	2-15
	8-30	Very fine sandy loam, silt loam.	ML, CL-ML, CL	A-4	0	95-100	95-100	85-100	80-100	20-35	2-15
	30-60	Very fine sandy loam, silt loam, loam.	ML, CL-ML, CL	A-4	0	95-100	95-100	85-100	80-100	20-35	2-15
Bs, BsB, BsD----- Bufton	0-5	Clay loam--------	CL, CH	A-7	0	100	95-100	80-100	70-90	40-60	20-30
	5-35	Clay loam, silty clay loam, silty clay.	CL, CH	A-7, A-6	0	100	95-100	80-100	80-95	35-60	15-30
	35-60	Silty clay loam, silt loam, silty clay.	CL, CH	A-7, A-6	0	100	95-100	80-100	80-95	30-60	15-30

TABLE 18.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO	3-10 inches	4	10	40	200		
	In				Pct					Pct	
BsE---------- Bufton	0-5	Silty clay loam	CL, CH	A-7	0	100	95-100	80-100	80-95	40-60	20-30
	5-35	Clay loam, silty clay loam, silty clay.	CL, CH	A-7, A-6	0	100	95-100	80-100	80-95	35-60	15-30
	35-60	Silty clay loam, silt loam, silty clay.	CL, CH	A-7, A-6	0	100	95-100	80-100	80-95	30-60	15-30
BuB, BuC, BuD---- Busher	0-8	Loamy very fine sand.	SM, ML, SC-SM, CL-ML	A-2, A-4	0	100	90-100	80-100	30-60	15-25	NP-5
	8-50	Loamy very fine sand, fine sandy loam, very fine sandy loam.	SM, ML, SC-SM, CL-ML	A-2, A-4	0	100	90-100	75-100	30-65	15-25	NP-5
	50-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
BwC: Busher----------	0-22	Loamy very fine sand.	SM, ML, SC-SM, CL-ML	A-2, A-4	0	100	90-100	80-100	30-60	15-25	NP-5
	22-51	Loamy very fine sand, fine sandy loam, very fine sandy loam.	SM, ML, SC-SM, CL-ML	A-2, A-4	0	100	90-100	75-100	30-65	15-25	NP-5
	51-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
Phiferson-------	0-9	Loamy very fine sand.	SM	A-2, A-4	0	100	90-100	65-85	30-50	---	NP
	9-37	Fine sandy loam, very fine sandy loam.	SM	A-4	0	95-100	80-100	70-90	35-50	15-25	NP-5
	37-60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
BxC, BxE: Busher----------	0-8	Loamy very fine sand.	SM, ML, SC-SM, CL-ML	A-2, A-4	0	100	90-100	80-100	30-60	15-25	NP-5
	8-50	Loamy very fine sand, fine sandy loam, very fine sandy loam.	SM, ML, SC-SM, CL-ML	A-2, A-4	0	100	90-100	75-100	30-65	15-25	NP-5
	50-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
Tassel----------	0-3	Loamy very fine sand.	SM, ML, CL-ML, SC-SM	A-4, A-2	0	95-100	90-100	75-95	30-65	15-25	NP-8
	3-15	Fine sandy loam, sandy loam, loamy very fine sand.	ML, CL-ML, SM, SC	A-4, A-2	0	95-100	80-100	60-95	25-60	15-25	NP-8
	15-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
Cr, Cs---------- Craft	0-6	Loam----------	ML, CL-ML	A-4	0	95-100	95-100	85-100	60-100	15-25	NP-5
	6-20	Stratified loamy very fine sand to loam.	ML, CL-ML	A-4	0	95-100	95-100	85-100	80-90	15-25	NP-5
	20-60	Very fine sandy loam, silt loam, loam.	ML, CL-ML	A-4	0	95-100	95-100	85-100	80-100	15-25	NP-5

TABLE 18.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO	3-10 inches	4	10	40	200		
	In				Pct					Pct	
Ct----------	0-6	Loam----------	ML, CL-ML	A-4	0	95-100	95-100	85-100	60-100	15-25	NP-5
Craft	6-60	Stratified loamy very fine sand to loam.	ML, CL-ML	A-4	0	95-100	95-100	85-100	80-90	15-25	NP-5
DpB----------	0-5	Loamy fine sand	SM	A-2	0	100	90-100	70-85	25-35	---	NP
Draknab	5-60	Stratified coarse sand to fine sandy loam.	SM, SP-SM	A-1, A-2, A-3	0-5	90-100	85-100	35-55	5-25	---	NP
EpF----------	0-4	Silt loam--------	ML, CL, CL-ML	A-4	0	100	95-100	85-100	65-100	15-30	2-10
Epping	4-8	Loam, silt loam, very fine sandy loam.	ML, CL, CL-ML	A-4, A-6	0	100	90-100	75-100	60-95	15-35	2-15
	8-15	Loam, silt loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	100	90-100	75-100	60-95	20-40	5-20
	15-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
EsG:											
Epping----------	0-4	Silt loam--------	ML, CL, CL-ML	A-4	0	100	95-100	85-100	65-100	15-30	2-10
	4-8	Loam, silt loam, very fine sandy loam.	ML, CL, CL-ML	A-4, A-6	0	100	90-100	75-100	60-95	15-35	2-15
	8-15	Loam, silt loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	100	90-100	75-100	60-95	20-40	5-20
	15-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
Badland---------	0-60	Unweathered bedrock.	---	---	0	---	---	---	---	---	---
Fu----------	0-60	Loamy sand-------	SM, SP-SM	A-2, A-3, A-4	0	100	100	50-70	5-40	15-25	NP-5
Fluvaquents											
Go, Gp----------	0-5	Fine sandy loam	SM, SC-SM	A-4, A-2	0	95-100	85-100	60-80	30-45	15-25	NP-7
Glenberg	5-60	Stratified fine sand to loam.	SM, SC-SM	A-2, A-4	0	90-100	75-100	50-70	25-40	15-20	NP-5
HsC:											
Hisle----------	0-2	Loam----------	CL-ML, CL	A-4, A-6	0	100	95-100	90-100	70-80	25-40	5-15
	2-25	Clay, silty clay	CH, CL	A-7	0	95-100	90-100	85-100	80-100	45-85	20-55
	25-60	Weathered bedrock	CH	A-7	0	100	95-100	95-100	85-100	50-90	30-60
Slickspots------	0-60	Clay----------	CH	A-7	0	100	100	90-100	85-100	50-80	25-55
In----------	0-6	Silty clay-------	CL, CH	A-7	0	100	100	95-100	70-95	45-60	20-30
Interior	6-60	Stratified very fine sandy loam to clay.	CL	A-6, A-7	0	100	100	90-100	70-95	30-45	10-20
JmB, JmC, JmD----	0-18	Loamy very fine sand.	SM	A-4, A-2	0	100	85-100	55-95	25-50	15-25	NP-5
Jayem	18-32	Fine sandy loam, very fine sandy loam.	ML, SM	A-4, A-2	0	100	85-100	70-95	25-60	15-25	NP-5
	32-60	Fine sandy loam, very fine sandy loam, loamy very fine sand.	ML, SM	A-4, A-2	0	100	85-100	70-95	25-60	15-25	NP-5

TABLE 18.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO	3-10 inches	4	10	40	200		
	In				Pct					Pct	
KeB, KeC---------- Keith	0-8	Loam----------	CL, ML, CL-ML	A-4	0	100	100	85-100	80-100	20-35	2-10
	8-26	Silt loam, silty clay loam, loam.	CL	A-6, A-7	0	100	100	95-100	80-100	30-45	10-25
	26-36	Silt loam, loam, very fine sandy loam.	ML, CL, CL-ML	A-4, A-6	0	100	100	90-100	80-100	20-35	2-12
	36-60	Silt loam, loam, very fine sandy loam.	ML, CL, CL-ML	A-4, A-6	0	100	100	90-100	80-100	20-35	2-12
Ky, KyC---------- Kyle	0-4	Silty clay-------	CH, MH	A-7	0	100	100	90-100	80-100	55-75	25-45
	4-33	Clay----------	CH, MH	A-7	0	100	100	90-100	80-100	55-75	25-45
	33-60	Clay----------	CH, MH	A-7	0	100	100	90-100	80-100	60-90	25-55
La---------- Las Animas	0-8	Fine sandy loam	SM, SC-SM, ML	A-4, A-2-4	0	100	95-100	60-90	30-65	20-30	NP-10
	8-60	Stratified very fine sandy loam to loamy fine sand.	SM, ML, SC-SM	A-2, A-4	0	95-100	90-100	55-90	25-55	20-25	NP-5
Lb---------- Las Animas	0-4	Fine sandy loam	SM, ML, SC-SM	A-4	0	100	95-100	70-90	30-55	15-35	NP-10
	4-60	Stratified very fine sandy loam to loamy fine sand.	SM, ML	A-2, A-4	0	95-100	90-100	55-90	25-55	20-25	NP-5
Lc:											
Las Animas------	0-12	Very fine sandy loam.	SM, ML, CL-ML	A-4	0	100	95-100	85-95	45-65	20-25	NP-5
	12-60	Stratified very fine sandy loam to loamy fine sand.	SM, ML, SC-SM	A-2, A-4	0	95-100	90-100	55-90	25-55	20-25	NP-5
Lisco----------	0-6	Very fine sandy loam.	SM, ML, CL-ML, SC-SM	A-4, A-2	0	100	100	60-85	30-55	15-20	NP-5
	6-25	Very fine sandy loam, loam, loamy very fine sand.	ML, CL-ML, CL	A-4	0	100	100	85-100	50-90	15-25	NP-10
	25-60	Very fine sandy loam, fine sandy loam, loamy very fine sand.	SM, SC-SM, ML, CL-ML	A-4, A-2	0	100	95-100	60-95	30-65	15-25	NP-5
Ld---------- Lisco	0-4	Very fine sandy loam.	SM, ML, CL-ML, SC-SM	A-4, A-2	0	100	100	60-85	30-55	15-20	NP-5
	4-22	Very fine sandy loam, loam, loamy very fine sand.	ML, CL-ML, CL	A-4	0	100	100	85-100	50-90	15-25	NP-10
	22-60	Very fine sandy loam, fine sandy loam, loamy very fine sand.	SM, SC-SM, ML, CL-ML	A-4, A-2	0	100	95-100	60-95	30-65	15-25	NP-5

TABLE 18.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO	3-10 inches	4	10	40	200		
	In				Pct					Pct	
Lh----------	0-6	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	85-100	35-50	12-25
Lohmiller	6-10	Silty clay loam, clay loam, silty clay.	CL, CH	A-7	0	100	95-100	90-100	70-100	40-60	15-30
	10-60	Stratified fine sandy loam to clay.	CL, CH	A-7	0	95-100	95-100	90-100	65-95	40-60	15-30
Lo----------	0-6	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	85-100	35-50	15-25
Lohmiller	6-10	Silty clay loam, clay loam, silty clay.	CL, CH	A-7	0	100	95-100	90-100	70-100	40-60	15-30
	10-60	Stratified fine sandy loam to clay.	CL, ML	A-4, A-6	0	95-100	95-100	90-100	65-75	30-40	5-15
Ls----------	0-6	Silty clay-------	CL, CH	A-7	0	100	100	95-100	85-100	45-60	20-30
Lohmiller	6-10	Silty clay loam, clay loam, silty clay.	CL, CH	A-7	0	100	95-100	90-100	70-100	40-60	15-30
	10-60	Stratified fine sandy loam to clay.	CL, ML	A-4, A-6	0	95-100	95-100	90-100	65-75	30-40	5-15
Mr, MrB, MrC-----	0-5	Very fine sandy loam.	ML, CL-ML, CL	A-4, A-6	0	100	100	85-100	65-95	20-35	NP-15
Mitchell	5-38	Loam, very fine sandy loam, silt loam.	ML, CL-ML, CL	A-4, A-6	0	100	95-100	85-100	60-100	20-35	NP-15
	38-60	Fine sandy loam, loamy fine sand.	SM, SC-SM, SC, ML	A-4, A-2	0	100	95-100	50-85	15-55	15-25	NP-8
Mt, MtB, MtC, MtD, MtE--------	0-5	Silt loam--------	CL-ML, CL	A-4, A-6	0	100	100	85-100	65-100	25-40	5-20
Mitchell	5-38	Loam, very fine sandy loam, silt loam.	ML, CL-ML, CL	A-4, A-6	0	100	95-100	85-100	60-100	20-35	NP-15
	38-60	Fine sandy loam, loamy fine sand.	SM, SC-SM, SC, ML	A-4, A-2	0	100	95-100	50-85	15-55	15-25	NP-10
MxD:											
Mitchell--------	0-10	Very fine sandy loam.	ML, CL-ML, CL	A-4, A-6	0	100	100	85-100	65-95	20-35	NP-15
	10-28	Loam, very fine sandy loam, silt loam.	ML, CL-ML, CL	A-4, A-6	0	100	95-100	85-100	60-100	20-35	NP-15
	28-60	Fine sandy loam, loamy fine sand.	SM, SC-SM, SC, ML	A-4, A-2	0	100	95-100	50-85	15-55	15-25	NP-8
Epping----------	0-12	Very fine sandy loam.	ML, CL, CL-ML	A-4	0	100	95-100	85-100	65-95	15-30	2-10
	12-18	Loam, silt loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	100	90-100	75-100	60-95	20-40	5-20
	18-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
MxF:											
Mitchell--------	0-10	Silt loam--------	CL-ML, CL	A-4, A-6	0	100	100	85-100	65-100	25-40	5-20
	10-28	Loam, very fine sandy loam, silt loam.	ML, CL-ML, CL	A-4, A-6	0	100	95-100	85-100	60-100	20-35	NP-15
	28-60	Fine sandy loam, loamy fine sand.	SM, SC-SM, SC, ML	A-4, A-2	0	100	95-100	50-85	15-55	15-25	NP-10

