

SOIL SURVEY OF

Central Plains Experimental Range Weld County, Colorado



Compiled by: Michael Petersen, USDA-NRCS

**Cooperators: USDA Natural Resources Conservation Service, Colorado State
University Experiment Station, USDA Agricultural Research Service**

**Fieldwork by: M. Petersen (NRCS), E.F. Kelly (CSU), S.W. Blecker (CSU),
C.M. Yonker (CSU)**

Feb. 4, 1994

HOW THIS SURVEY WAS MADE

Soil Scientists made this updated soil survey to learn what kinds of soils occur on the Central Plains Experimental Range Station, about eight miles due north of Nunn, Colorado, are where the soils are located and how they can be better understood for research. The soil scientists went into the area knowing they would find several of the soils already observed from the early 1970's progressive soil survey and perhaps some they had not. As they traversed the landscape, they observed the drainage and the various native plants, kinds of rock, slope, surface stoniness and many other facts about the soils. They dug or bored holes to a depth of 2 meters or to bedrock to expose soil profiles. A profile is the sequence of natural layers, or horizons, in a soil; it extends from the surface down into the parent material that has not been changed to any great extent from leaching or by the action of plant roots.

The soil scientists made comparisons among the profiles they observed, and compared these profiles with those in surrounding county, counties and other states. They classified and named soils according to the nationwide, uniform procedures set by the National Cooperative Soil Survey program. The soil series and the soil phase are the categories of the classification system used in this soil survey.

Soils that have profiles almost alike make up a soil series. Except for different textures in the surface layer, all soils of one series have major horizons that are similar in thickness, arrangement, and other important characteristics. Each soil series named generally for a geographical point, landmark or town. Owl Creek and Olney are the names of two soil series delineated on the CPER. The Owl Creek is named from one of the major drainages in the CPER and Olney from small community north of La Junta, Colorado. All the soils occurring in the United States having the same name are essentially alike in those characteristics that affect their behavior in the landscape.

Soil of one series can differ in texture of the surface layer and in slope, or some other characteristic that affects use of the soils by man. On the basis of such differences, a soil series is divided into phases. The name of a soil phase indicates a feature that affects management. For example, Remmit loamy sand, 2 to 5 percent slopes is a phase of the Remmit series.

After documenting many soil characteristics, observing similar and dissimilar landscapes where soils reside, classifying these soils, the soil scientists drew boundaries of the individual soil units on aerial photographs. These photographs show creeks, buildings, field borders, trees, fence lines, roads, rock outcrops and other details that help in delineating boundaries accurately.

The areas shown on a soil map are called mapping units. A mapping unit consists of soils similar to the soil phase and some soils that vary in thickness of the subsoil, depth to calcareous materials, thickness of the surface layer and texture, but not enough that it resides outside the soil series range of characteristics. That is the dominant portion of the soil phase, called the component. Also in the soil mapping unit the soil scientists observed dissimilar soils that have strong enough

differences that they would not be named the same but reside in similar positions on the landscape. Their differences might be more fragments of rock throughout the soil profile, depth to shale bedrock within 30 inches of the soil surface and so on. These soils occurring in the soil mapping unit are inclusions unless they make up more than 20 percent of the entire mapping unit's composition, then these dissimilar soils can be identified as another component in the mapping unit - thus a complex mapping unit. An example of this, Ulm-Renohill complex, 5 to 9 percent slopes. Other mapping units are made up of soils of different series and combinations with rock outcrops.

While a soil survey is in progress, soil scientists take soil samples needed for measurements and for engineering tests. Laboratory data from the same kind of soil in other places are also assembled. Data on yields of crops or native vegetation may be gathered too. Yields under defined management are estimated for the soils suitable for a crop.

Soil scientists observe how soils behave when used as a growing medium for native and cultivated plants, and as material for structures, foundations for structures or for covering of landfills. For example, they observe that soil material from heavy textured, expansive soils will make poor quality road materials due to the shrink-swell capacity of the soil, and clay percentage of the various layers of a specific soil. They have observed road pavements, and foundations for houses are cracked on a specific soil and relate this phenomena to the high potential for shrink-swell. Thus, they use observation and knowledge of soil physical and chemical properties, together with available research data, to predict limitations and or potentials for suitability of soils for uses.

HOW TO USE THIS INTERIM REPORT

This interim report contains information that can be applied in managing ranches, and non irrigated farmlands; helping in selecting sites for roads, ponds, buildings and other structures; and in judging the suitability of tracts of land for wildlife and recreation.

Locating Soils:

All the soils of the CPER are shown on the detailed maps in conjunction with this report. This map may consist of several sheets made from aerial photographs. On each sheet of the detailed map, soil areas are delineated and are identified by symbols. All areas marked with the same symbol in this survey area are similar soils. The soil symbol is inside the area if there is enough room to write the symbol; otherwise it is outside with a pointer showing where the symbol belongs. This symbol is to be referred to a legend providing you the user the name of the soil mapping unit and where you can read more about the composition of said mapping unit within this report.

Using the Soil Legend to Find Interpretations and Information

The soil legend can be used to find the interpretation sheet for a specific kind of soil. The soil legend lists in numerical order all of the symbols that appear on the soil map. The following is an example of how to go from the soil map to the interpretation sheets. Say that you

are interested in an area of land that is mapped with symbol 15. Your first step is to go from the soil map to the soil legend and find the name of the soil that is shown by map unit symbol 15. The mapping unit is Pleasant-Entic Haplusterts complex, 0 to 1 percent slope. Next, turn to the soil interpretation sheets that are arranged numerically and find the interpretation sheet for the Pleasant series portion. Since there is two portions or phases of this complex there are interpretations for both components.

Kinds of Interpretations and Information in this Report

Before using the information listed on the soil interpretation sheets, read and become familiar with the explanations of the individual interpretation sheets given in the section, " Use and Explanation of Soil Interpretation Sheets".

The interpretation sheets are a key source of the information written in this report. Each of the interpretaion sheets provides a brief description of the soil. This is followed by a section on the estimated physical and chemical properties of the soil. Other information and interpretations given are the land use capability, and climatic factors.

Preparing Interpretive Maps from the Soil Maps

Individual maps showing the relative limitations of soils for many specific purposes can be developed by using the soil map and the interpretations. Ratings can be shown visually by coloring soil maps or transparent overlays or use digitallly prepared spatial information to the traffic light color connotations to point out limitations for a specific use. A map or overlay or digital theme can be made in this manner for dwellings, roadfill or for any of the other uses the soils are rated for. For example, soil areas that have a slight limitations for a given use can be colored green, those with a moderate limitation could be colored yellow, those with severe limitations could be colored red and those with a very severe limitation could be colored purple to contrast with the traffic light colors. Once the interpretive map is complete, the patterns of the soil limitations are readily apparent. The user can quickly select areas that have a potential for a particular type of development and at the same time identify the areas where the potentials are very low.

Use and Explanation of Soil Interpretation Sheets

The interpretation sheets should be used only with soil surveys of medium or detailed intensity, that have been prepared according to standard procedures of the National Cooperative Soil Survey. It is not intended that they be used with "Land-Type Surveys", low intensity surveys, or general soil maps. The interpretations are for soils in their natural state and not for disturbed areas that are altered by cut or fill operations, or by drainage.

The soil interpretations will not eliminate the need for on-site sampling, testing, and the study of specific sites for design and construction of engineering works and various uses. The interpretation sheets should be used primarily to plan more detailed field investigations to determine the conditions of the soil at the proposed site fro the intended use.

When the interpretation sheets are used in connection with delineated soil areas on the soil maps, the information pertains to the dominant soil for which the soils are named. Other soils, too small an area to map out may occur within the soil map area. The interpretations ordinarily do not apply to the included soils. More studies are required if small, specific sites are to be developed or used within the given soil area. For example, a soil map bearing the name Olney-Owlcreek also can include small, unmappable areas of other soils such as Vona and Ustic Torrifuvents. The interpretations apply only to the Olney and Owlcreek parts of the delineated soil area, and not to the entire soil area.

rev. 6/93
Altvan Series

The Altvan series consists of very deep, well drained soils on convex shoulders, ridge tops and valley sideslopes. These soils formed in colluvium from mixed sources. Slopes are 2 to 6 percent. Elevation is 5000 to 5400 feet. The average annual precipitation is about 13 inches, average annual air temperature is 47 degrees F., and the average annual frost free season is about 120 days.

These soils are fine-loamy over sandy-skeletal, mixed, mesic, Aridic Argiustolls

Typical pedon of Altvan sandy loam, in an area of Otero-Altvan complex, 2 to 6 percent slopes; about 2000 feet west and 300 feet south of the northeast corner sec. 17, T.10N., R.65W..

A--0 to 5 inches; brown (10YR 5/3), sandy loam, dark grayish brown (10YR 3/3) moist; moderate fine granular structure; soft, very friable, nonsticky and nonplastic; common fine, very fine roots; 2 percent gravels, neutral; clear smooth boundary.

Bt1--5 to 11 inches; grayish brown (10YR 5/2), sandy clay loam, dark brown (10YR 3/3) moist; weak medium prisms parting to weak medium subangular blocky structure; hard, friable, sticky and slightly plastic; few to common (7 to 12 %) faint, discontinuous, thin clay bridging of sand grains; common fine and very fine roots; 5 percent gravel; neutral; clear wavy boundary.