TABLE 18.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO	3-10 inches	4	10	40	200		
	In				Pct					Pct	
MxF:											
Epping----------	0-12	Silt loam--------	ML, CL, CL-ML	A-4	0	100	95-100	85-100	65-100	15-30	2-10
	12-18	Loam, silt loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	100	90-100	75-100	60-95	20-40	5-20
	18-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
NrB, NrD---------	0-6	Clay loam--------	CL	A-6, A-7	0	100	95-100	90-100	70-95	35-45	12-20
Norrest	6-24	Silty clay loam, clay loam, silty clay.	CL, CH	A-7	0	100	100	85-100	60-95	40-65	15-35
	24-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
OgB, OgC, OgD----	0-13	Very fine sandy loam.	ML, CL-ML	A-4	0	100	100	85-100	51-85	15-30	NP-7
Oglala	13-49	Loam, silt loam, very fine sandy loam.	ML, CL	A-4, A-6	0	100	100	85-100	51-75	25-40	NP-15
	49-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
OnD, OnF:											
Oglala----------	0-13	Very fine sandy loam.	ML, CL-ML	A-4	0	100	100	85-100	51-85	15-30	NP-7
	13-49	Loam, silt loam, very fine sandy loam.	ML, CL	A-4, A-6	0	100	100	85-100	51-75	25-40	NP-15
	49-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
Canyon----------	0-4	Very fine sandy loam.	SM, SC, ML, SC-SM	A-4, A-2	0-5	90-100	75-100	50-95	30-65	15-30	NP-10
	4-15	Very fine sandy loam, loam, gravelly loam.	ML, SM, SC, GM	A-4, A-6, A-2	0-5	60-100	50-100	40-95	30-75	20-40	NP-15
	15-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
OpD--------------	0-4	Loam-------------	SC, SC-SM, CL, CL-ML	A-4, A-6	0	95-100	90-100	75-95	35-60	20-35	5-15
Olney	4-20	Sandy clay loam, sandy loam.	SC, CL	A-6	0	95-100	90-100	80-100	40-55	20-40	10-20
	20-60	Sandy loam, sandy clay loam, fine sandy loam.	SC, SC-SM, CL, CL-ML	A-4, A-6	0	95-100	95-100	75-95	35-55	20-35	5-15
OrF--------------	0-5	Clay-------------	CH	A-7	0	100	100	90-100	75-95	50-70	30-50
Orella	5-18	Clay, clay loam, silty clay loam.	CH	A-7	0	100	100	90-100	75-95	50-70	30-50
	18-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
OsG:											
Orella----------	0-5	Clay-------------	CH	A-7	0	100	100	90-100	75-95	50-70	30-50
	5-18	Clay, clay loam, silty clay loam.	CH	A-7	0	100	100	90-100	75-95	50-70	30-50
	18-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
Badland----------	0-60	Unweathered bedrock.	---	---	0	---	---	---	---	---	---
OwB--------------	0-15	Loamy very fine sand.	SM, ML	A-4	0	100	95-100	85-95	40-60	---	NP
Otero	15-60	Very fine sandy loam.	SM, ML, CL-ML, SC-SM	A-4	0	100	95-100	85-95	40-60	---	NP-5

TABLE 18.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO	3-10 inches	4	10	40	200		
	In				Pct					Pct	
Pa----------	0-5	Loamy fine sand	SM	A-2, A-4	0	100	100	75-100	15-50	10-20	NP-5
Pathfinder	5-18	Stratified fine sand to loamy fine sand.	SM, SP-SM, SP	A-2, A-3, A-4	0	100	90-100	60-95	0-40	10-20	NP-5
	18-29	Stratified loamy fine sand to fine sandy loam.	SM, SC-SM, SC	A-2, A-4	0	100	90-100	50-95	15-50	5-25	NP-10
	29-60	Stratified fine sand to loamy fine sand.	SM, SP-SM, SP	A-2, A-3, A-4	0	100	90-100	60-95	0-40	10-20	NP-5
PhF:											
Phiferson-------	0-8	Loamy very fine sand.	SM	A-2, A-4	0	100	90-100	65-85	30-50	---	NP
	8-33	Fine sandy loam, very fine sandy loam.	SM	A-4	0	95-100	80-100	70-90	35-50	15-25	NP-5
	33-60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Tassel----------	0-4	Loamy fine sand	SM, SC-SM, SC	A-2	0	95-100	90-100	65-95	15-35	15-25	NP-8
	4-17	Fine sandy loam, sandy loam, loamy very fine sand.	ML, CL-ML, SM, SC	A-4, A-2	0	95-100	80-100	60-95	25-60	15-25	NP-8
	17-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
Rock outcrop----	0-60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
PrC, PrE---------	0-3	Clay----------	CH, MH	A-7	0	100	100	90-100	80-100	50-90	25-50
Pierre	3-32	Clay----------	CH, MH	A-7	0	100	100	90-100	60-80	60-85	25-50
	32-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
PsD, PsE---------	0-13	Loamy very fine sand.	SC-SM, SM, SC, ML	A-2, A-4	0	100	95-100	80-100	30-60	15-30	NP-10
Ponderosa	13-45	Very fine sandy loam, loamy very fine sand.	SC-SM, SM, SC	A-4, A-2, A-6	0	95-100	75-100	65-100	30-50	15-30	NP-12
	45-60	Very fine sandy loam, loamy very fine sand.	SC-SM, SM, SC	A-4, A-2, A-6	0	85-100	75-100	65-100	30-50	15-30	NP-12
PtF:											
Ponderosa-------	0-19	Loamy very fine sand.	SC-SM, SM, SC, ML	A-2, A-4	0	100	95-100	80-100	30-60	15-30	NP-10
	19-32	Very fine sandy loam, loamy very fine sand.	SC-SM, SM, SC	A-4, A-2, A-6	0	95-100	75-100	65-100	30-50	15-30	NP-12
	32-60	Very fine sandy loam, loamy very fine sand.	SC-SM, SM, SC	A-4, A-2, A-6	0	85-100	75-100	65-100	30-50	15-30	NP-12
Tassel----------	0-5	Loamy very fine sand.	SM, ML, CL-ML, SC-SM	A-4, A-2	0	95-100	90-100	75-95	30-65	15-25	NP-8
	5-15	Fine sandy loam, sandy loam, loamy very fine sand.	ML, CL-ML, SM, SC	A-4, A-2	0	95-100	80-100	60-95	25-60	15-25	NP-8
	15-60	Weathered bedrock	---	---	---	---	---	---	---	---	---

TABLE 18.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO	3-10 inches	4	10	40	200		
	In				Pct					Pct	
PtF:											
Vetal----------	0-19	Very fine sandy loam.	CL, ML, SM, SC	A-4, A-6, A-2	0	100	95-100	90-100	30-55	20-35	NP-12
	19-30	Sandy loam, fine sandy loam, very fine sandy loam.	SM, ML, CL-ML, SC-SM	A-4, A-2	0	100	95-100	60-100	30-65	20-30	NP-10
	30-60	Sandy loam, fine sandy loam, very fine sandy loam.	SM, ML, CL-ML, SC-SM	A-4, A-2	0	100	90-100	60-100	30-65	20-30	NP-10
RkG:											
Rock outcrop----	0-60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Tassel----------	0-6	Loamy fine sand	SM, SC-SM, SC	A-2	0	95-100	90-100	65-95	15-35	15-25	NP-8
	6-16	Fine sandy loam, sandy loam, loamy very fine sand.	ML, CL-ML, SM, SC	A-4, A-2	0	95-100	80-100	60-95	25-60	15-25	NP-8
	16-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
SbF:											
Samsil----------	0-3	Clay----------	CH, MH	A-7	0	100	85-100	80-100	70-100	50-85	20-50
	3-18	Clay----------	CH, MH	A-7	0	100	95-100	90-100	85-100	50-90	18-55
	18-40	Weathered bedrock	---	---	---	---	---	---	---	---	---
Pierre----------	0-3	Clay----------	CH, MH	A-7	0	100	100	90-100	80-100	50-90	25-50
	3-32	Clay----------	CH, MH	A-7	0	100	100	90-100	60-80	60-85	25-50
	32-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
ScG:											
Samsil----------	0-3	Clay----------	CH, MH	A-7	0	100	85-100	80-100	70-100	50-85	20-50
	3-18	Clay----------	CH, MH	A-7	0	100	95-100	90-100	85-100	50-90	18-55
	18-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
Rock outcrop----	0-60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
SdD, SdF--------- Sarben	0-4	Loamy very fine sand.	SM, ML	A-2, A-4	0	100	100	90-100	30-70	15-30	NP-10
	4-31	Loamy very fine sand, fine sandy loam, very fine sandy loam.	SM, ML	A-4	0	100	100	90-100	40-65	15-30	NP-10
	31-60	Very fine sandy loam, loamy very fine sand, fine sandy loam.	SM, ML	A-4	0	100	100	90-100	40-65	15-30	NP-10
SeB:											
Sarben----------	0-10	Loamy very fine sand.	SM, ML	A-2, A-4	0	100	100	90-100	30-70	15-30	NP-10
	10-33	Loamy very fine sand, fine sandy loam, very fine sandy loam.	SM, ML	A-4	0	100	100	90-100	40-65	15-30	NP-10
	33-60	Very fine sandy loam, loamy very fine sand, fine sandy loam.	SM, ML	A-4	0	100	100	90-100	40-65	15-30	NP-10

TABLE 18.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	3-10 inches	4	10	40	200		
	In				Pct					Pct	
SeB:											
Busher	0-7	Loamy very fine sand.	SM, ML, SC-SM, CL-ML	A-2, A-4	0	100	90-100	80-100	30-60	15-25	NP-5
	7-49	Loamy very fine sand, fine sandy loam, very fine sandy loam.	SM, ML, SC-SM, CL-ML	A-2, A-4	0	100	90-100	75-100	30-65	15-25	NP-5
	49-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
SeD:											
Sarben	0-6	Loamy very fine sand.	SM, ML	A-2, A-4	0	100	100	90-100	30-70	15-30	NP-10
	6-25	Loamy very fine sand, fine sandy loam, very fine sandy loam.	SM, ML	A-4	0	100	100	90-100	40-65	15-30	NP-10
	25-60	Very fine sandy loam, loamy very fine sand, fine sandy loam.	SM, ML	A-4	0	100	100	90-100	40-65	15-30	NP-10
Busher	0-8	Loamy very fine sand.	SM, ML, SC-SM, CL-ML	A-2, A-4	0	100	90-100	80-100	30-60	15-25	NP-5
	8-49	Loamy very fine sand, fine sandy loam, very fine sandy loam.	SM, ML, SC-SM, CL-ML	A-2, A-4	0	100	90-100	75-100	30-65	15-25	NP-5
	49-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
SfB, SfC Satanta	0-8	Very fine sandy loam.	ML, CL-ML	A-4	0	100	95-100	85-95	50-65	<25	NP-5
	8-26	Loam, clay loam, sandy clay loam.	SC, CL	A-7, A-6	0	100	95-100	75-100	45-75	30-45	10-20
	26-60	Fine sandy loam, very fine sandy loam.	ML, SM	A-4	0	100	95-100	70-95	40-60	20-30	NP-5
Sg, SgC Savo	0-4	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	85-95	35-50	15-25
	4-15	Silty clay loam, silty clay, clay loam.	CL, CH	A-7	0	100	100	95-100	85-95	40-65	15-35
	15-47	Silty clay loam, clay loam, silt loam.	CL, CH	A-7	0	100	95-100	90-100	85-95	40-55	15-30
	47-60	Silty clay loam, silt loam, clay loam.	CL, CH	A-6, A-7	0	100	95-100	85-100	60-100	35-55	12-30
SrF Schamber	0-4	Gravelly sandy loam.	SM, SW-SM, GM, GW-GM	A-2, A-1	0-5	55-90	50-75	40-60	10-35	0-25	NP-5
	4-60	Very gravelly sand, very gravelly loamy sand.	SW, SW-SM, GW, GW-GM	A-1	0-15	30-80	25-50	5-20	0-10	0-25	NP-5