Bt2--11 to 21 inches; pale brown (10YR 6/3) sandy clay loam, brown (10YR 4/3) moist; weak medium prismatic parting to weak medium and fine subangular blocky structure; hard, friable, sticky and plastic; common (10 to 15 %) discontinuous patchy clay films in and around pores; few very fine roots; 13 percent gravel; slightly alkaline; clear smooth boundary.

Bk--21 to 24 inches; light yellowish brown (10YR 6/4) sandy loam, yellowish brown (10YR 5/4) moist; moderate fine subangular blocky structure; hard, very friable, slightly sticky, slightly plastic; common, continuous, prominent, thin coatings of secondary calcium carbonate on underneath sides of coarse fragments; few very fine roots; 12 percent gravel; violently effervescent, moderately alkaline; abrupt wavy boundary.

2C--24 to 60 inches; very pale brown (10YR 7/4, 7/3) very gravelly sand, pale brown (10YR 6/3) moist; single grained, loose, non sticky and non plastic; 30 percent gravel, 6 percent cobble; violently effervescent, moderately alkaline.

Range in Characteristics:

Thickness to the base of the argillic horizon(s) is 14 to 26 inches. Rock fragments make up 0 to 15 percent by volume above the lithologic change. Depth to lithologic discontinuity is 20 to 40 inches. There may be A, AB and C horizons present.

A horizon: Percent clay is 10 to 20 percent. Reaction is neutral or slightly acid. Rock fragments make up 0 to 10 percent by volume. Hues are 10YR, values 4 to 5 dry, 2 or 3 moist, and chromas 2 or 3.

Bt horizons: Percent clay ranges from 20 to 35 percent. Reaction is slightly alkaline. Hues are 10YR, values 4 through 6 dry, 3 or 4 moist, and chromas 2 or 3.

2C horizons: Percent clay is 1 to 9 percent. Reaction is neutral to moderately alkaline. Rock fragments make up 35 to 80 percent by volume.

rev. 6/93
Arvada Series

The Arvada series consists of very deep, well drained soils on concave low terraces and alluvial flats. These soils formed in alluvium from mixed sources. Slopes are 0 to 2 percent. Elevation is 4800 to 5000 feet. The average annual precipitation is about 13 inches, average annual air temperature is 47 degrees F., and the average annual frost free season is about 120 days.

These soils are fine, montmorillonitic, mesic, Ustollic Natrargids

Typical pedon of Arvada sandy clay loam, in an area of Aravda-Manzanola complex, 0 to 2 percent slopes; about 500 feet north and 400 feet east of the southwest corner sec. 13, T.10N., R.66W..

E--0 to 1 inches; light gray (10YR 7/2), sandy clay loam, dark yellowish brown (10YR 4/4) moist; moderate medium subangular blocky structure; hard, firm; sticky and plastic; few very fine roots; moderately alkaline; abrupt smooth boundary.

Ey--1 to 3 inches; pale brown (10YR 6/3), clay loam, brown (10YR 4/3) moist; moderate coarse subangular blocky structure; hard, very firm, sticky and plastic; common, fine seams and threads of salts; common fine and very fine roots; strongly alkaline; abrupt smooth boundary.

Bt_{ny}1--3 to 9 inches; dark grayish brown (10YR 4/2), clay, very dark grayish brown (10YR 3/2) moist; moderate medium subangular blocky structure; very hard, firm, very sticky and very plastic; few (5 to 10%) discontinuous, patchy clay films on the faces of peds; tops of blocks have powdery form of salts when dry; common, distinct fine and medium seams and tubular filled pores with sodium salts; many very fine and common fine roots; strongly effervescent, strongly alkaline; clear smooth boundary.

Bt_{ny}2--9 to 20 inches; pale brown (10YR 6/3) clay, brown (10YR 5/3) moist; weak medium and coarse subangular blocky structure; hard, very firm; very sticky and very plastic; few (5 to 8 %) discontinuous, thin tubular filaments of salt; common (8 to 12%) continuous, patchy, thin clay films around the pores, and common (10 to 15%) discontinuous, patchy clay bridging; few medium, fine and common very fine roots; strongly effervescent, very strongly alkaline; clear wavy boundary.

Bt_{ny}3--20 to 26 inches; pale brown (10YR 6/3) clay, yellowish brown (10YR 5/4) moist; weak coarse subangular blocky structure; hard, very firm, very sticky and very plastic; few (4 to 8%) discontinuous, thin clay films around the pores, and few (5 to 10%) discontinuous clay bridging; few fine and very fine roots; few to common (8 to 10%) discontinuous, thin tubular filaments of salt; strongly effervescent, strongly alkaline; clear smooth boundary.

Bt_{ny}4--26 to 32 inches; very pale brown (10YR 7/3) clay, brown (10YR 5/3) moist; weak coarse subangular blocky structure; very hard, very firm, very sticky and very plastic; few (4 to 8%) discontinuous, thin clay films on faces of peds; few very fine roots; common (10 to 15%)

discontinuous, thin tubular filaments and streaks of sodium salts; strongly effervescent, very strongly alkaline; clear smooth boundary.

Btkny--32 to 54 inches; very pale brown (10YR 7/3) clay loam, brown (10YR 5/3) moist; weak medium prismatic structure; hard, firm, very sticky, very plastic; few (<5%) discontinuous, thin clay films in and around pores; common (10%) medium, irregular shaped carbonate and salt spots on sides of ped faces; few fine and very fine roots; strongly effervescent; very strongly alkaline; clear wavy boundary.

Bkny--54 to 63 inches; very pale brown (10YR 7/3) clay loam, brown (10YR 5/3) moist; massive; hard; firm; sticky, plastic; 5 to 8 percent medium irregular shaped carbonate and salt spots on ped faces; few very fine roots; strongly effervescent, strongly alkaline; clear smooth boundary.

Bnyg--63 to 74 inches; light brownish gray (10YR 6/2) stratified loamy sand to clay loam, brown (10YR 5/3) moist; massive; slightly hard, friable; common, fine prominent olive (5Y 5/6) mottles; slightly sticky and slightly plastic; few to common (4 to 10%) distinct, fine tubular filaments and seams of sodium salts; few (<3%) irregular blotches of carbonates in soil matrix and between strata; strongly effervescent, strongly alkaline.

Range in Characteristics:

Depth to the bottom of the argillic horizon(s) is 30 to 54 inches. Rock fragments make up 0 to 10 percent by volume throughout the upper 60 inches. The subsoil contains 10 to 30 percent sodium absorption ratio. Within the upper 15 inches the ESP is less than 15. There may be Bg and C horizons present.

E horizon: Percent clay is 20 to 33 percent. Reaction is strongly alkaline. Hues are 2.5Y and 10YR, values 5 to 7 dry, 4 or 5 moist, and chromas 2 to 4.

Btn horizons: Rock fragments make up 0 to 10 percent by volume. Percent clay is 35 to 48 percent. Reaction is strongly alkaline to very strongly alkaline. Hues are 2.5Y and 10YR, values 6 or 7 dry, 4 or 5 moist, and chromas 2 through 4. Sodium salts do occur on tops of the columnar and prismatic structure and throughout.

Bk horizons: Percent clay is 30 to 45 percent. Reaction is strongly to very strongly alkaline. Rock fragments make up 0 to 10 percent by volume. Secondary salts are visible. An apparent water table is seasonal below depths of 58 inches during the months of May through July.

rev. 6/93
Ascalon Series

The Ascalon series consists of very deep, well drained soils on convex alluvial flats and upland Plains. These soils formed in alluvium from mixed sources. Slopes are 0 to 5 percent. Elevation is 4800 to 5400 feet. The average annual precipitation is about 13 inches, average annual air temperature is 47 degrees F., and the average annual frost free season is about 120 days.

These soils are fine-loamy, mixed, mesic, Aridic Argiustolls

Typical pedon of Ascalon fine sandy loam, in an area of Ascalon fine sandy loam, 0 to 2 percent slopes; about 450 feet east and 275 feet north of the southwest corner sec. 28, T.10N., R.66.

A--0 to 6 inches; brown (10YR 5/3), fine sandy loam, dark grayish brown (10YR 3/3) moist; moderate fine and medium granular structure; soft, very friable, slightly sticky and slightly plastic; common fine, very fine and few medium roots; neutral; abrupt smooth boundary.

AB--6 to 10 inches; brown (10YR 5/3) loam, very dark grayish brown (10YR 3/2) moist; weak fine subangular blocks parting to moderate fine and medium granular structure; soft, very friable, slightly sticky and slightly plastic; common fine and very fine roots; slightly alkaline; clear smooth boundary.

Bt1--10 to 17 inches; yellowish brown (10YR 5/4), ^{sandy} clay loam, brown (10YR 4/3) moist; moderate medium and fine prisms parting to moderate medium subangular blocky structure; slightly hard, friable, sticky and plastic; few to common (5 to 12%) discontinuous, patchy clay films on the faces of peds and few (<5%) continuous, patchy clay films in and around the pores; common very fine and few fine roots; slightly alkaline; clear wavy boundary.

Bt2--17 to 25 inches; yellowish brown (10YR 5/4), ^{sandy} clay loam, dark yellowish brown (10YR 4/4) moist; moderate medium prisms parting to moderate medium subangular blocky structure; slightly hard, friable, sticky and plastic; few (<10%) discontinuous, thin clay films on the faces of peds and common (10 to 13%) discontinuous, thin clay films in and around the pores; few fine and very fine roots; slightly alkaline; gradual smooth boundary.

Bk--25 to 32 inches; light yellowish brown (10YR 6/4) loam, dark yellowish brown (10YR 4/4) moist; weak medium prisms parting to weak coarse subangular blocky structure, soft, very friable, slightly sticky and slightly plastic; few (<3%) prominent medium sized carbonates on sides of ped faces; strongly effervescent, slightly alkaline; gradual wavy boundary.

C--32 to 63 inches; pale brown (10YR 6/3) sandy loam, brown (10YR 5/3) moist; weak coarse subangular blocky structure; soft, very

friable, non sticky and non plastic; slightly effervescent, slightly alkaline.

Range in Characteristics:

Thickness to the base of the argillic is 26 to 36 inches. Rock fragments make up 0 to 15 percent by volume throughout the soil profile. The subsoil contains 22 to 35 percent clay. There may be Bk, BC and C horizons present.

A horizon: Percent clay is 10 to 24 percent. Reaction is neutral to slightly alkaline. Hues are 10YR, values 4 or 5 dry, 2 or 3 moist, and chromas 1 to 3.

Bt horizons: Rock fragments make up 0 to 10 percent by volume. Percent clay is 24 to 35 percent. Reaction is neutral to slightly alkaline. Hues are 10YR, values 5 or 6 dry, 3 through 4 moist, and chromas 2 through 4.

Bk or C horizons: Percent clay is 15 to 25 percent. Reaction is neutral to slightly alkaline. Rock fragments make up 0 to 15 percent by volume.

rev. 6/93
Avar Family

The Avar series consists of very deep, well drained soils on convex and concave low terraces and alluvial flats. These soils formed in alluvium from mixed sources. Slopes are 0 to 2 percent. Elevation is 4800 to 5000 feet. The average annual precipitation is about 13 inches, average annual air temperature is 47 degrees F., and the average annual frost free season is about 120 days.

These soils are fine-loamy, mixed, mesic, Ustollic Natrargids

Typical pedon of Avar fine sandy loam, in an area of Avar-Manzanola complex, 0 to 2 percent slopes; about 1900 feet south and 600 feet west of the northeast corner sec. 7, T.10N., R.65W..

A--0 to 5 inches; brown (10YR 5/3), fine sandy loam, very dark grayish brown (10YR 3/2) moist; moderate fine granular structure; soft, very friable, slightly sticky and slightly plastic; many medium and fine, common very fine roots; slightly effervescent, moderately alkaline; abrupt smooth boundary.

Btn1--5 to 12 inches; light yellowish brown (10YR 6/4), clay loam, yellowish brown (10YR 5/4) moist; moderate medium columns parting to moderate medium and fine subangular blocky structure; hard, firm, very sticky and very plastic; common to many (10 to 20%) discontinuous, moderately thick clay films in and around pores, few (5 to 10%) continuous, thin to patchy clay films; common (12%) distinct soft, powdery forms of salt on tops of the columns, common fine and few very fine roots; strongly effervescent; strongly alkaline; clear smooth boundary.

Btn2--12 to 19 inches; very pale brown (10YR 7/4) sandy clay loam, light yellowish brown (10YR 6/4) moist; weak medium prismatic parting to weak to moderate medium subangular blocky structure; hard, firm; very sticky and very plastic; few to common (5 to 12%) discontinuous, patchy clay films in and around pores, and common to many (15 to 20%) discontinuous, thin clay bridging; few medium, fine roots and common very fine roots; 3 to 7 percent secondary carbonates as tubular filaments; 5 to 8 percent of matrix contains thin tubular filaments of salt, violently effervescent, strongly alkaline; clear wavy boundary.

Bk1--19 to 34 inches; very pale brown (10YR 7/3) loam, light yellowish brown (10YR 6/4) moist; weak medium prismatic structure; soft; friable, sticky, plastic; few to common (5 to 10%) medium irregular shaped carbonate and salt spots; few fine and medium and common very fine roots; violently effervescent; strongly alkaline; clear wavy boundary.

Bk2--34 to 45 inches; very pale brown (10YR 7/3) loam, light yellowish brown (10YR 6/4) moist; weak coarse prismatic structure; soft; friable, sticky, plastic; common (8 to 15%) medium irregular shaped carbonate and salt spots on faces of peds; few fine, medium and very fine roots; violently effervescent, strongly alkaline; gradual wavy boundary.

BC--45 to 72 inches; pale brown (10YR 6/3) fine sandy loam, yellowish brown (10YR 5/4) moist; weak coarse subangular blocky structure, slightly hard, very friable, slightly sticky and slightly plastic; few, fine distinct dark brown (7.5YR 3/2) spots around manganese and iron concretions; violently effervescent, strongly alkaline.

Range in Characteristics:

Thickness to the base of the natric horizon is 12 to 21 inches. Rock fragments make up 0 to 15 percent by volume throughout the soil profile. The natric horizon contains less than 35% clay. The subsoil contains 5 to 25 percent sodium absorption ratio. There may be BC and C horizons present.

A horizon: Percent clay is 10 to 19 percent. Reaction is strongly alkaline. Hues are 10YR, values 5 to 7 dry, 3 to 4 moist, and chromas 2 to 4.

Btn horizons: Rock fragments make up 0 to 10 percent by volume. Percent clay is 27 to 35 percent. Reaction is moderately alkaline to very strongly alkaline. Hues are 10YR, values 6 or 7 dry, 4 through 6 moist, and chromas 2 through 4. Sodium salts may occur on tops of the columnar and prismatic structure. Sodium adsorption ratio ranges from 9 to 25.

BC or C horizons: Percent clay is 15 to 25 percent. Reaction is strongly to very strongly alkaline. Rock fragments make up 0 to 10 percent by volume.

rev. 6/93

Ustic Torrifluvents, sandy-skeletal

These soils consists of very deep, well to somewhat excessively drained soils on alluvial bottoms. These soils formed in alluvium from mixed sources. Slopes are 0 to 2 percent. Elevation is 4800 to 5100 feet. The average annual precipitation is about 13 inches, average annual air temperature is 49 degrees F., and the average annual frost free season is about 120 days.

These soils are sandy-skeletal, mixed, mesic, Ustic Torrifluvents

Typical pedon of Ustic Torrifluvents sand, in an area of Ustic Torrifluvents, 0 to 2 percent slopes; about 2750 feet west and 1700 feet north of the southeast corner sec. 2, T.10N., R.65W..

A--0 to 4 inches; light yellowish brown (10YR 6/4) sand, brown (10YR 5/3) moist; single grained; loose, nonsticky and nonplastic; common fine, very fine and few coarse and medium roots; 10 percent gravel, 4 percent cobbles; neutral; clear wavy boundary.

A2--4 to 7 inches; pale brown (10YR 6/3) gravelly fine sand, brown (10YR 5/3) moist; single grained; loose, nonsticky and nonplastic; common medium and few fine roots; 15 percent gravel, 2 percent cobble; slightly alkaline; gradual smooth boundary.

C1--7 to 39 inches; pale brown (10YR 6/3) very gravelly sand, brown (10YR 5/3) moist; single grained; loose, nonsticky and nonplastic; few fine and medium roots; 40 percent gravel, 3 percent cobble; slightly alkaline; gradual wavy boundary.

C2--39 to 44 inches; very pale brown (10YR 7/4) extremely gravelly fine sand, pale brown (10YR 6/3) moist; single grained; loose, nonsticky and nonplastic; 60 percent gravel, 5 percent cobble; slightly alkaline; gradual smooth boundary.

C3--44 to 62 inches; pale brown (10YR 6/3) very gravelly sand, brown (10YR 5/3) moist; single grained, loose, non sticky and non plastic; 45 percent gravel, 5 percent cobble; slightly effervescent, moderately alkaline.

Range in Caharacteristics:

Rock fragments make up 35 to 75 percent by volume throughout the soil profile. There may be A, AC and C horizons present.

A horizon: Percent clay is 3 to 10 percent. Reaction is neutral or slightly alkaline. Rock fragments make up 10 to 30 percent by volume. Hues are 10YR, values 4 to 7 dry, 3 to 6 moist, and chromas 1 through 4.

C horizons: Percent clay is 1 to 9 percent. Reaction is neutral to moderately alkaline. Rock fragments make up 35 to 80 percent by volume.

rev. 6/93
Cushman Series

The Cushman series consists of moderately deep, well drained soils on nearly level to gently sloping upland Plains. These soils formed in alluvium from loessal sources. Slopes are 2 to 5 percent. Elevation is 4800 to 5400 feet. The average annual precipitation is about 13 inches, average annual air temperature is 47 degrees F., and the average annual frost free season is about 120 days.

These soils are fine-loamy, mixed, mesic, Ustollic Haplargids

Typical pedon of Cushman fine sandy loam, in an area of Cushman fine sandy loam, 2 to 5 percent slopes; about 1950 feet south and 1795 feet east of the northwest corner sec. 34, T.10N., R.66.