TABLE 18.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO	3-10 inches	4	10	40	200		
	In				Pct					Pct	
Ss, SsB----------	0-8	Fine sand--------	SM, SP-SM	A-2, A-3	0	100	100	75-100	5-35	<20	NP
Scoville	8-49	Fine sand, loamy fine sand, loamy sand.	SM, SP-SM	A-2, A-3	0	100	100	75-100	5-50	<20	NP
	49-60	Very fine sandy loam, fine sandy loam, loam.	ML, CL-ML, SM	A-4	0	100	100	70-100	35-75	<30	NP-10
Su, SuB----------	0-6	Loamy fine sand	SM	A-2	0	100	100	75-100	15-50	<20	NP
Scoville	6-36	Fine sand, loamy fine sand, loamy sand.	SM, SP-SM	A-2, A-3	0	100	100	75-100	5-50	<20	NP
	36-60	Very fine sandy loam, fine sandy loam, loam.	ML, CL-ML, SM	A-4	0	100	100	70-100	35-75	<30	NP-10
SxE----------	0-3	Silty clay loam	CL	A-6, A-7	0	100	95-100	85-100	80-95	35-50	15-25
Skilak	3-60	Silty clay loam, silt loam.	CL	A-6	0	100	95-100	85-100	80-95	30-40	10-20
TbG:											
Tassel----------	0-7	Loamy very fine sand.	SM, ML, CL-ML, SC-SM	A-4, A-2	0	95-100	90-100	75-95	30-65	15-25	NP-8
	7-13	Fine sandy loam, sandy loam, loamy very fine sand.	ML, CL-ML, SM, SC	A-4, A-2	0	95-100	80-100	60-95	25-60	15-25	NP-8
	13-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
Ashollow--------	0-8	Loamy very fine sand.	SM, ML, CL-ML, SC-SM	A-2, A-4	0	95-100	75-100	45-100	25-65	15-20	NP-5
	8-60	Loamy very fine sand.	SM, ML, CL-ML, SC-SM	A-2, A-4	0	95-100	75-100	45-100	25-65	15-20	NP-5
Rock outcrop----	0-60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
TgF:											
Tassel----------	0-8	Loamy very fine sand.	SM, ML, CL-ML, SC-SM	A-4, A-2	0	95-100	90-100	75-95	30-65	15-25	NP-8
	8-15	Fine sandy loam, sandy loam, loamy very fine sand.	ML, CL-ML, SM, SC	A-4, A-2	0	95-100	80-100	60-95	25-60	15-25	NP-8
	15-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
Busher----------	0-18	Loamy very fine sand.	SM, ML, SC-SM, CL-ML	A-2, A-4	0	100	90-100	80-100	30-60	15-25	NP-5
	18-52	Loamy very fine sand, fine sandy loam, very fine sandy loam.	SM, ML, SC-SM, CL-ML	A-2, A-4	0	100	90-100	75-100	30-65	15-25	NP-5
	52-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
Rock outcrop----	0-60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

TABLE 18.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO	3-10 inches	4	10	40	200		
	In				Pct					Pct	
TrG:											
Tassel----------	0-5	Loamy very fine sand.	SM, ML, CL-ML, SC-SM	A-4, A-2	0	95-100	90-100	75-95	30-65	15-25	NP-8
	5-17	Fine sandy loam, sandy loam, loamy very fine sand.	ML, CL-ML, SM, SC	A-4, A-2	0	95-100	80-100	60-95	25-60	15-25	NP-8
	17-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
Ponderosa-------	0-13	Loamy very fine sand.	SC-SM, SM, SC, ML	A-2, A-4	0	100	95-100	80-100	30-60	15-30	NP-10
	13-22	Very fine sandy loam, loamy very fine sand.	SC-SM, SM, SC	A-4, A-2, A-6	0	95-100	75-100	65-100	30-50	15-30	NP-12
	22-60	Very fine sandy loam, loamy very fine sand.	SC-SM, SM, SC	A-4, A-2, A-6	0	85-100	75-100	65-100	30-50	15-30	NP-12
Rock outcrop----	0-60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
TtB, TtC, TtD---- Thirtynine	0-8	Loam----------	ML, CL-ML, CL	A-4, A-6	0	100	95-100	75-100	70-90	20-35	2-15
	8-22	Silt loam, silty clay loam, clay loam.	CL	A-6	0	100	95-100	90-100	75-95	30-40	10-20
	22-60	Silt loam, silty clay loam, loam.	CL-ML, CL	A-4, A-6	0	100	95-100	90-100	75-95	25-35	5-15
Tv, TvB---------- Tripp	0-14	Very fine sandy loam.	SC, SC-SM, CL-ML, ML	A-4, A-6	0	95-100	95-100	70-100	40-90	15-35	NP-15
	14-32	Silt loam, loam, very fine sandy loam.	ML, CL, CL-ML	A-4, A-6	0	95-100	95-100	85-100	80-95	20-35	2-12
	32-60	Silt loam, loam, very fine sandy loam.	ML, CL, CL-ML	A-4, A-6	0	95-100	95-100	85-100	60-90	20-35	2-12
VaB, VaD, VaE---- Valent	0-7	Fine sand--------	SP-SM, SM	A-2, A-3	0	100	100	60-70	5-20	---	NP
	7-60	Fine sand, loamy fine sand, sand.	SM, SP-SM	A-2	0	100	95-100	75-90	10-30	---	NP
VaF:											
Valent, rolling	0-7	Fine sand--------	SP-SM, SM	A-2, A-3	0	100	100	60-70	5-20	---	NP
	7-60	Fine sand, loamy fine sand, sand.	SM, SP-SM	A-2	0	100	95-100	75-90	10-30	---	NP
Valent, hilly---	0-7	Fine sand--------	SP-SM, SM	A-2, A-3	0	100	100	60-70	5-20	---	NP
	7-60	Fine sand, loamy fine sand, sand.	SM, SP-SM	A-2	0	100	95-100	75-90	10-30	---	NP
VbB, VbD--------- Valent	0-7	Loamy fine sand	SM, SP-SM	A-2	0	100	100	70-95	10-30	15-25	NP-5
	7-60	Fine sand, loamy fine sand, sand.	SM, SP-SM	A-2	0	100	95-100	75-90	10-30	---	NP

TABLE 18.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO	3-10 inches	4	10	40	200		
	In				Pct					Pct	
VcB---------- Vetal	0-5	Fine sandy loam	SM, ML, CL-ML, SC-SM	A-4, A-2	0	100	95-100	60-100	30-55	20-30	NP-10
	5-24	Sandy loam, fine sandy loam, very fine sandy loam.	SM, ML, CL-ML, SC-SM	A-4, A-2	0	100	95-100	60-100	30-65	20-30	NP-10
	24-60	Sandy loam, fine sandy loam, very fine sandy loam.	SM, ML, CL-ML, SC-SM	A-4, A-2	0	100	90-100	60-100	30-65	20-30	NP-10
VgB, VgC---------- Vetal	0-7	Very fine sandy loam.	CL, ML, SM, SC	A-4, A-6, A-2	0	100	95-100	90-100	30-55	20-35	NP-12
	7-45	Sandy loam, fine sandy loam, very fine sandy loam.	SM, ML, CL-ML, SC-SM	A-4, A-2	0	100	95-100	60-100	30-65	20-30	NP-10
	45-60	Sandy loam, fine sandy loam, very fine sandy loam.	SM, ML, CL-ML, SC-SM	A-4, A-2	0	100	90-100	60-100	30-65	20-30	NP-10
WhB---------- Wildhorse	0-6	Loamy fine sand	SM	A-2, A-4	0	100	100	65-100	15-40	10-20	NP-5
	6-60	Fine sand, loamy fine sand, sand.	SM, SP-SM	A-2, A-3	0	100	100	50-100	5-35	10-20	NP-5

TABLE 19.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS

(The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated)

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
									K	T		
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm					Pct
Ab, AbB, AbC-----	0-11	7-10	1.30-1.50	2.0-6.0	0.10-0.18	6.6-7.8	0-0	Low-------	0.20	5	3	1-3
Alice	11-26	5-18	1.30-1.50	2.0-6.0	0.11-0.15	7.4-8.4	0-0	Low-------	0.28			
	26-54	5-18	1.40-1.60	2.0-6.0	0.08-0.19	7.4-8.4	0-0	Low-------	0.28			
	54-60	5-15	1.40-1.60	2.0-6.0	0.08-0.19	7.9-9.0	0-2	Low-------	0.28			
AcB, AcC---------	0-8	15-20	1.25-1.45	0.6-2.0	0.20-0.22	6.6-7.8	0-0	Low-------	0.28	4	5	2-4
Alliance	8-18	25-35	1.15-1.30	0.2-2.0	0.18-0.20	6.6-7.8	0-0	Moderate	0.43			
	18-26	15-25	1.20-1.40	0.6-2.0	0.16-0.20	6.6-8.4	0-0	Low-------	0.43			
	26-46	10-20	1.30-1.60	0.6-2.0	0.15-0.18	7.4-8.4	0-0	Low-------	0.24			
	46-60	---	---	0.2-0.6	---	---	---	----------	----			
ArB---------------	0-1	15-27	1.10-1.25	0.6-2.0	0.16-0.18	6.6-9.0	0-4	Low-------	0.32	5	6	.5-1
Arvada	1-23	35-60	1.20-1.40	0.01-0.06	0.07-0.09	7.9-9.6	0-2	High------	0.37			
	23-60	28-45	1.20-1.40	0.06-0.2	0.09-0.11	7.9-9.6	0-4	High------	0.37			
AwD, AwE---------	0-15	2-10	1.35-1.55	2.0-6.0	0.12-0.15	7.4-8.4	0-0	Low-------	0.24	5	2	1-2
Ashollow	15-60	2-10	1.35-1.55	2.0-6.0	0.08-0.12	7.4-8.4	0-0	Low-------	0.28			
Ba----------------	0-60	---	---	---	---	---	<2	----------	----	---	8	---
Badland												
BbB---------------	0-1	40-50	1.05-1.15	0.06-0.2	0.14-0.16	7.4-8.4	0-2	High------	0.32	5	4	1-2
Bahl	1-14	35-50	1.20-1.30	0.06-0.2	0.14-0.18	7.9-9.0	0-4	High------	0.37			
	14-60	40-55	1.15-1.25	0.06-0.2	0.14-0.16	7.9-9.0	0-4	High------	0.37			
Bc----------------	0-4	2-10	1.80-1.95	6.0-20	0.10-0.15	7.4-8.4	<2	Low-------	0.17	5	2	.5-2
Bankard	4-48	0-10	1.85-2.00	6.0-20	0.07-0.15	7.4-8.4	<2	Low-------	0.17			
	48-60	0-10	1.85-2.00	6.0-20	0.07-0.14	7.4-8.4	<2	Low-------	0.17			
Bd----------------	0-7	2-10	1.80-1.95	6.0-20	0.10-0.15	7.4-8.4	<2	Low-------	0.17	5	2	.5-2
Bankard	7-40	0-10	1.85-2.00	6.0-20	0.07-0.15	7.4-8.4	<2	Low-------	0.17			
	40-60	0-10	1.85-2.00	6.0-20	0.07-0.14	7.4-8.4	<2	Low-------	0.17			
Be, BeB, BeC-----	0-14	5-18	1.30-1.50	2.0-6.0	0.13-0.18	6.6-7.8	0-0	Low-------	0.20	5	3	1-3
Bayard	14-32	5-18	1.20-1.50	2.0-6.0	0.12-0.18	7.4-8.4	0-0	Low-------	0.28			
	32-60	5-10	1.50-1.80	6.0-20	0.08-0.10	7.4-8.4	0-0	Low-------	0.17			
Bh----------------	0-4	10-18	1.25-1.35	0.6-2.0	0.13-0.18	6.6-7.8	<2	Low-------	0.32	5	3	2-4
Bigwinder	4-12	10-18	1.30-1.40	0.6-2.0	0.12-0.17	7.4-8.4	<2	Low-------	0.32			
	12-60	10-18	1.40-1.50	0.6-2.0	0.12-0.15	7.4-8.4	<2	Low-------	0.24			
BoG---------------	0-3	0-5	1.40-1.60	6.0-20	0.07-0.10	5.6-7.3	0-0	Low-------	0.10	2	2	.5-1
Blueridge	3-60	0-3	1.65-1.85	>20	0.02-0.05	6.1-7.8	0-0	Low-------	0.02			
BpE:												
Blueridge-------	0-5	3-10	1.35-1.55	6.0-20	0.10-0.12	5.6-7.3	<2	Low-------	0.17	5	2	<1
	5-60	0-3	1.65-1.85	>20	0.02-0.05	5.6-7.3	<2	Low-------	0.05			
Bayard----------	0-8	5-18	1.20-1.50	2.0-6.0	0.17-0.18	6.6-7.8	0-0	Low-------	0.32	5	3	1-3
	8-23	5-18	1.20-1.50	2.0-6.0	0.12-0.18	7.4-8.4	0-0	Low-------	0.28			
	23-60	5-10	1.50-1.80	6.0-20	0.08-0.10	7.4-8.4	0-0	Low-------	0.17			
BrC, BrD, BrF----	0-8	5-18	1.30-1.50	0.6-2.0	0.16-0.20	6.6-7.8	0-0	Low-------	0.32	5	3	1-3
Bridget	8-30	5-18	1.40-1.60	0.6-2.0	0.16-0.24	7.4-8.4	0-0	Low-------	0.43			
	30-60	5-18	1.40-1.60	0.6-2.0	0.16-0.24	7.4-8.4	0-0	Low-------	0.43			