A--0 to 4 inches; yellowish brown (10YR 5/4) fine sandy loam, dark grayish brown (10YR 3/3) moist; moderate medium granular structure; soft, very friable, non sticky and non plastic; many fine, very fine and few medium roots; slightly alkaline; abrupt smooth boundary.

Bt1--4 to 14 inches; yellowish brown (10YR 5/4) sandy clay loam, brown (10YR 4/3) moist; moderate medium prismatic parting to weak to moderate medium subangular blocky structure; slightly hard, very friable, sticky and slightly plastic; common (10 -12%) discontinuous, patchy clay bridging; common fine and very fine roots; mildly alkaline; clear wavy boundary.

Bt2--14 to 21 inches; light yellowish brown (10YR 6/4), sandy clay loam, brown (10YR 4/3) moist; moderate medium prisms parting to weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few (5 to 7%) discontinuous, patchy clay bridging; common very fine and few fine roots; moderately alkaline; clear wavy boundary.

BC--21 to 30 inches; light yellowish brown (10YR 6/4) sandy loam, yellowish brown (10YR 5/4) moist; weak coarse subangular blocky structure, soft, very friable, slightly sticky and slightly plastic; few, (<1%) distinct, soft carbonates on sides of ped faces as blotches or spots; slightly effervescent, moderately alkaline; clear smooth boundary.

Cr--30 inches; buff colored sandstone with lenses of shale

Range in Characteristics:

Depth to sandstone is 21 to 40 inches. There may be Bk, BC and C horizons present.

A horizon: Percent clay is 10 to 24 percent. Reaction is neutral to mildly alkaline. Hues are 10YR, values 4 to 6 dry, 3 to 5 moist, and chromas 2 to 4.

Bt horizons: Percent clay is 24 to 35 percent. Reaction is slightly to moderately alkaline. Hues are 10YR, values 5 to 7 dry, 4 through 6 moist, and chromas 2 through 4.

BC or C horizons: Percent clay is 15 to 25 percent. Reaction is slightly to moderately alkaline. Rock fragments make up 0 to 15 percent by volume. Rock structure may be 10 to 30% by volume.

rev. 6/93
 Edgar Series

The Edgar series consists of very deep, well drained soils on alluvial flats and terraces. These soils formed in alluvium from mixed sources with loess influence. Slopes are 0 to 2 percent. Elevation is 4900 to 5100 feet. The average annual precipitation is about 13 inches, average annual air temperature is 47 degrees F., and the average annual frost free season is about 120 days.

These soils are fine-loamy, mixed, mesic, Ustollic Camborthids

Typical pedon of Edgar loam, in an area of Edgar loam, 0 to 2 percent slopes; about 1900 feet west and 450 feet south of the northeast corner sec. 12, T.10N., R.66W..

A--0 to 6 inches; pale brown (10YR 6/3), loam, dark brown, aggregate color (10YR 3/3), crushed color (10YR 4/3) moist; moderate medium crumb structure; soft, very friable, slightly sticky and slightly plastic; many very fine, common fine and few coarse and medium roots; slightly effervescent, moderately alkaline; clear smooth boundary.

Bw--6 to 14 inches; light yellowish brown (10YR 6/4) loam, brown (10YR 5/3) moist; moderate medium and fine prismatic parting to moderate medium subangular blocky structure; slightly hard, very friable; slightly sticky and slightly plastic; common very fine and fine roots; slightly effervescent, moderately alkaline; clear wavy boundary.

Bck--14 to 31 inches; very pale brown (10YR 7/4) silt loam, brown (10YR 5/4) moist; weak medium prismatic parting to weak medium subangular blocky structure; soft, friable; slightly sticky and slightly plastic; few fine and very fine roots; few, (2-4%) distinct calcium carbonates as seams and in rounded pore channels; strongly effervescent; moderately alkaline; gradual smooth boundary.

C1--31 to 52 inches; very pale brown (10YR 7/4) loam, pale brown (10YR 6/3) moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; common, violently effervescent, moderately alkaline; gradual smooth boundary.

C2--52 to 72 inches; very pale brown (10YR 7/3) loam, pale brown (10YR 6/3) moist; weak medium prismatic structure, slightly hard, very friable; slightly sticky and slightly plastic; thin lenses (<0.5cm thick) of loamy fine sand or fine sand that are discontinuous throughout the horizon; disseminated calcium carbonates in matrix, violently effervescent, moderately alkaline.

Range in Characteristics:

Rock fragments make up 0 to 10 percent by volume. There may be BC and C horizons present.

A horizon: Percent clay is 12 to 30 percent. Reaction is neutral to moderately alkaline. Rock fragments make up 0 to 10 percent by volume. Hues are 10YR, values 5 or 6 dry, 3 or 4 moist, and chromas 2 or 3.

Bw horizons: Percent clay is 18 to 35 percent. Reaction ranges from slightly alkaline to strongly alkaline. Rock fragments make up 0 to 15 percent by volume. Hues are 2.5Y or 10YR, values 5 or 6 dry, and chromas 2 to 4.

C horizons: Percent clay is 15 to 30 percent. Thin lenses of very fine sand or fine sand may occur below a depth of 28 inches. Some root channels may exhibit secondary carbonates in some profiles.

rev. 6/93
Kim Series

The Kim series consists of deep, well drained soils on alluvial fans and terrace footslopes. These soils formed in alluvium from mixed sources with loess influence. Slopes are 2 to 5 percent. Elevation is 4900 to 5100 feet. The average annual precipitation is about 13 inches, average annual air temperature is 47 degrees F., and the average annual frost free season is about 120 days.

These soils are fine-loamy, mixed, mesic, Ustic Torriorthents

Typical pedon of Kim loam, in an area of Kim-Cushman complex, 2 to 5 percent slopes; about 1400 feet east and 500 feet north of the southwest corner Sec. 5, T.10N., R.65W..

A--0 to 3 inches; brown (10YR 5/3), loam, dark brown, aggregate color (10YR 3/3), crushed color (10YR 4/3) moist; weak medium crumb structure; soft, very friable, slightly sticky and slightly plastic; common fine and few coarse and medium roots; effervescent, moderately alkaline; clear smooth boundary.

AC--3 to 20 inches; pale brown (10YR 6/3) loam, brown (10YR 5/3) moist; weak medium prismatic structure; slightly hard, very friable; slightly sticky and slightly plastic; few very fine and fine roots; strongly effervescent, moderately alkaline; gradual smooth boundary.

C--20 to 58 inches; very pale brown (10YR 7/3) loam, brown (10YR 5/3) moist; massive, slightly hard, very friable; slightly sticky and slightly plastic; few fine roots; 10 percent or less of the lower 10 inches of this horizon has siltstone chip fragments; strongly effervescent, strongly alkaline; clear smooth boundary.

Cr--58 + inches; Soft Siltstone

Range in Characteristics:

Rock fragments make up 0 to 10 percent by volume. There may be AC and Cr horizons present. There may be secondary masses of carbonates occurring in the C substratum.

A horizon: Percent clay is 12 to 25 percent. Reaction is mildly to moderately alkaline. Rock fragments make up 0 to 10 percent by volume. Hues are 10YR, values 5 to 7 dry, 3 to 6 moist, and chromas 2 through 4.

C horizon: Percent clay is 15 to 30 percent. Reaction is moderately or strongly alkaline. Remanent rock fragments of the Siltstone exists in lower reaches of the underlying material.

rev. 11/93
Manzanola Series

The Manzanola series consists of very deep, well drained soils on concave terraces and alluvial floodplains. These soils formed in local alluvium and from loess sources. Slopes are 0 to 2 percent. Elevation is 4800 to 5200 feet. The average annual precipitation is about 13 inches, average annual air temperature is 47 degrees F., and the average annual frost free season is about 120 days.

These soils are fine, montmorillonitic, mesic, Ustollic Haplargids

Typical pedon of Manzanola loam, in an area of Arvada-Manzanola complex, 0 to 2 percent slopes; about 1100 feet east and 150 feet north of the southwest corner sec. 11, T.10N., R.66W..

A1--0 to 5 inches; pale brown (10YR 6/3), loam, dark brown (10YR 3/3) moist; moderate fine granular structure; soft, very friable, sticky and plastic; common very fine and fine, few medium roots throughout; slightly alkaline; abrupt smooth boundary.

BA--5 to 7 inches; brown (10YR 5/3), clay loam, brown (10YR 4/3) moist; moderate medium and fine subangular blocky structure; hard, firm, very sticky and very plastic; common fine and very fine roots throughout; 5% fine gravel; moderately alkaline; clear smooth boundary.

Bt1--7 to 16 inches; yellowish brown (10YR 5/4) clay loam, dark yellowish brown (10YR 4/4) moist; moderate medium prismatic parting to moderate fine subangular blocky structure; very hard, very firm; very sticky and very plastic; few (2 to 7%) continuous clay films in and around pores, and common (5 to 10%) discontinuous, thin clay films on faces of peds; few, medium, distinct organic stains, black (10YR 2/1) occurring on faces of peds; few fine roots and very fine roots; slight effervescent, moderately alkaline; clear wavy boundary.

Bt2--16 to 25 inches; pale brown (10YR 6/3) clay loam, brown (10YR 5/3) moist; weak coarse prisms parting to moderate medium subangular blocky structure; very hard, very firm, very sticky and very plastic; few, moderately thick (2 to 5%) continuous clay films on ped faces and around pores; few, fine distinct organic stains, black (10YR 2/1) occurring on faces of peds; few fine roots; moderately alkaline; gradual wavy boundary.

Bk--25 to 33 inches; pale brown (10YR 6/3) clay loam, brown (10YR 5/3) moist; weak coarse prisms parting to weak medium and fine subangular blocky structure; hard, firm, sticky and plastic; common (10-16%) fine filaments and spots of calcium carbonates or magnesium carbonates throughout; strongly effervescent; moderately alkaline; gradual wavy boundary.

BC--33 to 50 inches; light brownish gray (10YR 6/2) sandy clay loam, brown (10YR 5/3) moist; weak medium subangular blocky structure; very hard, firm, sticky and plastic; 4% gravel; slightly effervescent, moderately alkaline; gradual smooth boundary.

C--50 to 61 inches; brown (10YR 5/3) loamy fine sand, brown (10YR 4/3) moist; single grained; loose, non-sticky and non-plastic; 8% fine rounded gravel; moderately alkaline .

Range in Characteristics:

Thickness to the base of the argillic horizon is 10 to 40 inches. The argillic horizon contains 35 to 55% clay. Depth to continuous subhorizons of visible carbonates is 10 to 40 inches. There may be BC and C horizons present.

A horizon: Percent clay is 18 to 30 percent. Hues are 10YR or 7.5YR, values 5 to 7 dry, 4 to 6 moist, and chromas 1 to 4. Reaction is slightly to moderately alkaline.

Bt horizons: Percent clay is 35 to 50 percent. Reaction is slightly alkaline to moderately alkaline. Hues are 5Y through 10YR, values 5 to 7 dry, 4 through 6 moist, and chromas 1 through 6. Secondary carbonates may be found in the lower portions of these horizons. It ranges from nonsaline to slightly saline in portions of these subhorizons.

Bk horizon: Percent clay is 35 to 45 percent. Hues are 5Y to 7.5YR, values 6 or 7, 4 or 5 moist, and chromas of 2 through 4. Secondary carbonates are visible as spots, seams or filaments. Reaction is moderately to strongly alkaline. Sodium adsorption ratio ranges from 1 to 10 and the electro-conductivity ranges from 1 to 6mmhos/cm.

BC or C horizons: Percent clay is 5 to 35 percent. Depth to sandstone is 65 inches or greater. Rock fragments range from 0 to 15% by volume.

rev. 6/93
Nucla Series

The Nucla series consists of very deep, well drained soils on alluvial fans and terraces. These soils formed in alluvium from mixed sources. Slopes are 0 to 2 percent. Elevation is 4900 to 5100 feet. The average annual precipitation is about 13 inches, average annual air temperature is 47 degrees F., and the average annual frost free season is about 120 days.

These soils are fine-loamy, mixed, mesic, Torriothentic Haplustolls

Typical pedon of Nucla loam, in an area of Nucla loam, 0 to 2 percent slopes; about 2250 feet south and 500 feet east of the northwest corner sec. 5, T.10N., R.65W..

A--0 to 9 inches; brown (10YR 5/3), loam, dark brown (10YR 3/3) moist; moderate medium granular structure; soft, very friable, slightly sticky and slightly plastic; common very fine and few fine and medium roots; slightly effervescent, slightly alkaline; clear smooth boundary.

Bw--9 to 14 inches; pale brown (10YR 6/3) loam, brown (10YR 4/3) moist; moderate coarse granular structure; soft, very friable, slightly sticky and slightly plastic; few very fine and few fine roots; strongly effervescent, moderately alkaline; gradual smooth boundary.

C1--14 to 29 inches; very pale brown (10YR 7/3) silt loam, brown (10YR 5/3) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few fine roots; calcium carbonate is disseminated throughout horizon, violently effervescent; moderately alkaline; gradual wavy boundary.

C2--29 to 62 inches; very pale brown (10YR 7/3) loam, pale brown (10YR 6/3) moist; massive; slightly hard, slightly sticky and slightly plastic; violently effervescent, moderately alkaline; gradual smooth boundary.

2C3--62 to 72 inches; very pale brown (10YR 7/3) coarse sandy loam, brown (10YR 5/3) moist; massive, soft, very friable, non sticky and non plastic; strongly effervescent, moderately alkaline.

Range in Characteristics:

Thickness of the mollic epipedon is 7 to 13 inches. There may be AC and C horizons present. In some places a cambic subsoil occurs.

A horizon: Percent clay is 17 to 30 percent. Reaction is neutral to moderately alkaline. Rock fragments make up 0 to 10 percent by volume. Hues are 10YR, values 4 or 5 dry, 2 or 3 moist, and chromas 1 through 3.

C horizons: Percent clay is 18 to 27 percent. Reaction is moderately to strongly alkaline. Calcium carbonate equivalent is less than 8 percent. Rock fragments make up 5 to 20 percent by volume.

rev. 6/93
Olney Series

The Olney series consists of very deep, well drained soils on convex alluvial flats and upland Plains. These soils formed in alluvium from mixed sources. Slopes are 0 to 5 percent. Elevation is 4800 to 5400 feet. The average annual precipitation is about 13 inches, average annual air temperature is 47 degrees F., and the average annual frost free season is about 120 days.

These soils are fine-loamy, mixed, mesic, Ustollic Haplargids

Typical pedon of Olney fine sandy loam, in an area of Olney sandy loam, 0 to 2 percent slopes; about 250 feet east and 1550 feet south of the northwest corner Sec.32, T.10N., R.65W.

A--0 to 4 inches; brown (10YR 5/3), fine sandy loam, dark grayish brown (10YR 3/3) moist; moderate fine granular structure; soft, very friable, slightly sticky and slightly plastic; common fine, very fine and few medium roots; neutral; abrupt smooth boundary.

Bt1--4 to 7 inches; brown (10YR 5/3) sandy clay loam, dark grayish brown (10YR 3/3) moist; weak medium subangular blocky parting to moderate fine subangular blocky structure; hard, friable, sticky and plastic; few (<3 to 7%) continuous clay bridging; few fine and very fine roots; slightly alkaline; clear smooth boundary.

Bt2--7 to 16 inches; pale brown (10YR 6/3), sandy clay loam, dark brown (10YR 4/3) moist; strong medium and fine prisms parting to moderate fine and medium subangular blocky structure; hard, firm, sticky and plastic; few (4 to 8 %) discontinuous, patchy clay films on faces of peds; few very fine and few fine roots; slightly alkaline; clear wavy boundary.

Bt3--16 to 22 inches; light yellowish brown (10YR 6/4), sandy loam, dark yellowish brown (10YR 4/4) moist; weak coarse prisms parting to weak medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few (<7 %) discontinuous, patchy clay films on ped faces; few fine and very fine roots; moderately alkaline; clear wavy boundary.

Bk1--22 to 33 inches; very pale brown (10YR 7/4) sandy loam, yellowish brown (10YR 5/4) moist; weak coarse prisms parting to weak medium subangular blocky structure, hard, very friable, slightly sticky and slightly plastic; few (<3%) distinct, secondary soft masses of carbonates on sides of ped faces; strongly effervescent, moderately alkaline; gradual wavy boundary.

Bk2--33 to 47 inches; very pale brown (10YR 7/3) loamy sand, light yellowish brown (10YR 6/4) moist; weak medium prismatic structure; hard, friable, nonsticky and nonplastic; few (3 to 8%) prominent soft secondary carbonates on sides of ped faces; violently effervescent, strongly alkaline; clear smooth boundary.

2Bk3--47 to 64 inches; very pale brown (10YR 7/3) loam, light yellowish brown (10YR 6/4) moist; massive; slightly hard, friable,

sticky and plastic; violently effervescent, common (8 to 15%), prominent, soft secondary carbonates in blotches, seams and fissures; strongly alkaline; clear smooth boundary.

Range in Characteristics:

Rock fragments make up 0 to 15 percent by volume throughout the soil profile. Depth to the base of the argillic subsoil is 12 to 26 inches. The subsoil contains 18 to 35 percent clay. There may be Bk, BC and C horizons present.

A horizon: Percent clay is 10 to 20 percent. Reaction is neutral to mildly alkaline. Hues are 10YR, values 5 or 6 dry, 4 or 5 moist, and chromas 2 to 4.

Bt horizons: Rock fragments make up 0 to 10 percent by volume. Percent clay is 20 to 35 percent. Reaction is slightly to moderately alkaline. Hues are 10YR, values 5 to 7 dry, 4 through 6 moist, and chromas 2 through 4.

Bk or C horizons: Percent clay is 15 to 25 percent. Reaction is moderately to strongly alkaline. Rock fragments make up 0 to 15 percent by volume.

rev. 6/93
Otero Series

The Otero series consists of deep to very deep, well drained soils on gently sloping to rolling ridge shoulders, crowns and tops of upland Plains. These soils formed in alluvium from mixed sources. Slopes are 6 to 15 percent. Elevation is 5000 to 5400 feet. The average annual precipitation is about 13 inches, average annual air temperature is 47 degrees F., and the average annual frost free season is about 120 days.