TABLE 19.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
									K	T		
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm					Pct
Bs, BsB, BsD-----	0-5	30-40	1.20-1.40	0.2-0.6	0.17-0.22	6.6-8.4	0-0	High------	0.37	5	4L	1-3
Bufton	5-35	35-45	1.20-1.40	0.06-0.6	0.12-0.20	7.4-9.0	0-4	High------	0.37			
	35-60	25-45	1.20-1.30	0.06-0.6	0.10-0.18	7.9-9.0	0-4	High------	0.37			
BsE----------	0-5	30-40	1.20-1.40	0.2-0.6	0.18-0.23	6.6-8.4	0-0	High------	0.43	5	4L	1-3
Bufton	5-35	35-45	1.20-1.40	0.06-0.6	0.12-0.20	7.4-9.0	0-4	High------	0.37			
	35-60	25-45	1.20-1.30	0.06-0.6	0.10-0.18	7.9-9.0	0-4	High------	0.37			
BuB, BuC, BuD----	0-8	5-15	1.30-1.50	2.0-6.0	0.15-0.18	6.1-7.8	0-0	Low-------	0.20	4	2	1-3
Busher	8-50	5-12	1.40-1.60	2.0-6.0	0.13-0.19	6.6-8.4	0-0	Low-------	0.28			
	50-60	---	---	0.2-0.6	---	---	---	----------	----			
BwC:												
Busher----------	0-22	5-15	1.30-1.50	2.0-6.0	0.15-0.18	6.1-7.8	0-0	Low-------	0.20	4	2	1-3
	22-51	5-12	1.40-1.60	2.0-6.0	0.13-0.19	6.6-8.4	0-0	Low-------	0.28			
	51-60	---	---	0.2-0.6	---	---	---	----------	----			
Phiferson-------	0-9	6-10	1.35-1.45	2.0-6.0	0.10-0.12	6.6-7.8	0-0	Low-------	0.24	3	2	1-3
	9-37	6-16	1.35-1.45	2.0-6.0	0.13-0.15	7.9-8.4	0-0	Low-------	0.32			
	37-60	---	---	---	---	---	---	----------	----			
BxC, BxE:												
Busher----------	0-8	5-15	1.30-1.50	2.0-6.0	0.15-0.18	6.1-7.8	0-0	Low-------	0.20	4	2	1-3
	8-50	5-12	1.40-1.60	2.0-6.0	0.13-0.19	6.6-8.4	0-0	Low-------	0.28			
	50-60	---	---	0.2-0.6	---	---	---	----------	----			
Tassel----------	0-3	2-10	1.60-1.70	2.0-6.0	0.12-0.18	7.4-8.4	0-0	Low-------	0.24	2	2	1-3
	3-15	5-12	1.40-1.70	2.0-6.0	0.12-0.18	7.4-8.4	0-0	Low-------	0.28			
	15-60	---	---	0.2-0.6	---	---	---	----------	----			
Cr, Cs-----------	0-6	8-20	1.20-1.40	0.6-2.0	0.20-0.24	7.4-8.4	0-2	Low-------	0.32	5	4L	.5-2
Craft	6-20	15-27	1.15-1.30	0.6-2.0	0.17-0.20	7.4-8.4	0-4	Low-------	0.43			
	20-60	8-20	1.20-1.40	2.0-6.0	0.17-0.19	7.4-8.4	0-4	Low-------	0.43			
Ct---------------	0-6	8-20	1.20-1.40	0.6-2.0	0.20-0.24	7.4-8.4	0-2	Low-------	0.32	5	4L	.5-2
Craft	6-60	15-27	1.15-1.30	0.6-2.0	0.17-0.20	7.4-8.4	0-4	Low-------	0.43			
DpB--------------	0-5	4-12	1.45-1.55	6.0-20	0.07-0.09	7.4-7.8	2-4	Low-------	0.17	5	2	1-2
Draknab	5-60	3-10	1.40-1.50	6.0-20	0.06-0.09	7.4-8.4	2-4	Low-------	0.15			
EpF--------------	0-4	10-20	1.20-1.45	0.6-2.0	0.18-0.24	6.6-8.4	<2	Low-------	0.43	2	4L	.5-2
Epping	4-8	10-20	1.20-1.45	0.6-2.0	0.12-0.20	7.4-8.4	<2	Low-------	0.43			
	8-15	15-30	1.20-1.45	0.6-2.0	0.12-0.20	7.4-8.4	<2	Moderate	0.43			
	15-60	---	---	0.06-0.2	---	---	---	----------	----			
EsG:												
Epping----------	0-4	10-20	1.20-1.45	0.6-2.0	0.18-0.24	6.6-8.4	<2	Low-------	0.43	2	4L	.5-2
	4-8	10-20	1.20-1.45	0.6-2.0	0.12-0.20	7.4-8.4	<2	Low-------	0.43			
	8-15	15-30	1.20-1.45	0.6-2.0	0.12-0.20	7.4-8.4	<2	Moderate	0.43			
	15-60	---	---	0.06-0.2	---	---	---	----------	----			
Badland---------	0-60	---	---	---	---	---	<2	----------	----	---	8	---
Fu---------------	0-60	1-18	1.30-1.80	6.0-20	0.07-0.13	6.6-8.4	0-2	Low-------	0.17	5	8	2-8
Fluvaquents												
Go, Gp-----------	0-5	8-20	1.30-1.50	2.0-6.0	0.16-0.18	7.4-8.4	<2	Low-------	0.24	5	3	.5-2
Glenberg	5-60	8-15	1.50-1.60	2.0-6.0	0.07-0.16	7.4-8.4	<2	Low-------	0.28			
HsC:												
Hisle------------	0-2	18-27	1.15-1.25	0.6-2.0	0.16-0.18	6.1-7.8	0-2	Low-------	0.32	2	6	1-3
	2-25	50-60	1.25-1.40	0.01-0.06	0.05-0.12	7.4-9.0	2-16	Very high	0.37			
	25-60	---	---	0.01-0.2	---	---	---	----------	----			

TABLE 19.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
									K	T		
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm					Pct
HsC:												
Slickspots	0-60	40-70	1.20-1.30	0.01-0.06	0.08-0.12	8.5-9.0	>16	High	0.37	3	8	0-1
In	0-6	40-50	1.20-1.30	0.06-0.2	0.10-0.15	7.4-9.0	0-2	High	0.32	5	4	.5-1
Interior	6-60	20-35	1.25-1.40	0.2-2.0	0.14-0.17	7.9-9.0	0-4	Moderate	0.43			
JmB, JmC, JmD	0-18	5-15	1.20-1.35	2.0-6.0	0.13-0.15	6.6-7.8	0-0	Low	0.20	5	2	1-3
Jayem	18-32	5-18	1.30-1.45	2.0-6.0	0.13-0.15	6.6-7.8	0-0	Low	0.32			
	32-60	5-18	1.30-1.50	2.0-6.0	0.13-0.15	6.6-7.8	0-0	Low	0.32			
KeB, KeC	0-8	14-20	1.25-1.45	0.6-2.0	0.20-0.23	6.1-7.3	0-0	Low	0.28	5	5	1-3
Keith	8-26	20-35	1.10-1.20	0.6-2.0	0.18-0.22	6.6-7.3	0-0	Moderate	0.43			
	26-36	8-20	1.30-1.40	0.6-2.0	0.20-0.22	7.4-8.4	0-0	Low	0.43			
	36-60	8-20	1.30-1.40	0.6-2.0	0.20-0.22	8.5-9.0	0-0	Low	0.43			
Ky, KyC	0-4	50-65	1.15-1.30	0.01-0.06	0.08-0.12	6.6-7.8	0-2	Very high	0.37	5	4	1-3
Kyle	4-33	60-65	1.15-1.30	0.01-0.06	0.08-0.12	7.4-8.4	0-4	Very high	0.37			
	33-60	60-65	1.15-1.30	0.01-0.06	0.08-0.12	7.4-8.4	2-8	Very high	0.37			
La	0-8	8-18	1.40-1.55	2.0-6.0	0.13-0.18	7.4-8.4	0-4	Low	0.24	4	3	.5-2
Las Animas	8-60	8-18	1.50-1.70	2.0-6.0	0.12-0.18	7.4-8.4	0-2	Low	0.28			
Lb	0-4	5-18	1.30-1.55	2.0-6.0	0.15-0.20	7.4-8.4	<4	Low	0.24	5	3	.5-2
Las Animas	4-60	8-18	1.55-1.75	2.0-6.0	0.06-0.12	7.4-8.4	<4	Low	0.24			
Lc:												
Las Animas	0-12	8-18	1.40-1.55	2.0-6.0	0.17-0.22	7.4-8.4	0-4	Low	0.37	4	3	.5-2
	12-60	8-18	1.50-1.70	2.0-6.0	0.12-0.18	7.4-8.4	0-2	Low	0.28			
Lisco	0-6	5-10	1.40-1.50	0.6-2.0	0.13-0.18	7.4-9.6	0-4	Low	0.37	5	3	.5-2
	6-25	5-18	1.30-1.40	0.6-2.0	0.15-0.19	8.5-9.6	0-4	Low	0.43			
	25-60	5-15	1.40-1.50	0.6-2.0	0.10-0.15	8.5-9.6	8-16	Low	0.28			
Ld	0-4	5-10	1.40-1.50	0.6-2.0	0.13-0.18	7.4-9.6	0-4	Low	0.37	5	3	.5-2
Lisco	4-22	5-18	1.30-1.40	0.6-2.0	0.15-0.19	8.5-9.6	0-4	Low	0.43			
	22-60	5-15	1.40-1.50	0.6-2.0	0.10-0.15	8.5-9.6	8-16	Low	0.28			
Lh	0-6	30-45	1.15-1.25	0.06-0.6	0.14-0.17	6.6-8.4	0-4	Moderate	0.37	5	4L	1-3
Lohmiller	6-10	35-50	1.20-1.35	0.06-0.6	0.11-0.16	6.6-8.4	0-4	High	0.43			
	10-60	35-50	1.30-1.45	0.06-0.6	0.14-0.16	7.4-8.4	0-8	High	0.37			
Lo	0-6	30-40	1.15-1.25	0.06-0.6	0.14-0.17	6.6-8.4	0-4	Moderate	0.37	5	4L	1-2
Lohmiller	6-10	35-50	1.20-1.35	0.06-0.6	0.11-0.16	7.4-8.4	0-4	High	0.43			
	10-60	25-35	1.30-1.45	0.06-0.6	0.14-0.16	7.4-8.4	0-4	Moderate	0.37			
Ls	0-6	40-50	1.15-1.25	0.06-0.2	0.11-0.16	6.6-8.4	0-4	High	0.28	5	4	1-2
Lohmiller	6-10	35-50	1.20-1.35	0.06-0.6	0.11-0.16	7.4-8.4	0-4	High	0.43			
	10-60	25-35	1.30-1.45	0.06-0.6	0.14-0.16	7.4-8.4	0-4	Moderate	0.37			
Mr, MrB, MrC	0-5	10-20	1.30-1.60	0.6-2.0	0.16-0.20	7.4-8.4	0-0	Low	0.43	5	3	.5-2
Mitchell	5-38	8-18	1.20-1.60	0.6-2.0	0.16-0.22	7.4-8.4	0-0	Low	0.43			
	38-60	5-15	1.30-1.75	2.0-20	0.08-0.16	7.4-8.4	0-0	Low	0.28			
Mt, MtB, MtC, MtD, MtE	0-5	15-27	1.20-1.45	0.6-2.0	0.20-0.24	7.4-8.4	0-0	Low	0.43	5	4L	.5-2
Mitchell	5-38	8-18	1.20-1.60	0.6-2.0	0.16-0.22	7.4-8.4	0-0	Low	0.43			
	38-60	5-15	1.30-1.75	2.0-20	0.08-0.16	7.4-8.4	0-0	Low	0.28			
MxD:												
Mitchell	0-10	10-20	1.30-1.60	0.6-2.0	0.16-0.20	7.4-8.4	0-0	Low	0.43	5	3	.5-2
	10-28	8-18	1.20-1.60	0.6-2.0	0.16-0.22	7.4-8.4	0-0	Low	0.43			
	28-60	5-15	1.30-1.75	2.0-20	0.08-0.16	7.4-8.4	0-0	Low	0.28			

TABLE 19.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
									K	T		
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm					Pct
MxD:												
Epping----------	0-12	10-20	1.25-1.45	0.6-2.0	0.12-0.20	6.6-8.4	<2	Low-------	0.43	2	3	.5-2
	12-18	15-30	1.20-1.45	0.6-2.0	0.12-0.20	7.4-8.4	<2	Moderate	0.43			
	18-60	---	---	0.06-0.2	---	---	---	----------	----			
MxF:												
Mitchell--------	0-10	15-27	1.20-1.45	0.6-2.0	0.20-0.24	7.4-8.4	0-0	Low-------	0.43	5	4L	.5-2
	10-28	8-18	1.20-1.60	0.6-2.0	0.16-0.22	7.4-8.4	0-0	Low-------	0.43			
	28-60	5-15	1.30-1.75	2.0-20	0.08-0.16	7.4-8.4	0-0	Low-------	0.28			
Epping----------	0-12	10-20	1.20-1.45	0.6-2.0	0.18-0.24	6.6-8.4	<2	Low-------	0.43	2	4L	.5-2
	12-18	15-30	1.20-1.45	0.6-2.0	0.12-0.20	7.4-8.4	<2	Moderate	0.43			
	18-60	---	---	0.06-0.2	---	---	---	----------	----			
NrB, NrD---------	0-6	27-34	1.10-1.30	0.2-0.6	0.19-0.22	7.4-8.4	<2	Moderate	0.37	3	4L	2-4
Norrest	6-24	35-45	1.20-1.40	0.2-0.6	0.11-0.17	7.4-8.4	<2	High------	0.32			
	24-60	---	---	---	---	---	---	----------	----			
OgB, OgC, OgD----	0-13	8-18	1.15-1.25	0.6-2.0	0.17-0.19	6.1-7.8	0-2	Low-------	0.32	4	3	1-4
Oglala	13-49	5-18	1.25-1.40	0.6-2.0	0.16-0.23	6.6-7.8	0-2	Low-------	0.43			
	49-60	---	---	0.2-0.6	---	---	---	----------	----			
OnD, OnF:												
Oglala----------	0-13	8-18	1.15-1.25	0.6-2.0	0.17-0.19	6.1-7.8	0-2	Low-------	0.32	4	3	1-4
	13-49	5-18	1.25-1.40	0.6-2.0	0.16-0.23	6.6-7.8	0-2	Low-------	0.43			
	49-60	---	---	0.2-0.6	---	---	---	----------	----			
Canyon----------	0-4	5-15	1.30-1.50	0.6-2.0	0.17-0.19	7.4-8.4	0-2	Low-------	0.37	2	3	1-3
	4-15	12-25	1.45-1.70	0.6-2.0	0.13-0.18	7.4-8.4	0-2	Low-------	0.20			
	15-60	---	---	0.2-0.6	---	---	---	----------	----			
OpD---------------	0-4	15-25	1.35-1.40	0.6-2.0	0.11-0.15	6.6-7.8	0-0	Low-------	0.24	5	4	1-2
Olney	4-20	18-35	1.40-1.45	0.6-2.0	0.13-0.17	6.6-7.8	0-0	Low-------	0.24			
	20-60	15-30	1.40-1.50	0.6-6.0	0.11-0.15	7.9-8.4	0-2	Low-------	0.24			
OrF---------------	0-5	40-50	1.00-1.20	0.06-0.2	0.09-0.11	7.4-8.4	0-4	High------	0.32	2	4	.5-1
Orella	5-18	38-65	1.00-1.20	0.00-0.06	0.09-0.11	7.4-9.0	4-16	High------	0.32			
	18-60	---	---	0.06-0.2	---	---	---	----------	----			
OsG:												
Orella----------	0-5	40-50	1.00-1.20	0.06-0.2	0.09-0.11	7.4-8.4	0-4	High------	0.32	2	4	.5-1
	5-18	38-65	1.00-1.20	0.00-0.06	0.09-0.11	7.4-9.0	4-16	High------	0.32			
	18-60	---	---	0.06-0.2	---	---	---	----------	----			
Badland---------	0-60	---	---	---	---	---	<2	----------	----	---	8	---
OwB---------------	0-15	5-10	1.50-1.70	6.0-20	0.13-0.17	7.4-8.4	0-0	Low-------	0.24	5	2	.5-1
Otero	15-60	5-10	1.45-1.75	2.0-6.0	0.12-0.19	7.4-8.4	0-2	Low-------	0.32			
Pa----------------	0-5	3-7	1.35-1.55	6.0-20	0.10-0.12	7.4-8.4	0-8	Low-------	0.17	5	2	.5-3
Pathfinder	5-18	3-7	1.50-1.80	6.0-20	0.06-0.11	7.9-9.0	0-8	Low-------	0.15			
	18-29	3-15	1.55-1.75	2.0-20	0.08-0.17	7.9-9.0	0-8	Low-------	0.17			
	29-60	3-7	1.50-1.80	6.0-20	0.05-0.10	7.9-9.0	0-8	Low-------	0.15			
PhF:												
Phiferson-------	0-8	6-10	1.35-1.45	2.0-6.0	0.10-0.12	6.6-7.8	0-0	Low-------	0.24	3	2	1-3
	8-33	6-16	1.35-1.45	2.0-6.0	0.13-0.15	7.9-8.4	0-0	Low-------	0.32			
	33-60	---	---	---	---	---	---	----------	----			
Tassel----------	0-4	2-8	1.60-1.80	6.0-20	0.10-0.12	7.4-8.4	0-0	Low-------	0.17	2	2	1-3
	4-17	5-12	1.40-1.70	2.0-6.0	0.12-0.18	7.4-8.4	0-0	Low-------	0.28			
	17-60	---	---	0.2-0.6	---	---	---	----------	----			

TABLE 19.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
									K	T		
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm					Pct
PhF:												
Rock outcrop----	0-60	---	---	---	---	---	<2	----------	----	---	8	---
PrC, PrE---------	0-3	50-60	1.10-1.25	0.00-0.06	0.08-0.12	6.1-7.8	0-2	Very high	0.37	3	4	1-3
Pierre	3-32	50-60	1.10-1.25	0.00-0.06	0.08-0.12	6.6-8.4	0-2	Very high	0.37			
	32-60	---	---	0.01-0.2	---	---	---	----------	----			
PsD, PsE---------	0-13	5-12	1.35-1.55	2.0-6.0	0.13-0.17	6.6-7.3	0-0	Low-------	0.20	5	2	1-3
Ponderosa	13-45	5-18	1.55-1.80	2.0-6.0	0.12-0.18	6.6-7.8	0-0	Low-------	0.43			
	45-60	5-18	1.55-1.80	2.0-6.0	0.11-0.18	7.4-8.4	0-0	Low-------	0.43			
PtF:												
Ponderosa-------	0-19	5-12	1.35-1.55	2.0-6.0	0.13-0.17	6.6-7.3	0-0	Low-------	0.20	5	2	1-3
	19-32	5-18	1.55-1.80	2.0-6.0	0.12-0.18	6.6-7.8	0-0	Low-------	0.43			
	32-60	5-18	1.55-1.80	2.0-6.0	0.11-0.18	7.4-8.4	0-0	Low-------	0.43			
Tassel----------	0-5	2-10	1.60-1.70	2.0-6.0	0.12-0.18	7.4-8.4	0-0	Low-------	0.24	2	2	1-3
	5-15	5-12	1.40-1.70	2.0-6.0	0.12-0.18	7.4-8.4	0-0	Low-------	0.28			
	15-60	---	---	0.2-0.6	---	---	---	----------	----			
Vetal-----------	0-19	10-18	1.20-1.30	2.0-6.0	0.17-0.21	5.6-7.8	0-0	Low-------	0.32	5	3	1-3
	19-30	12-18	1.25-1.40	2.0-6.0	0.11-0.17	6.1-7.8	0-0	Low-------	0.20			
	30-60	10-18	1.30-1.40	2.0-6.0	0.11-0.17	6.1-8.4	0-0	Low-------	0.20			
RkG:												
Rock outcrop----	0-60	---	---	---	---	---	<2	----------	----	---	8	---
Tassel----------	0-6	2-8	1.60-1.80	6.0-20	0.10-0.12	7.4-8.4	0-0	Low-------	0.17	2	2	1-3
	6-16	5-12	1.40-1.70	2.0-6.0	0.12-0.18	7.4-8.4	0-0	Low-------	0.28			
	16-60	---	---	0.2-0.6	---	---	---	----------	----			
SbF:												
Samsil----------	0-3	45-60	1.15-1.30	0.06-0.2	0.08-0.12	7.4-8.4	0-2	Very high	0.37	2	4	1-2
	3-18	50-65	1.15-1.30	0.06-0.2	0.08-0.12	7.4-8.4	0-4	Very high	0.37			
	18-40	---	---	---	---	---	---	----------	----			
Pierre----------	0-3	50-60	1.10-1.25	0.00-0.06	0.08-0.12	6.1-7.8	0-2	Very high	0.37	3	4	1-3
	3-32	50-60	1.10-1.25	0.00-0.06	0.08-0.12	6.6-8.4	0-2	Very high	0.37			
	32-60	---	---	0.01-0.2	---	---	---	----------	----			
ScG:												
Samsil----------	0-3	45-60	1.15-1.30	0.06-0.2	0.08-0.12	7.4-8.4	0-2	Very high	0.37	2	4	1-2
	3-18	50-65	1.15-1.30	0.06-0.2	0.08-0.12	7.4-8.4	0-4	Very high	0.37			
	18-60	---	---	---	---	---	---	----------	----			
Rock outcrop----	0-60	---	---	---	---	---	<2	----------	----	---	8	---
SdD, SdF---------	0-4	8-15	1.35-1.55	2.0-6.0	0.11-0.13	6.1-7.3	0-0	Low-------	0.24	5	2	.5-2
Sarben	4-31	10-18	1.45-1.75	2.0-6.0	0.10-0.19	6.6-7.8	0-0	Low-------	0.24			
	31-60	10-18	1.45-1.75	2.0-6.0	0.10-0.18	6.6-7.8	0-0	Low-------	0.24			
SeB:												
Sarben----------	0-10	8-15	1.35-1.55	2.0-6.0	0.11-0.13	6.1-7.3	0-0	Low-------	0.24	5	2	.5-2
	10-33	10-18	1.45-1.75	2.0-6.0	0.10-0.19	6.6-7.8	0-0	Low-------	0.24			
	33-60	10-18	1.45-1.75	2.0-6.0	0.10-0.18	6.6-7.8	0-0	Low-------	0.24			
Busher----------	0-7	5-15	1.30-1.50	2.0-6.0	0.15-0.18	6.1-7.8	0-0	Low-------	0.20	4	2	1-3
	7-49	5-12	1.40-1.60	2.0-6.0	0.13-0.19	6.6-8.4	0-0	Low-------	0.28			
	49-60	---	---	0.2-0.6	---	---	---	----------	----			

TABLE 19.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm					Pct
SeD:												
Sarben----------	0-6	8-15	1.35-1.55	2.0-6.0	0.11-0.13	6.1-7.3	0-0	Low-------	0.24	5	2	.5-2
	6-25	10-18	1.45-1.75	2.0-6.0	0.10-0.19	6.6-7.8	0-0	Low-------	0.24			
	25-60	10-18	1.45-1.75	2.0-6.0	0.10-0.18	6.6-7.8	0-0	Low-------	0.24			
Busher----------	0-8	5-15	1.30-1.50	2.0-6.0	0.15-0.18	6.1-7.8	0-0	Low-------	0.20	4	2	1-3
	8-49	5-12	1.40-1.60	2.0-6.0	0.13-0.19	6.6-8.4	0-0	Low-------	0.28			
	49-60	---	---	0.2-0.6	---	---	---	----------	----			
SfB, SfC---------	0-8	5-15	1.30-1.40	0.6-2.0	0.17-0.19	6.1-7.8	<2	Low-------	0.32	5	3	1-2
Satanta	8-26	18-35	1.35-1.45	0.6-2.0	0.16-0.19	6.6-8.4	<2	Moderate	0.28			
	26-60	5-15	1.30-1.40	0.6-2.0	0.12-0.18	7.4-8.4	<2	Low-------	0.32			
Sg, SgC----------	0-4	27-35	1.15-1.25	0.6-2.0	0.19-0.22	6.1-7.3	0-0	High------	0.32	5	7	2-4
Savo	4-15	35-50	1.20-1.40	0.2-0.6	0.11-0.19	6.1-7.8	0-0	High------	0.32			
	15-47	25-35	1.20-1.40	0.2-0.6	0.11-0.19	7.4-8.4	0-2	High------	0.43			
	47-60	20-35	1.25-1.45	0.2-2.0	0.11-0.17	7.4-8.4	0-2	Moderate	0.43			
SrF---------------	0-4	18-25	1.40-1.60	6.0-20	0.03-0.06	6.1-8.4	0-2	Low-------	0.20	2	6	.5-2
Schamber	4-60	2-10	1.40-1.65	6.0-20	0.03-0.06	7.4-8.4	0-2	Low-------	0.05			
Ss, SsB----------	0-8	2-8	1.40-1.60	6.0-20	0.07-0.09	6.1-7.8	<2	Low-------	0.15	5	1	.5-1
Scoville	8-49	2-8	1.55-1.80	6.0-20	0.06-0.11	6.6-7.8	<2	Low-------	0.15			
	49-60	8-18	1.45-1.70	0.6-2.0	0.12-0.19	7.4-8.4	<2	Low-------	0.24			
Su, SuB----------	0-6	2-8	1.35-1.55	6.0-20	0.10-0.12	6.1-7.8	<2	Low-------	0.17	5	2	.5-1
Scoville	6-36	2-8	1.55-1.80	6.0-20	0.06-0.11	6.6-7.8	<2	Low-------	0.15			
	36-60	8-18	1.45-1.70	0.6-2.0	0.12-0.19	7.4-8.4	<2	Low-------	0.24			
SxE---------------	0-3	27-35	1.05-1.15	0.6-2.0	0.18-0.22	7.4-8.4	0-2	Moderate	0.49	5	4L	1-2
Skilak	3-60	18-35	1.15-1.25	0.6-2.0	0.18-0.22	7.9-9.0	2-8	Moderate	0.43			
TbG:												
Tassel----------	0-7	2-10	1.60-1.70	2.0-6.0	0.12-0.18	7.4-8.4	0-0	Low-------	0.24	2	2	1-3
	7-13	5-12	1.40-1.70	2.0-6.0	0.12-0.18	7.4-8.4	0-0	Low-------	0.28			
	13-60	---	---	0.2-0.6	---	---	---	----------	----			
Ashollow--------	0-8	2-10	1.35-1.55	2.0-6.0	0.12-0.15	7.4-8.4	0-0	Low-------	0.24	5	2	1-2
	8-60	2-10	1.35-1.55	2.0-6.0	0.08-0.12	7.4-8.4	0-0	Low-------	0.28			
Rock outcrop----	0-60	---	---	---	---	---	<2	----------	----	---	8	---
TgF:												
Tassel----------	0-8	2-10	1.60-1.70	2.0-6.0	0.12-0.18	7.4-8.4	0-0	Low-------	0.24	2	2	1-3
	8-15	5-12	1.40-1.70	2.0-6.0	0.12-0.18	7.4-8.4	0-0	Low-------	0.28			
	15-60	---	---	0.2-0.6	---	---	---	----------	----			
Busher----------	0-18	5-15	1.30-1.50	2.0-6.0	0.15-0.18	6.1-7.8	0-0	Low-------	0.20	4	2	1-3
	18-52	5-12	1.40-1.60	2.0-6.0	0.13-0.19	6.6-8.4	0-0	Low-------	0.28			
	52-60	---	---	0.2-0.6	---	---	---	----------	----			
Rock outcrop----	0-60	---	---	---	---	---	<2	----------	----	---	8	---
TrG:												
Tassel----------	0-5	2-10	1.60-1.70	2.0-6.0	0.12-0.18	7.4-8.4	0-0	Low-------	0.24	2	2	1-3
	5-17	5-12	1.40-1.70	2.0-6.0	0.12-0.18	7.4-8.4	0-0	Low-------	0.28			
	17-60	---	---	0.2-0.6	---	---	---	----------	----			
Ponderosa-------	0-13	5-12	1.35-1.55	2.0-6.0	0.13-0.17	6.6-7.3	0-0	Low-------	0.20	5	2	1-3
	13-22	5-18	1.55-1.80	2.0-6.0	0.12-0.18	6.6-7.8	0-0	Low-------	0.43			
	22-60	5-18	1.55-1.80	2.0-6.0	0.11-0.18	7.4-8.4	0-0	Low-------	0.43			
Rock outcrop----	0-60	---	---	---	---	---	<2	----------	----	---	8	---