These soils are coarse-loamy, mixed, mesic, calcareous Ustic Torriorthents

Typical pedon of Otero sandy loam, in an area of Otero-Altvan complex, 6 to 15 percent slopes; about 1900 feet west and 1200 feet south of the northeast corner sec. 17, T.10N., R.65W.

A--0 to 4 inches; pale brown (10YR 6/3), sandy loam, brown (10YR 4/3) moist; weak medium granular structure; soft, very friable, nonsticky and nonplastic; common fine, very fine and few medium roots; 2 percent gravel; slightly alkaline; clear smooth boundary.

AC--4 to 27 inches; pale brown (10YR 6/3) sandy loam, brown (10YR 5/3) moist; weak coarse subangular blocky structure; soft, very friable, nonsticky and nonplastic; common very fine and few fine roots; moderately alkaline; gradual wavy boundary.

C1--27 to 40 inches; pale brown (10YR 6/3), sandy loam, brown (10YR 5/3) moist; massive; soft, very friable, nonsticky and nonplastic; few very fine and fine roots; very few soft streaks of calcium carbonate in lower 1/3rd of this horizon, effervescent, moderately alkaline; gradual wavy boundary.

2C2--40 to 53 inches; light yellowish brown (10YR 6/4) loamy sand, yellowish brown (10YR 5/4) moist; single grained; loose; nonsticky and nonplastic; disseminated calcium carbonate throughout the soil matrix; strongly effervescent, 10 percent gravel and 1 percent cobble; moderately alkaline; gradual smooth boundary.

3C3--53 to 65 inches; brown (7.5YR 5/4) gravelly loamy coarse sand, dark brown (10YR 4/3) moist; single grained; loose, nonsticky and nonplastic; 20 percent gravel and 4 percent cobble; moderately alkaline

Range in Characteristics:

Rock fragments make up 0 to 15 percent by volume throughout the profile. The underlying material contains 5 to 18 percent clay. There may be several C horizons present.

A horizon: Percent clay is 8 to 18 percent. Reaction is neutral to mildly alkaline. Hues are 10YR, values 5 to 7 dry, 3 through 5 moist, and chromas 2 to 4.

C horizons: Percent clay is 8 to 18 percent. Reaction is moderately alkaline to strongly alkaline. Rock fragments make up 0 to 15 percent by volume.

rev. 6/93
Owlcreek Series

The Owlcreek series consists of very deep, well drained soils on convex alluvial terraces, flats and upland Plains. These soils formed in alluvium from mixed sources and some influence from loess. Slopes are 0 to 5 percent. Elevation is 4800 to 5400 feet. The average annual precipitation is about 13 inches, average annual air temperature is 47 degrees F., and the average annual frost free season is about 120 days.

These soils are fine-loamy, mixed, mesic, Aridic Argiustolls

Typical pedon of Owlcreek fine sandy loam, in an area of Owlcreek-Olney complex, 0 to 2 percent slopes; about 1550 feet north and 2300 feet west of the southeast corner sec. 2, T.10N., R.66W.

A--0 to 3 inches; brown (10YR 5/3), fine sandy loam, dark grayish brown (10YR 3/3) moist; moderate fine granular structure; soft, very friable, slightly sticky and nonplastic; common fine, very fine and few medium roots; neutral; clear smooth boundary.

A2--3 to 12 inches; brown (10YR 5/3) loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky parting to moderate fine granular structure; soft, very friable, slightly sticky and nonplastic; common fine and very fine roots; neutral; clear smooth boundary.

Bt1--12 to 16 inches; brown (10YR 5/3), sandy clay loam, dark brown (10YR 3/3) moist; weak to moderate fine subangular blocky structure; slightly hard, friable, sticky and slightly plastic; few (2 to 7 %) faint, discontinuous patchy clay films on faces of peds and few (<5%) distinct, continuous clay bridging; few very fine and few fine roots; neutral; clear smooth boundary.

Bt2k--16 to 21 inches; pale brown (10YR 6/3), clay loam, dark brown (10YR 4/3) moist; weak to moderate medium prisms parting to moderate fine and medium subangular blocky structure; hard, friable, sticky and plastic; common (7 to 10 %) distinct, continuous clay bridging; few very fine roots; few, segregated calcium carbonate seams (<5%) moderately alkaline; abrupt smooth boundary.

BAkb--21 to 25 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) crushed, moist; moderate fine and medium subangular blocky structure, hard, very friable, slightly sticky and plastic; disseminated calcium carbonate throughout, strongly effervescent, moderately alkaline; clear smooth boundary.

Bt3kb--25 to 28 inches; pale brown (10YR 6/3), sandy clay loam, dark brown (10YR 4/3) moist; strong fine and medium subangular blocky structure; hard, firm, sticky and plastic; few (4 to 10 %) distinct, continuous clay bridging and few (2 to 5 %) discontinuous, thin clay films in and around pores; few very fine roots; common (6 to 10%), prominent, segregated calcium carbonate seams strongly effervescent, moderately alkaline; clear smooth boundary.

2Btkb1--28 to 35 inches; brown (10YR 5/3), clay loam, very dark grayish brown (10YR 3/2) moist; moderate to strong fine subangular blocky structure; extremely hard, firm, sticky and plastic; few (3 to 5%) distinct, continuous clay bridging and few (2 to 5%) discontinuous, thin clay films in and around pores; few very fine roots; many (10 to 20%), distinct segregated calcium carbonate spots and seams, violently effervescent, moderately alkaline; clear wavy boundary.

2Btkb2--35 to 48 inches; light yellowish brown (10YR 6/4), gravelly sandy clay loam, yellowish brown (10YR 5/4) moist; strong fine prisms parting to strong fine and medium subangular blocky structure; extremely hard, firm; sticky and plastic; few (1 to 5%), distinct, discontinuous clay bridging; few very fine roots; 20 percent gravel; many, distinct moderately thick, carbonate coatings on coarse fragments mainly on underneath side of rocks; violently effervescent, moderately alkaline; clear wavy boundary.

3Bck--48 to 80 inches; light yellowish brown (10YR 6/4) very gravelly loamy sand, yellowish brown (10YR 5/4) moist; single grained; loose, non sticky and non plastic; 50 percent gravel, 7 percent cobble and 2 percent stone; common (5 to 15%), prominent, thin coatings of calcium carbonate on the underneath sides of the rocks, strongly effervescent; moderately alkaline.

Rock fragments make up 0 to 15 percent by volume above the lithologic discontinuity, below that 30 to 80 percent by volume. The subsoil contains 22 to 35 percent clay. The the buried remnant surface horizon ranges in depth from 20 to 32 inches below the surface. The depth to the lithologic gravel substratum ranges from 40 to 60 inches below the surface.

A horizon: Percent clay is 10 to 24 percent. Reaction is neutral to slightly alkaline. Hues are 10YR, values 4 or 5 dry, 2 or 3 moist, and chromas 1 to 3.

Bt horizons: Rock fragments make up 0 to 10 percent by volume. Percent clay is 24 to 35 percent. Reaction is neutral or slightly alkaline. Hues are 10YR, values 5 or 6 dry, 3 through 6 moist, and chromas 3 or 4.

Btb horizons: Percent clay is 25 to 35 percent. Reaction is neutral to moderately alkaline. Rock fragments make up 0 to 15 percent by volume. Hues are 10YR, values 4 to 5 dry, 3 to 5 moist, and chroma of 1 to 3.

2Btkb horizons: Percent clay is 20 to 35 percent. Reaction is moderately alkaline. Rock fragments make up 0 to 35 percent by volume. Calcium carbonate equivalent ranges from 1 to 6 percent.

3BC or 3C horizons: Percent clay is 3 to 15 percent. Rock fragments make up 35 to 80 percent by volume.

rev. 11/93
Unnamed Series

This Unnamed series consists of very deep, well drained soils on concave or planar sloped Upland swales or depressions. It formed in local alluvium and loess from mixed sources. Slopes are 0 to 1 percent. Elevation is 4800 to 5400 feet. The average annual precipitation is about 13 inches, average annual air temperature is 47 degrees F., and the average annual frost free season is about 120 days.

These soils are fine-montmorillonitic, mesic, Typic Haplusterts

Typical pedon of Haplustert clay, in an area of Pleasant-Haplustert complex, 0 to 1 percent slopes; about 375 feet west and 600 feet north of the southeast corner Sec. 26, T.10N., R.66W.

A1--0 to 2 inches; gray (10YR 5/1), clay, dark gray (10YR 4/1) moist; strong medium and fine subangular blocky structure; very hard, very firm, very sticky and very plastic; few fine, very fine and medium roots throughout; slightly alkaline; abrupt smooth boundary.

A2--2 to 5 inches; gray (10YR 5/1) clay, dark gray (10YR 4/1) moist; weak medium and coarse subangular blocky that parts to moderate medium and fine subangular blocky structure; very hard, very firm, very sticky and very plastic; few medium, fine and very fine roots throughout; slightly alkaline; clear wavy boundary.

ABss--5 to 14 inches; gray (10YR 5/1) clay, very dark gray (10YR 3/1) moist; strong fine and medium angular blocky structure; extremely hard, extremely firm, very sticky and very plastic; many sphenoidal wedges laying on angles of 25-30 degrees of the horizontal, slickenslide faces 13X22 cm in size, common fine grooves on slickenslide faces; 3-5% rounded gravel throughout horizon; few fine roots; moderately alkaline; irregular wavy boundary.

Bss--14 to 27 inches; gray (10YR 5/1), clay, very dark gray (10YR 3/1) aggregate, dark grayish brown (10YR 4/2) crushed color, moist; strong medium and fine angular blocky structure; extremely hard, extremely firm, very sticky and very plastic; 30% of the structure appears as fine and medium sized wedges with intersecting slickenslides; few fine distinct yellowish brown (10YR 5/6) mottles; few fine roots; moderately alkaline; gradual wavy boundary.

C1--27 to 31 inches; light gray (10YR 7/2) clay, dark grayish brown (10YR 4/2) crushed color when moist; moderate to coarse medium and fine angular blocky structure; extremely hard, extremely firm, very sticky and very plastic; common fine faint brown (7.5YR 4/3) and common fine distinct strong brown (7.5YR 4/6) mottles; few fine roots throughout; moderately alkaline; clear wavy boundary.

2C2--31 to 51 inches; very pale brown (10YR 8/2), loamy fine sand, light gray (10YR 7/2) moist; weak coarse subangular blocky structure; slightly hard, very friable, non sticky and non plastic; few fine distinct strong brown (7.5YR 4/6) and common fine distinct

reddish yellow (10YR 7/6) mottles; few fine roots throughout; slightly alkaline; gradual smooth boundary.

2C3--51 to 71 inches; very pale brown (10YR 8/2) fine sand, pale brown (10YR 6/3) moist; structureless, slightly hard, very friable, nonsticky and nonplastic; thin continuous color strata of yellow (10YR 7/6) sandy material; slightly alkaline.

Range in Characteristics:

Depth to the base of the slickenslides ranges from 12 to 38 inches. The subsoil contains 40 to 55 percent clay. Slickenslides exists at depths of 10 to 38 inches. Cracks exist for 20 to 30 days during the summer growing season extending from the surface to a depth of 24 inches. Weathered sandstone does occur at depths greater than 72 inches in some pedons. There may be BC and C horizons present.

A horizon: Percent clay is 40 to 45 percent. Reaction is neutral to slightly alkaline. Hues are 10YR, values 5 or 6 dry, 3 or 4 moist, and chromas of 1.

Bss horizons: Rock fragments make up 0 to 5 percent by volume. Percent clay is 45 to 55 percent. Reaction is slightly or moderately alkaline. Hues are 10YR.

BC or C horizons: Percent clay is 35 to 50 percent. Reaction is slightly or moderately alkaline.

2C horizons: Percent clay is 2 to 12 percent. Contact to sandstone is 60 to 84 inches.

rev. 11/93
Pleasant Series

The Pleasant series consists of very deep, well drained soils on concave upland swales. These soils formed in local alluvium from loess sources. Slopes are 0 to 1 percent. Elevation is 4800 to 5200 feet. The average annual precipitation is about 13 inches, average annual air temperature is 47 degrees F., and the average annual frost free season is about 120 days.

These soils are fine, montmorillonitic, mesic, Torriertic Argiustolls

Typical pedon of Pleasant silty clay loam, in an area of Pleasant-Haplusterts complex, 0 to 1 percent slopes; about 2550 feet north and 1000 feet east of the southwest corner sec. 24, T.10N., R.66W..

A1--0 to 3 inches; grayish brown (10YR 5/2), silty clay loam, very dark gray (10YR 3/1) moist; moderate medium granular structure; slightly hard, firm, sticky and plastic; many very fine and fine, few medium roots throughout; neutral; clear smooth boundary.

A2--3 to 10 inches; gray (10YR 5/1), silty clay, very dark gray (10YR 3/1) moist; moderate fine subangular blocky structure; hard, very firm, very sticky and very plastic; common fine and very fine roots throughout; clear smooth boundary.

Bt1--10 to 17 inches; brown (10YR 5/3) silty clay, brown (10YR 4/3) moist; coarse medium prismatic parting to moderate medium and fine angular blocky structure; very hard, very firm; very sticky and very plastic; common (7 to 12%) discontinuous, patchy clay films in and around pores, and common (5 to 10%) discontinuous, thin clay films on faces of peds; few large slickenslide faces at a 15-30 deg. angle off horizontal; cracks 1 to 3cm wide extending to the bottom of the A1 horizon; organic stains, black (10YR 2/1) occurring on faces of peds; few fine roots and very fine roots; clear wavy boundary.

Bt2--17 to 28 inches; yellowish brown (10YR 5/4) loam, brown (10YR 4/3) moist; moderate coarse prisms parting to strong medium and fine angular blocky structure; extremely hard, extremely firm, very sticky and very plastic; few, moderately thick (2 to 5%) continuous clay films on ped faces and around pores; few medium slickenslide faces at a 15 to 30 degree angle off of horizontal; organic stains, black (10YR 2/1) occurring on faces of peds; few fine roots; gradual smooth boundary.

BC--28 to 51 inches; brown (10YR 5/3) clay loam, brown (10YR 4/3) moist; moderate coarse prismatic structure; very hard, very firm, very sticky and very plastic; slightly alkaline; gradual wavy boundary.

C--51 to 64 inches; light gray (10YR 7/2) clay loam, pale brown (10YR 6/3) moist; massive; hard, firm, very sticky and very plastic; slightly alkaline, slight effervescent.

Range in Characteristics:

Thickness to the base of the argillic horizon is 14 to 40 inches. The argillic horizon contains 35 to 55% clay. Cracks are observable during the summer season for 30 to 50 days after the summer solstice extending from the surface to a depth of 24 inches. Slickenslides are observed in some pedons in the 10 to 35 inch zone below the soils surface. There may be BC and C horizons present.

A horizon: Percent clay is 30 to 45 percent. Hues are 10YR, values 4 or 5 dry, 2 or 3 moist, and chromas 1 to 3.

Bt horizons: Percent clay is 35 to 59 percent. Reaction is neutral slightly alkaline. Hues are 10YR, values 5 to 6 dry, 3 through 6 moist, and chromas 2 through 4. Slickenslide faces may be observed.

BC or C horizons: Percent clay is 35 to 55 percent. Depth to sandstone is 65 inches or greater.

rev. 6/93
Remmit Series

The Remmit series consists of very deep, well drained soils on convex alluvial terraces and upland Plains. These soils formed in alluvium from mixed sources. Slopes are 0 to 5 percent. Elevation is 4800 to 5400 feet. The average annual precipitation is about 13 inches, average annual air temperature is 47 degrees F., and the average annual frost free season is about 120 days.

These soils are coarse-loamy, mixed, mesic, Ustollic Camborthids

Typical pedon of Remmit fine sandy loam, in an area of Remmit fine sandy loam, 0 to 2 percent slopes; about 1580 feet north and 2050 feet west of the southeast corner Sec. 2, T.10N., R.66W.

A--0 to 4 inches; brown (10YR 5/3), fine sandy loam, dark grayish brown (10YR 3/3) moist; moderate fine granular structure; soft, very friable, slightly sticky and slightly plastic; common fine, very fine and few medium roots; neutral; abrupt smooth boundary.

Bt1--4 to 7 inches; pale brown (10YR 6/3) sandy loam, dark grayish brown (10YR 3/3) moist; weak medium subangular blocks parting to moderate fine subangular blocky structure; hard, very friable, slightly sticky and slightly plastic; few (1 to 4%), discontinuous, thin, patchy clay films around pores; few fine and very fine roots; neutral; clear smooth boundary.

Bt2--7 to 16 inches; pale brown (10YR 6/3) sandy loam, dark brown (10YR 4/3) moist; strong fine prisms parting to moderate fine and medium subangular blocky structure; hard, firm, slightly sticky and slightly plastic; few (1 to 5%), distinct, continuous clay bridging; few fine roots; moderately alkaline; clear wavy boundary.

Bt3--16 to 22 inches; light yellowish brown (10YR 6/4), sandy loam, dark yellowish brown (10YR 4/4) moist; weak coarse prisms parting to weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few (1 to 3%), faint, continuous clay bridging; few fine roots; moderately alkaline; clear wavy boundary.

Bk1--22 to 33 inches; very pale brown (10YR 7/4) sandy loam, yellowish brown (10YR 5/4) moist; weak coarse prisms parting to weak medium subangular blocky structure, hard, friable, slightly sticky and slightly plastic; few (<3%), distinct, soft secondary carbonates as fine filaments filling old pores; strongly effervescent, moderately alkaline; gradual wavy boundary.

Bk2--33 to 47 inches; very pale brown (10YR 7/3) sandy loam, light yellowish brown (10YR 6/4) moist; weak medium prismatic structure; slightly hard, friable; nonsticky and nonplastic; few to common (3 to 10%), prominent, soft secondary carbonates as streaks, filaments and coatings on ped faces; strongly effervescent, moderately alkaline.

2Bk3--47 to 64 inches; very pale brown (10YR 8/3) loam, light yellowish brown (10YR 6/4) moist; weak coarse prismatic structure;

slightly hard, friable, slightly sticky and slightly plastic; few to common (3 to 10%) distinct, soft carbonates as streaks, filaments and filled pores; strongly effervescent, moderately alkaline.