TABLE 19.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
									K	T		
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm					Pct
TtB, TtC, TtD----	0-8	10-24	1.25-1.45	0.6-2.0	0.20-0.22	6.1-7.8	0-2	Low-------	0.28	5	5	2-4
Thirtynine	8-22	18-35	1.15-1.25	0.6-2.0	0.19-0.22	7.4-8.4	0-2	Moderate	0.49			
	22-60	15-30	1.15-1.25	0.6-2.0	0.19-0.22	7.9-9.0	0-2	Moderate	0.49			
Tv, TvB----------	0-14	9-18	1.25-1.45	0.6-2.0	0.17-0.19	6.1-7.8	0-0	Low-------	0.32	5	3	1-3
Tripp	14-32	13-18	1.40-1.65	0.6-2.0	0.16-0.20	6.6-8.4	0-0	Low-------	0.43			
	32-60	13-18	1.40-1.65	0.6-2.0	0.16-0.20	7.4-8.4	0-2	Low-------	0.43			
VaB, VaD, VaE----	0-7	2-6	1.55-1.65	6.0-20	0.05-0.10	6.6-7.8	0-0	Low-------	0.15	5	1	.5-1
Valent	7-60	2-8	1.60-1.70	6.0-20	0.05-0.10	6.6-7.8	0-0	Low-------	0.15			
VaF:												
Valent, rolling-	0-7	2-6	1.55-1.65	6.0-20	0.05-0.10	6.6-7.8	0-0	Low-------	0.15	5	1	.5-1
	7-60	2-8	1.60-1.70	6.0-20	0.05-0.10	6.6-7.8	0-0	Low-------	0.15			
Valent, hilly---	0-7	2-6	1.55-1.65	6.0-20	0.05-0.10	6.6-7.8	0-0	Low-------	0.15	5	1	.5-1
	7-60	2-8	1.60-1.70	6.0-20	0.05-0.10	6.6-7.8	0-0	Low-------	0.15			
VbB, VbD---------	0-7	3-10	1.55-1.65	6.0-20	0.07-0.12	6.6-7.8	0-0	Low-------	0.17	5	2	.5-1
Valent	7-60	2-8	1.60-1.70	6.0-20	0.05-0.10	6.6-7.8	0-0	Low-------	0.15			
VcB----------	0-5	10-18	1.25-1.40	2.0-6.0	0.11-0.17	5.6-7.8	0-0	Low-------	0.20	5	3	1-3
Vetal	5-24	12-18	1.25-1.40	2.0-6.0	0.11-0.17	6.1-7.8	0-0	Low-------	0.20			
	24-60	10-18	1.30-1.40	2.0-6.0	0.11-0.17	6.1-8.4	0-0	Low-------	0.20			
VgB, VgC---------	0-7	10-18	1.20-1.30	2.0-6.0	0.17-0.21	5.6-7.8	0-0	Low-------	0.32	5	3	1-3
Vetal	7-45	12-18	1.25-1.40	2.0-6.0	0.11-0.17	6.1-7.8	0-0	Low-------	0.20			
	45-60	10-18	1.30-1.40	2.0-6.0	0.11-0.17	6.1-8.4	0-0	Low-------	0.20			
WhB----------	0-6	2-10	1.60-1.90	6.0-20	0.03-0.10	8.5-9.9	0-8	Low-------	0.17	5	2	.5-1
Wildhorse	6-60	1-10	1.50-1.70	6.0-20	0.01-0.08	8.5-9.6	0-4	Low-------	0.15			

TABLE 20.--SOIL AND WATER FEATURES

("Flooding," "water table," and terms such as "rare," "brief," and "apparent" are explained in the text. The symbol < means less than; > means more than. Absence of an entry indicates that the feature is not a concern or that data were not estimated)

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				
Ab, AbB, AbC--- Alice	B	None	---	---	>6.0	---	---	>60	---	Moderate	Low	Low.
AcB, AcC--- Alliance	B	None	---	---	>6.0	---	---	40-60	Soft	Moderate	Moderate	Low.
ArB--- Arvada	D	None	---	---	>6.0	---	---	>60	---	Low	High	Low.
AwD, AwE--- Ashollow	B	None	---	---	>6.0	---	---	>80	---	Low	Low	Low.
Ba--- Badland	D	None	---	---	>6.0	---	---	0-3	Soft	---	---	---
BbB--- Bahl	C	None	---	---	>6.0	---	---	>60	---	Low	High	Low.
Bc--- Bankard	A	Occasional	Very brief	Mar-Aug	>6.0	---	---	>60	---	Low	Low	Low.
Bd--- Bankard	A	Frequent	Very brief	Mar-Aug	>6.0	---	---	>60	---	Low	Low	Low.
Be, BeB, BeC--- Bayard	B	None	---	---	>6.0	---	---	>80	---	Moderate	Low	Low.
Bh--- Bigwinder	D	Frequent	Brief	Mar-Jun	1.0-3.0	Apparent	Apr-Aug	>60	---	Moderate	High	Low.
BoG--- Blueridge	A	None	---	---	>6.0	---	---	>60	---	Low	Low	Low.
BpE: Blueridge	A	None	---	---	>6.0	---	---	>60	---	Low	Low	Low.
Bayard	B	None	---	---	>6.0	---	---	>80	---	Moderate	Low	Low.
BrC, BrD, BrF--- Bridget	B	None	---	---	>6.0	---	---	>60	---	Moderate	Low	Low.
Bs, BsB, BsD, BsE- Bufton	C	None	---	---	>6.0	---	---	>60	---	Low	High	Low.
BuB, BuC, BuD--- Busher	B	None	---	---	>6.0	---	---	40-60	Soft	Low	Low	Low.

TABLE 20.--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				
BwC:												
Busher	B	None	---	---	>6.0	---	---	40-60	Soft	Low	Low	Low.
Phiferson	B	None	---	---	>6.0	---	---	20-40	Soft	Moderate	High	Low.
BxC, BxE:												
Busher	B	None	---	---	>6.0	---	---	40-60	Soft	Low	Low	Low.
Tassel	D	None	---	---	>6.0	---	---	6-20	Soft	Low	Low	Low.
Cr Craft	B	Rare	---	---	>6.0	---	---	>60	---	Low	High	Low.
Cs Craft	B	Occasional	Brief	Mar-Jun	>6.0	---	---	>60	---	Low	High	Low.
Ct Craft	B	Frequent	Brief	Mar-Jun	>6.0	---	---	>60	---	Low	High	Low.
DpB Draknab	A	Rare	---	---	>6.0	---	---	>60	---	Low	High	Low.
EpF Epping	D	None	---	---	>6.0	---	---	10-20	Soft	Low	Low	Low.
EsG:												
Epping	D	None	---	---	>6.0	---	---	10-20	Soft	Low	Low	Low.
Badland	D	None	---	---	>6.0	---	---	0-3	Soft	---	---	---
Fu Fluvaquents	D	Frequent	Brief to very long.	Nov-Jun	+2-1.0	Apparent	Jan-Dec	>60	---	Moderate	High	Low.
Go Glenberg	B	Rare	---	---	>6.0	---	---	>60	---	Moderate	Low	Low.
Gp Glenberg	B	Frequent	Very brief	Apr-Aug	>6.0	---	---	>60	---	Moderate	Low	Low.
HsC:												
Hisle	D	None	---	---	>6.0	---	---	20-40	Soft	Low	High	Moderate.
Slickspots	D	None	---	---	3.0-5.0	Apparent	Mar-Jun	>60	---	High	High	Moderate.
In Interior	B	Frequent	Brief	Mar-Oct	>6.0	---	---	>60	---	Low	High	Moderate.
JmB, JmC, JmD Jayem	B	None	---	---	>6.0	---	---	>60	---	Low	Moderate	Low.

TABLE 20.--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				
KeB, KeC---------- Keith	B	None--------	---	---	>6.0	---	---	>80	---	Moderate	Moderate	Low.
Ky, KyC---------- Kyle	D	None--------	---	---	>6.0	---	---	>60	---	Low------	High-----	Moderate.
La---------- Las Animas	C	Occasional	Brief-----	Mar-Aug	1.5-3.0	Apparent	Nov-May	>60	---	Moderate	High-----	Low.
Lb---------- Las Animas	D	Frequent----	Brief-----	Mar-Aug	1.5-3.5	Apparent	Nov-Jun	>60	---	High-----	High-----	Moderate.
Lc:												
Las Animas-------	C	Occasional	Brief-----	Mar-Aug	1.5-3.0	Apparent	Nov-May	>60	---	Moderate	High-----	Low.
Lisco----------	C	Occasional	Brief-----	Feb-Jun	1.5-3.0	Apparent	Feb-May	>80	---	Moderate	High-----	High.
Ld---------- Lisco	C	Occasional	Brief-----	Feb-Jun	1.5-3.0	Apparent	Feb-May	>80	---	Moderate	High-----	High.
Lh---------- Lohmiller	C	Rare--------	---	---	>6.0	---	---	>60	---	Low------	High-----	Moderate.
Lo---------- Lohmiller	C	Frequent----	Brief-----	Mar-Sep	>6.0	---	---	>60	---	Low------	High-----	Moderate.
Ls---------- Lohmiller	C	Occasional	Brief-----	Mar-Sep	>6.0	---	---	>60	---	Low------	High-----	Moderate.
Mr, MrB, MrC, Mt, MtB, MtC, MtD, MtE---------- Mitchell	B	None--------	---	---	>6.0	---	---	>80	---	Low------	Low------	Low.
MxD, MxF:												
Mitchell---------	B	None--------	---	---	>6.0	---	---	>80	---	Low------	Low------	Low.
Epping----------	D	None--------	---	---	>6.0	---	---	10-20	Soft	Low------	Low------	Low.
NrB, NrD---------- Norrest	C	None--------	---	---	>6.0	---	---	20-40	Soft	Low------	High-----	Low.
OgB, OgC, OgD----- Oglala	B	None--------	---	---	>6.0	---	---	40-60	Soft	Moderate	Moderate	Low.
OnD, OnF:												
Oglala----------	B	None--------	---	---	>6.0	---	---	40-60	Soft	Moderate	Moderate	Low.
Canyon----------	D	None--------	---	---	>6.0	---	---	6-20	Soft	Low------	Low------	Low.

TABLE 20.--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				
OpD---------- Olney	B	None--------	---	---	>6.0	---	---	>60	---	Low------	High-----	Low.
OrF---------- Orella	D	None--------	---	---	>6.0	---	---	10-20	Soft	Low------	High-----	Low.
OsG:												
Orella------	D	None--------	---	---	>6.0	---	---	10-20	Soft	Low------	High-----	Low.
Badland------	D	None--------	---	---	>6.0	---	---	0-3	Soft	---	---	---
OwB---------- Otero	B	None--------	---	---	>6.0	---	---	>60	---	Low------	High-----	Low.
Pa---------- Pathfinder	A	Rare--------	---	---	>6.0	---	---	>80	---	Low------	High-----	Moderate.
PhF:												
Phiferson----	B	None--------	---	---	>6.0	---	---	20-40	Soft	Moderate	High-----	Low.
Tassel------	D	None--------	---	---	>6.0	---	---	6-20	Soft	Low------	Low------	Low.
Rock outcrop--	D	None--------	---	---	>6.0	---	---	0	Soft	---	---	---
PrC, PrE---------- Pierre	D	None--------	---	---	>6.0	---	---	20-40	Soft	Low------	High-----	Moderate.
PsD, PsE---------- Ponderosa	B	None--------	---	---	>6.0	---	---	>80	---	Low------	Low------	Low.
PtF:												
Ponderosa----	B	None--------	---	---	>6.0	---	---	>80	---	Low------	Low------	Low.
Tassel------	D	None--------	---	---	>6.0	---	---	6-20	Soft	Low------	Low------	Low.
Vetal-------	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Low.
RkG:												
Rock outcrop--	D	None--------	---	---	>6.0	---	---	0	Soft	---	---	---
Tassel------	D	None--------	---	---	>6.0	---	---	6-20	Soft	Low------	Low------	Low.
SbF:												
Samsil------	D	None--------	---	---	>6.0	---	---	4-20	Soft	Low------	High-----	Moderate.
Pierre------	D	None--------	---	---	>6.0	---	---	20-40	Soft	Low------	High-----	Moderate.
ScG:												
Samsil------	D	None--------	---	---	>6.0	---	---	4-20	Soft	Low------	High-----	Moderate.

TABLE 20.--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				
ScG:												
Rock outcrop-----	D	None--------	---	---	>6.0	---	---	0	Soft	---	---	---
SdD, SdF---------- Sarben	B	None--------	---	---	>6.0	---	---	>80	---	Low------	High-----	Low.
SeB, SeD:												
Sarben-----------	B	None--------	---	---	>6.0	---	---	>80	---	Low------	High-----	Low.
Busher-----------	B	None--------	---	---	>6.0	---	---	40-60	Soft	Low------	Low------	Low.
SfB, SfC---------- Satanta	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Low------	Low.
Sg, SgC----------- Savo	C	None--------	---	---	>6.0	---	---	>60	---	Low------	High-----	Moderate.
SrF--------------- Schamber	A	None--------	---	---	>6.0	---	---	>60	---	Low------	Moderate	Low.
Ss, SsB, Su, SuB-- Scoville	A	None--------	---	---	>6.0	---	---	>60	---	Low------	High-----	Low.
SxE--------------- Skilak	C	None--------	---	---	>6.0	---	---	>60	---	Low------	High-----	Low.
TbG:												
Tassel-----------	D	None--------	---	---	>6.0	---	---	6-20	Soft	Low------	Low------	Low.
Ashollow---------	B	None--------	---	---	>6.0	---	---	>80	---	Low------	Low------	Low.
Rock outcrop-----	D	None--------	---	---	>6.0	---	---	0	Soft	---	---	---
TgF:												
Tassel-----------	D	None--------	---	---	>6.0	---	---	6-20	Soft	Low------	Low------	Low.
Busher-----------	B	None--------	---	---	>6.0	---	---	40-60	Soft	Low------	Low------	Low.
Rock outcrop-----	D	None--------	---	---	>6.0	---	---	0	Soft	---	---	---
TrG:												
Tassel-----------	D	None--------	---	---	>6.0	---	---	6-20	Soft	Low------	Low------	Low.
Ponderosa--------	B	None--------	---	---	>6.0	---	---	>80	---	Low------	Low------	Low.
Rock outcrop-----	D	None--------	---	---	>6.0	---	---	0	Soft	---	---	---
TtB, TtC, TtD----- Thirtynine	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	High-----	Low.

TABLE 20.--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				
Tv, TvB---------- Tripp	B	None---------	---	---	>6.0	---	---	>80	---	Moderate	Low------	Low.
VaB, VaD, VaE----- Valent	A	None---------	---	---	>6.0	---	---	>60	---	Low------	Moderate	Low.
VaF:												
Valent, rolling--	A	None---------	---	---	>6.0	---	---	>60	---	Low------	Moderate	Low.
Valent, hilly----	A	None---------	---	---	>6.0	---	---	>60	---	Low------	Moderate	Low.
VbB, VbD---------- Valent	A	None---------	---	---	>6.0	---	---	>60	---	Low------	Moderate	Low.
VcB, VgB, VgC----- Vetal	B	None---------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Low.
WhB--------------- Wildhorse	A	None---------	---	---	1.5-3.5	Apparent	Nov-May	>80	---	Moderate	High-----	High.

TABLE 21.--ENGINEERING INDEX TEST DATA

(Dashes indicate that data were not available. LL means liquid limit; PI, plasticity index; and NP, nonplastic)

Soil name, report number, horizon, and depth in inches*	AASHTO classification	Grain-size distribution: Percentage passing sieve-- 3/4 inch	3/8 inch	No. 4	No. 10	No. 40	No. 200	Percentage smaller than-- .05 mm	.002 mm	LL	PI	Specific gravity
										Pct		
Bufton clay loam: (S83-NE-165-2)												
B1----- 3 to 10	A-7-6(13)	---	---	---	---	99	84	68	29	42	22	2.66
BCk---- 20 to 28	A-6(12)	---	---	---	---	---	88	75	31	40	21	2.67
Ck----- 28 to 60	A-6(10)	---	---	---	---	---	86	74	23	34	15	2.67
Busher loamy very fine sand: (S84-NE-165-23)												
A------ 0 to 8	A-4(5)	---	---	---	---	---	60	30	7	27	2	2.65
Bw----- 8 to 25	A-4(4)	---	---	---	---	---	55	23	3	NP	NP	2.65
C1----- 25 to 40	A-4(5)	---	---	---	---	100	58	22	3	NP	NP	2.64
C2----- 40 to 50	A-4(4)	---	---	100	99	98	55	21	3	NP	NP	2.64
Epping silt loam: (S82-NE-165-50)												
A------ 0 to 6	A-4(8)	---	---	---	---	100	79	57	13	33	7	2.54
C------ 10 to 15	A-4(8)	---	---	---	---	100	78	56	16	33	9	2.61
Cr----- 15 to 60	A-6(10)	---	---	---	---	96	84	73	6	38	14	2.58
Jayem loamy very fine sand: (S85-NE-165-21)												
A------ 0 to 8	A-4(3)	---	---	---	---	---	51	21	3	NP	NP	2.62
Bw----- 18 to 32	A-4(3)	---	---	---	---	100	50	20	3	NP	NP	2.63
C------ 32 to 60	A-4(3)	---	---	---	---	100	50	21	3	NP	NP	2.63
Kyle silty clay: (S90-NE-165-1)												
Bw1---- 4 to 20	A-7-6(30)	---	---	---	---	---	99	95	58	72	49	2.69
C------ 49 to 60	A-7-6(27)	---	---	---	---	---	97	96	43	70	43	2.77
Mitchell silt loam: (S88-NE-165-78)												
A------ 0 to 5	A-7-5()9)	---	---	---	---	100	93	82	20	42	11	2.51
AC----- 5 to 15	A-7-5()9)	---	---	---	---	99	89	80	21	43	12	2.57
C1----- 15 to 38	A-4(8)	---	---	---	---	100	92	80	17	37	9	2.57
C2----- 38 to 60	A-6(9)	---	---	---	---	99	90	83	21	38	12	2.59

See footnote at end of table.

TABLE 21.--ENGINEERING INDEX TEST DATA--Continued

Soil name, report number, horizon, and depth in inches*	AASHTO classification	Grain-size distribution: Percentage passing sieve-- 3/4 inch	3/8 inch	No. 4	No. 10	No. 40	No. 200	Percentage smaller than-- .05 mm	.002 mm	LL	PI	Specific gravity
										Pct		
Oglala very fine sandy loam: (S84-NE-165-34)												
Ap----- 0 to 7	A-4(8)	---	---	---	---	---	77	45	7	26	NP	2.61
A------ 7 to 13	A-4(8)	---	---	---	---	---	79	47	8	26	NP	2.61
AC----- 13 to 28	A-4(8)	---	---	---	---	---	81	52	5	25	NP	2.65
C------ 28 to 49	A-4(8)	---	---	---	---	---	86	52	6	24	NP	2.65
Orella clay: (S82-NE-165-36)												
A------ 0 to 5	A-7-6(17)	100	98	97	96	91	79	71	20	49	29	2.60
C------ 12 to 18	A-7-6(32)	100	99	99	99	96	90	86	53	79	55	2.63
Cr----- 18 to 60	A-7-6(32)	---	---	---	100	95	86	84	69	95	70	2.61
Pierre clay: (S81-NE-165-19)												
Bw----- 3 to 20	A-7-6(27)	---	---	---	---	99	94	89	45	65	44	2.73
Bky1--- 20 to 29	A-7-6(25)	---	---	---	100	98	92	88	53	63	41	2.74
Cr----- 32 to 60	A-7-6(25)	---	---	---	---	---	99	---	55	64	41	2.69
Samsil clay: (S83-NE-165-29)												
A------ 0 to 4	A-7-6(32)	---	---	---	---	---	99	97	65	82	55	2.69
C1, C2 10 to 17	A-7-5(32)	---	---	---	---	---	99	94	73	113	77	2.74
Cr----- 17 to 30	---	---	---	---	---	---	---	---	---	---	---	---
Tassel loamy very fine sand: (S82-NE-165-52)												
A------ 0 to 6	A-4(4)	---	---	---	---	---	54	30	4	29	1	2.59
C------ 12 to 18	A-4(2)	---	---	---	---	---	45	14	2	NP	NP	2.57
Cr----- 18 to 60	A-4(6)	---	---	---	100	95	63	35	0	30	NP	2.57
Valent fine sand: (S85-NE-165-45)												
A------ 0 to 7	A-3(2)	---	---	---	---	100	7	5	2	NP	NP	2.67
C------ 7 to 60	A-3(2)	---	---	---	---	---	6	4	2	NP	NP	2.70

See footnote at end of table.

TABLE 21.--ENGINEERING INDEX TEST DATA--Continued

Soil name, report number, horizon, and depth in inches*	AASHTO classification	Grain-size distribution: Percentage passing sieve-- 3/4 inch	3/8 inch	No. 4	No. 10	No. 40	No. 200	Percentage smaller than-- .05 mm	.002 mm	LL	PI	Specific gravity
										Pct		
Vetal very fine sandy loam: (S85-NE-165-22)												
A------ 0 to 8	A-4(6)	---	---	---	---	---	66	23	3	NP	NP	2.60
AC1---- 15 to 30	A-4(4)	---	---	---	---	---	56	23	4	NP	NP	2.59
C------ 48 to 60	A-4(4)	---	---	---	---	---	57	31	3	NP	NP	2.62

* The locations of the sampled pedons are as follows:

Bufton clay loam, 2,525 feet north and 1,250 feet west of the southeast corner of sec. 35, T. 34 N., R. 56 W.

Busher loamy very fine sand, 1,650 feet east and 2,200 feet south of the northwest corner of sec. 4, T. 30 N., R. 55 W.

Epping silt loam, 1,400 feet east and 2,300 feet north of the southwest corner of sec. 28, T. 33 N., R. 53 W.

Jayhem loamy very fine sand, 1,500 feet west and 500 feet south of the northeast corner of sec. 16, T. 29 N., R. 57 W.

Kyle silty clay, 2,000 feet east and 2,300 feet north of the southwest corner of sec. 28, T. 35 N., R. 53 W.

Mitchell silt loam, 1,300 feet west and 2,250 feet south of the northeast corner of sec. 4, T. 32 N., R. 53 W.

Oglala very fine sandy loam, 600 feet west and 2,100 feet south of the northeast corner of sec. 14, T. 30 N., R. 55 W.

Orella clay, 1,400 feet east and 200 feet south of the northwest corner of sec. 29, T. 34 N., R. 53 W.

Pierre clay, 1,500 feet west and 1,400 feet south of the northeast corner of sec. 33, T. 35 N., R. 53 W.

Samsil clay, 1,000 feet north and 400 feet east of the southwest corner of sec. 35, T. 35 N., R. 53 W.

Tassel loamy very fine sand, 500 feet east and 700 feet north of the southwest corner of sec. 11, T. 31 N., R. 54 W.

Valent fine sand, 1,700 feet west and 450 feet south of the northeast corner of sec. 7, T. 28 N., R. 57 W.

Vetal very fine sandy loam, 150 feet east and 1,000 feet north of the southwest corner of sec. 22, T. 30 N., R. 57 W.

TABLE 22.--CLASSIFICATION OF THE SOILS

(An asterisk in the first column indicates that the soil is a taxadjunct to the series. See text for a description of those characteristics of the soil that are outside the range of the series)

Soil name	Family or higher taxonomic class
Alice	Coarse-loamy, mixed, mesic Aridic Haplustolls
Alliance	Fine-silty, mixed, mesic Aridic Argiustolls
Arvada	Fine, montmorillonitic, mesic Ustic Natrargids
Ashollow	Coarse-loamy, mixed (calcareous), mesic Aridic Ustorthents
Bahl	Fine, montmorillonitic (calcareous), mesic Ustertic Torriorthents
Bankard	Sandy, mixed, mesic Ustic Torrifluvents
Bayard	Coarse-loamy, mixed, mesic Torriorthentic Haplustolls
Bigwinder	Coarse-loamy, mixed (calcareous), mesic Aeric Fluvaquents
Blueridge	Mixed, mesic Aridic Ustipsamments
Bridget	Coarse-silty, mixed, mesic Torriorthentic Haplustolls
Bufton	Fine, mixed, mesic Aridic Ustochrepts
Busher	Coarse-loamy, mixed, mesic Aridic Haplustolls
Canyon	Loamy, mixed (calcareous), mesic, shallow Ustic Torriorthents
Craft	Coarse-silty, mixed (calcareous), mesic Aridic Ustifluvents
Draknab	Sandy, mixed, mesic Ustic Torrifluvents
Epping	Loamy, mixed (calcareous), mesic, shallow Ustic Torriorthents
Fluvaquents	Fluvaquents
*Glenberg	Coarse-loamy, mixed (calcareous), mesic Ustic Torrifluvents
Hisle	Fine, montmorillonitic, mesic Ustollic Natrargids
Interior	Fine-silty, mixed (calcareous), mesic Ustic Torrifluvents
Jayem	Coarse-loamy, mixed, mesic Aridic Haplustolls
Keith	Fine-silty, mixed, mesic Aridic Argiustolls
*Kyle	Very fine, montmorillonitic, mesic Aridic Haplusterts
Las Animas	Coarse-loamy, mixed (calcareous), mesic Typic Fluvaquents
Lisco	Coarse-loamy, mixed (calcareous), mesic Typic Halaquepts
Lohmiller	Fine, montmorillonitic (calcareous), mesic Ustic Torrifluvents
Mitchell	Coarse-silty, mixed (calcareous), mesic Ustic Torriorthents
Norrest	Fine, montmorillonitic, mesic Ustollic Haplargids
Oglala	Coarse-silty, mixed, mesic Aridic Haplustolls
Olney	Fine-loamy, mixed, mesic Ustollic Haplargids
Orella	Clayey, mixed (calcareous), mesic, shallow Ustic Torriorthents
Otero	Coarse-loamy, mixed (calcareous), mesic Aridic Ustorthents
Pathfinder	Sandy, mixed, mesic Aridic Ustifluvents
Phiferson	Coarse-loamy, mixed, mesic Aridic Haplustolls
Pierre	Fine, smectitic, mesic Aridic Haplusterts
Ponderosa	Coarse-loamy, mixed, mesic Torriorthentic Haplustolls
Samsil	Clayey, montmorillonitic (calcareous), mesic, shallow Ustic Torriorthents
Sarben	Coarse-loamy, mixed, nonacid, mesic Aridic Ustorthents
Satanta	Fine-loamy, mixed, mesic Aridic Argiustolls
Savo	Fine, montmorillonitic, mesic Aridic Argiustolls
Schamber	Sandy-skeletal, mixed, mesic Ustic Torriorthents
Scoville	Mixed, mesic Ustic Torripsamments
Skilak	Fine-silty, mixed (calcareous), mesic Ustic Torriorthents
Tassel	Loamy, mixed (calcareous), mesic, shallow Ustic Torriorthents
Thirtynine	Fine-silty, mixed, mesic Aridic Argiustolls
Tripp	Coarse-silty, mixed, mesic Aridic Haplustolls
Valent	Mixed, mesic Ustic Torripsamments
Vetal	Coarse-loamy, mixed, mesic Pachic Haplustolls
Wildhorse	Sandy, mixed, mesic Typic Halaquepts

Interpretive Groups

INTERPRETIVE GROUPS

(Dashes indicate that the soil was not assigned to the interpretive group)

Map symbol and soil name	Land capability		Prime farmland	Range site	Windbreak suitability group
	N	I			
Ab, AbB---------- Alice	IIIe-3	IIe-8	Yes*	Sandy----------	5
AbC---------- Alice	IVe-3	IIIe-8	Yes*	Sandy----------	5
AcB---------- Alliance	IIe-1	IIe-4	Yes*	Silty----------	3
AcC---------- Alliance	IIIe-1	IIIe-4	Yes*	Silty----------	3
ArB---------- Arvada	VIs-1	---	---	Panspots----------	10
AwD---------- Ashollow	IVe-5	IVe-10	---	Sandy----------	8
AwE---------- Ashollow	VIe-5	---	---	Sandy----------	8
Ba---------- Badland	VIIIs-8	---	---	None----------	10
BbB---------- Bahl	IVs-2	---	---	Clayey----------	4C
Bc---------- Bankard	IVw-5	IVw-11	---	Sandy Lowland--------	7
Bd---------- Bankard	VIw-7	---	---	Shallow to Gravel----	10
Be, BeB---------- Bayard	IIIe-3	IIe-8	Yes*	Sandy----------	5
BeC---------- Bayard	IVe-3	IIIe-8	Yes*	Sandy----------	5
Bh---------- Bigwinder	VIw-7	---	---	Wet Land----------	10
BoG---------- Blueridge	VIIs-4	---	---	Shallow to Gravel----	10
BpE:					
Blueridge----------	VIs-4	---	---	Shallow to Gravel----	10
Bayard----------	VIe-3	---	---	Sandy----------	5
BrC---------- Bridget	IIIe-3	IIIe-6	Yes*	Silty----------	3
BrD---------- Bridget	IVe-3	IVe-6	---	Silty----------	3
BrF---------- Bridget	VIe-3	---	---	Silty----------	10

See footnote at end of table.

INTERPRETIVE GROUPS--Continued

Map symbol and soil name	Land capability		Prime farmland	Range site	Windbreak suitability group
	N	I			
Bs Bufton	IIIs-2	IIIs-3	Yes*	Clayey	4L
BsB Bufton	IIIe-1	IIIe-3	Yes*	Clayey	4L
BsD Bufton	IVe-1	IVe-3	---	Clayey	4L
BsE Bufton	VIe-1	---	---	Clayey	4L
BuB Busher	IIIe-5	IIIe-10	---	Sandy	5
BuC Busher	IVe-5	IVe-10	---	Sandy	5
BuD Busher	IVe-5	IVe-10	---	Sandy	5
BwC:					
Busher	IVe-5	IVe-10	---	Sandy	5
Phiferson	IVe-5	IVe-10	---	Sandy	6R
BxC:					
Busher	IVe-5	IVe-10	---	Sandy	5
Tassel	VIs-4	---	---	Shallow Limy	10
BxE:					
Blueridge	VIe-5	---	---	Sandy	7
Tassel	VIs-4	---	---	Shallow Limy	10
Cr Craft	IIc-1	I-6	Yes*	Silty Lowland	1L
Cs Craft	IIw-3	IIw-6	Yes*	Silty Overflow	1L
Ct Craft	VIw-7	---	---	Silty Overflow	10
DpB Draknab	IVe-5	IVe-11	---	Sandy Lowland	7
EpF Epping	VIs-4	---	---	Shallow Limy	10
EsG:					
Epping	VIs-4	---	---	Shallow Limy	10
Badland	VIIIs-8	---	---	None	10
Fu Fluvaquents	VIIIw-7	---	---	None	10
Go Glenberg	IIIe-3	IIe-8	Yes*	Sandy Lowland	1L
Gp Glenberg	VIw-7	---	---	Sandy Lowland	10

See footnote at end of table.

INTERPRETIVE GROUPS--Continued

Map symbol and soil name	Land capability N	Land capability I	Prime farmland	Range site	Windbreak suitability group
HsC:					
Hisle	VIs-1	---	---	Panspots	10
Slickspots	VIIIs-8	---	---	None	---
In Interior	VIw-7	---	---	Saline Lowland	10
JmB Jayem	IIIe-5	IIIe-10	---	Sandy	5
JmC Jayem	IVe-5	IVe-10	---	Sandy	5
JmD Jayem	IVe-5	IVe-10	---	Sandy	5
KeB Keith	IIe-1	IIe-4	Yes*	Silty	3
KeC Keith	IIIe-1	IIIe-4	Yes*	Silty	3
Ky Kyle	IVs-2	IVs-1	---	Clayey	4C
KyC Kyle	IVe-4	---	---	Clayey	4C
La Las Animas	IIIw-6	IIIw-8	Yes*	Subirrigated	2S
Lb Las Animas	VIw-7	---	---	Subirrigated	10
Lc:					
Las Animas	IIIw-6	IIIw-8	---	Subirrigated	2S
Lisco	VIs-1	---	---	Saline Subirrigated	10
Ld Lisco	VIs-1	---	---	Saline Subirrigated	10
Lh Lohmiller	IIIc-1	IIIe-3	Yes*	Clayey Overflow	1L
Lo Lohmiller	VIw-7	---	---	Clayey Overflow	10
Ls Lohmiller	IIIw-2	IIIw-1	---	Clayey Overflow	1L
Mr Mitchell	IIIc-1	IIe-6	Yes*	Limy Upland	8
MrB Mitchell	IIIe-3	IIe-6	Yes*	Limy Upland	8
MrC Mitchell	IIIe-3	IIIe-6	Yes*	Limy Upland	8
Mt Mitchell	IIc-1	I-6	Yes*	Limy Upland	8

See footnote at end of table.

INTERPRETIVE GROUPS--Continued

Map symbol and soil name	Land capability N	Land capability I	Prime farmland	Range site	Windbreak suitability group
MtB---------- Mitchell	IIe-9	IIe-6	Yes*	Limy Upland----------	8
MtC---------- Mitchell	IIIe-9	IIIe-6	Yes*	Limy Upland----------	8
MtD---------- Mitchell	IVe-9	IVe-6	---	Limy Upland----------	8
MtE---------- Mitchell	VIe-9	---	---	Limy Upland----------	8
MxD:					
Mitchell----------	IVe-3	IVe-6	---	Limy Upland----------	8
Epping----------	VIs-4	---	---	Shallow Limy---------	10
MxF:					
Mitchell----------	VIe-9	---	---	Limy Upland----------	10
Epping----------	VIs-4	---	---	Shallow Limy---------	10
NrB---------- Norrest	IIIe-1	IIIe-3	---	Clayey---------------	4L
NrD---------- Norrest	IVe-1	IVe-3	---	Clayey---------------	4L
OgB---------- Oglala	IIe-3	IIe-6	Yes*	Silty----------------	3
OgC---------- Oglala	IIIe-3	IIIe-6	Yes*	Silty----------------	3
OgD---------- Oglala	IVe-3	IVe-6	---	Silty----------------	3
OnD:					
Oglala----------	IVe-3	IVe-6	---	Silty----------------	3
Canyon----------	VIs-4	---	---	Shallow Limy---------	10
OnF:					
Oglala----------	VIe-3	---	---	Silty----------------	3
Canyon----------	VIs-4	---	---	Shallow Limy---------	10
OpD---------- Olney	IVe-1	IIIe-4	---	Silty----------------	3
OrF---------- Orella	VIs-4	---	---	Saline Upland--------	10
OsG:					
Orella----------	VIs-4	---	---	Saline Upland--------	10
Badland----------	VIIIs-8	---	---	None-----------------	10
OwB---------- Otero	IVe-5	IIIe-10	---	Sandy----------------	8
Pa---------- Pathfinder	VIs-1	IVs-11	---	Saline Lowland-------	9N

See footnote at end of table.

INTERPRETIVE GROUPS--Continued

Map symbol and soil name	Land capability		Prime farmland	Range site	Windbreak suitability group
	N	I			
PhF:					
Phiferson	VIe-5	---	---	Sandy	6R
Tassel	VIs-4	---	---	Shallow Limy	10
Rock outcrop	VIIIs-8	---	---	None	10
PrC Pierre	IVe-4	---	---	Clayey	4C
PrE Pierre	VIe-4	---	---	Clayey	4C
PsD Ponderosa	IVe-5	IVe-10	---	Sandy	5
PsE Ponderosa	VIe-5	---	---	Sandy	5
PtF:					
Ponderosa	VIe-5	---	---	Sandy	10
Tassel	VIs-4	---	---	Shallow Limy	10
Vetal	IVe-5	---	---	Sandy	5
RkG:					
Rock outcrop	VIIIs-8	---	---	None	10
Tassel	VIs-4	---	---	Shallow Limy	10
SbF:					
Samsil	VIs-4	---	---	Shallow Clay	10
Pierre	VIe-4	---	---	Clayey	4C
ScG:					
Samsil	VIs-4	---	---	Shallow Clay	10
Rock outcrop	VIIIs-8	---	---	None	10
SdD Sarben	IVe-5	IVe-10	---	Sandy	5
SdF Sarben	VIe-5	---	---	Sandy	10
SeB:					
Sarben	IIIe-3	IIIe-10	---	Sandy	5
Busher	IIIe-5	IIIe-10	---	Sandy	5
SeD Sarben-Busher	IVe-3	IVe-10	---	Sandy	5
SfB Satanta	IIe-3	IIe-5	Yes*	Silty	3
SfC Satanta	IIIe-3	IIIe-5	Yes*	Silty	3
Sg Savo	IIc-1	I-3	Yes*	Silty	3
SgC Savo	IIe-1	IIe-3	Yes*	Silty	3
SrF Schamber	VIs-4	---	---	Shallow to Gravel	10

See footnote at end of table.

INTERPRETIVE GROUPS--Continued

Map symbol and soil name	Land capability N	Land capability I	Prime farmland	Range site	Windbreak suitability group
Ss, SsB---------- Scoville	VIe-5	IVe-10	---	Sandy----------	7
Su, SuB---------- Scoville	IVe-5	IVe-10	---	Sandy----------	5
SxE---------- Skilak	VIe-1	---	---	Limy Upland----------	8
TbG:					
Tassel----------	VIIs-4	---	---	Shallow Limy----------	10
Ashollow----------	VIe-5	---	---	Sandy----------	10
Rock outcrop----------	VIIIs-8	---	---	None----------	10
TgF:					
Tassel----------	VIs-4	---	---	Shallow Limy----------	10
Busher----------	VIe-5	---	---	Sandy----------	7
Rock outcrop----------	VIIIs-8	---	---	None----------	10
TrG:					
Tassel----------	VIIs-4	---	---	Shallow Limy----------	10
Ponderosa----------	VIIe-5	---	---	Sandy----------	10
Rock outcrop----------	VIIIs-8	---	---	None----------	10
TtB---------- Thirtynine	IIe-1	IIe-4	Yes*	Silty----------	3
TtC---------- Thirtynine	IIIe-1	IIIe-4	Yes*	Silty----------	3
TtD---------- Thirtynine	IVe-1	IVe-4	---	Silty----------	3
Tv---------- Tripp	IIIc-1	IIe-6	Yes*	Silty----------	3
TvB---------- Tripp	IIIe-3	IIe-6	Yes*	Silty----------	3
VaB---------- Valent	VIe-5	IVe-12	---	Sandy----------	7
VaD---------- Valent	VIe-5	IVe-12	---	Sands----------	7
VaE---------- Valent	VIe-5	---	---	Sands----------	7
VaF:					
Valent, rolling----------	VIe-5	---	---	Sands----------	7
Valent, hilly----------	VIIe-5	---	---	Choppy Sands----------	10
VbB---------- Valent	VIe-5	IVe-11	---	Sandy----------	7
VbD---------- Valent	VIe-5	IVe-11	---	Sands----------	7
VcB---------- Vetal	IIIe-3	IIe-8	---	Sandy----------	5

See footnote at end of table.

INTERPRETIVE GROUPS--Continued

Map symbol and soil name	Land capability		Prime farmland	Range site	Windbreak suitability group
	N	I			
VgB---------- Vetal	IIe-3	IIe-8	Yes*	Sandy----------	5
VgC---------- Vetal	IIIe-3	IIIe-8	Yes*	Sandy----------	5
WhB---------- Wildhorse	VIs-1	---	---	Saline Subirrigated--	10

* Where irrigated.

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