Range in Characteristics:

The surface horizon is 3 to 7 inches thick. Rock fragments make up 0 to 15 percent by volume. The subsoil contains 10 to 18 percent clay. The weighted average of organic carbon in the upper 10 inches is 0.5 to 1.0 percent. There may be Bk, BC and C horizons present.

A horizon: Percent clay is 10 to 17 percent. Reaction is neutral to mildly alkaline. Hues are 10YR, values 5 or 6 dry, 3 to 5 moist, and chromas 2 or 3.

Bt horizons: Rock fragments make up 0 to 10 percent by volume. Percent clay is 10 to 18 percent. Reaction is neutral to moderately alkaline. Hues are 10YR or 2.5Y, values 5 through 7 dry, 4 through 6 moist, and chromas 3 or 4.

Bk or C horizons: Percent clay is 7 to 18 percent. Hues are 2.5Y or 10YR. Reaction is slightly to strongly alkaline. Rock fragments make up 0 to 15 percent by volume.

rev. 6/93
Renohill Series

The Renohill series consists of moderately deep, well drained soils on gently sloping upland ridges and sideslopes. These soils formed in colluvium from interbedded shale and sandstone. Slopes are 2 to 9 percent. Elevation is 4800 to 5400 feet. The average annual precipitation is about 13 inches, average annual air temperature is 47 degrees F., and the average annual frost free season is about 120 days.

These soils are fine, montmorillonitic, mesic Ustollic Haplargids

Typical pedon of Renohill fine sandy loam, in an area of Ulm-Renohill complex, 5 to 9 percent slopes; about 1175 feet east and 300 feet south of the northwest corner sec. 34, T.10N., R.66W.

A--0 to 4 inches; brown (10YR 5/3), fine sandy loam, dark brown (10YR 4/3) moist; moderate medium granular structure; soft, very friable, nonsticky and nonplastic; common fine, and few very fine and medium roots; slightly alkaline; clear smooth boundary.

BA--4 to 10 inches; yellowish brown (10YR 5/4) sandy clay loam, dark yellowish brown (10YR 4/4) moist; moderate medium and fine subangular blocky structure; hard, firm, sticky and plastic; common very fine and few fine roots; moderately alkaline; clear wavy boundary.

Bt1--10 to 19 inches; yellowish brown (10YR 5/4) clay loam, yellowish brown (10YR 4/4) moist; moderate fine prismatic parting to moderate medium and fine subangular blocky structure; hard, firm, very sticky and very plastic; few (2 to 6%), discontinuous, patchy clay films on ped faces and in and around fine pores; few fine and very fine roots; slightly effervescent, moderately alkaline; gradual wavy boundary.

Btk2--19 to 25 inches; light yellowish brown (10YR 6/4) and light brownish gray (10YR 6/2), clay loam, brown (10YR 5/3) moist; weak medium prisms parting to weak to moderate fine subangular blocky structure; hard, firm, slightly sticky and slightly plastic; few (2 to 5%), discontinuous, thin clay films on ped faces and around pores; few very fine and fine roots; common, secondary calcium carbonates in soft powdery forms as blotches along prism faces, strongly effervescent, moderately alkaline; gradual wavy boundary.

BCK--25 to 29 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (10YR 5/4) moist; moderate coarse subangular blocky structure, very hard, very firm, very sticky and very plastic; common (5-10%), prominent, soft carbonates plugging old root channels and along sides of ped faces as blotches or spots; 30 percent of this horizon exhibits rock structure; strongly effervescent, strongly alkaline; clear smooth boundary.

Cr--29 + inches; Shale

Range in Characteristics:

Thickness to the base of the argillic horizon is 22 to 36 inches. Depth to shale is 24 to 40 inches. Rock fragments make up 0 to 15 percent by volume. The subsoil contains 35 to 45 percent clay. There may be Bk, BC and C horizons present.

A horizon: Percent clay is 10 to 18 percent. Reaction is neutral to mildly alkaline. Hues are 10YR, values 5 or 6 dry, 3 to 5 moist, and chromas 2 or 3.

Bt horizons: Rock fragments make up 0 to 10 percent by volume. Percent clay is 35 to 45 percent. Reaction is moderately alkaline. Hues are 2.5Y or 10YR, values 4 through 6 dry, 4 or 5 moist, and chromas 2 through 4.

BC or C horizons: Percent clay is 30 to 45 percent. Reaction is moderately alkaline to strongly alkaline. Rock fragments make up 0 to 15 percent by volume. Raw gypsum crystals may be present. Rock structure may be 5 to 35% by volume.

rev. 6/93
Ulm Series

The Ulm series consists of very deep, well drained soils on convex upland Plains. These soils formed in alluvium from mixed sources. Slopes are 2 to 9 percent. Elevation is 4800 to 5400 feet. The average annual precipitation is about 13 inches, average annual air temperature is 47 degrees F., and the average annual frost free season is about 120 days.

These soils are fine-montmorillonitic, mesic, Ustollic Haplargids

Typical pedon of Ulm fine sandy loam, in an area of Ulm-Renohill complex, 2 to 5 percent slopes; about 550 feet north and 175 feet east of the southwest corner Sec. 15, T.10N., R.66W.

A1--0 to 2 inches; light grayish brown (10YR 6/2), fine sandy loam, dark grayish brown (10YR 3/3) moist; weak medium granular structure; soft, very friable, non sticky and non plastic; common fine, very fine and few medium roots; neutral; clear smooth boundary.

A2--2 to 6 inches; brown (10YR 5/3) fine sandy loam, dark grayish brown (10YR 3/3) moist; moderate fine granular structure; soft, very friable, slightly sticky and nonplastic; few fine and very fine roots; mildly alkaline; clear smooth boundary.

BA--6 to 10 inches; brown (10YR 5/3) loam, dark brown (10YR 4/3) moist; weak to moderate fine and medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots; moderately alkaline; abrupt smooth boundary.

Bt1--10 to 15 inches; yellowish brown (10YR 5/4), clay loam, dark brown (10YR 4/3) moist; moderate medium prisms parting to moderate fine and medium subangular blocky structure; hard, firm, very sticky and very plastic; few to common (5 to 8%), distinct, discontinuous clay films on ped faces and common (10 to 12%), discontinuous clay films in and around pores; few very fine roots; moderately alkaline; clear wavy boundary.

Bt2--15 to 26 inches; light grayish brown (10YR 6/2), clay loam, grayish brown (10YR 4/2) moist; moderate medium prisms parting to strong medium subangular blocky structure; very hard, firm, sticky and plastic; common (10 to 12%), discontinuous, patchy clay films on faces of peds; few very fine roots; slightly effervescent, moderately alkaline; abrupt smooth boundary.

Bck--26 to 35 inches; mix of colors, yellowish brown (10YR 5/4), brownish yellow (10YR 6/6) and light gray (10YR 7/2) sandy clay loam, light yellowish brown (10YR 6/4) and brownish yellow (10YR 6/8) moist; moderate fine prisms parting to moderate medium and fine subangular blocky structure, hard, firm, slightly sticky and slightly plastic; 20 to 25 percent of the structure is remnant rock structure; few (<3%), distinct, soft carbonates in seams and in filled pores; strongly effervescent, moderately alkaline; clear wavy boundary.

2CBk--35 to 60 inches; light gray (10YR 7/2) loamy sand, light brownish gray (10YR 6/2) moist; massive; slightly hard, loose, nonsticky and nonplastic; few, (3 to 8%), prominent, soft carbonates in seams and fissures; violently effervescent, moderately alkaline.

Range in Characteristics:

Depth to the base of the argillic horizon ranges from 20 to 41 inches. Rock fragments make up 0 to 15 percent by volume. The subsoil contains 35 to 45 percent clay. There may be Bk, BC and C horizons present.

A horizon: Percent clay is 10 to 20 percent. Reaction is neutral to slightly alkaline. Hues are 10YR, values 5 to 7 dry, 3 to 5 moist, and chromas 1 to 3.

Bt horizons: Rock fragments make up 0 to 10 percent by volume. Percent clay is 35 to 45 percent. Reaction is moderately alkaline. Hues are 10YR.

Bk or C horizons: Percent clay is 25 to 40 percent. Reaction is moderately or strongly alkaline. Rock fragments make up 0 to 15 percent by volume.

rev. 6/93
Valent Series

The Valent series consists of very deep, somewhat excessively drained soils on convex and concave upland Plains. These soils formed in wind reworked sandy alluvium from mixed sources. Slopes are 2 to 5 percent. Elevation is 5000 to 5400 feet. The average annual precipitation is about 13 inches, average annual air temperature is 49 degrees F., and the average annual frost free season is about 120 days.

These soils are sandy, mixed, mesic, non-calcareous Ustic Torriorthents

Typical pedon of Valent fine sand, in an area of Valent fine sand, 2 to 5 percent slopes; about 750 feet west and 600 feet south of the northeast corner sec. 29, T.10N., R.65W.

A--0 to 4 inches; pale brown (10YR 6/3), fine sand, brown (10YR 4/3) moist; single grained; loose, nonsticky and nonplastic; common very fine, and few fine roots; neutral; clear smooth boundary.

C1--3 to 16 inches; pale brown (10YR 6/3) fine sand, brown (10YR 5/3) moist; single grained; loose, nonsticky and nonplastic; few very fine and few fine roots; neutral; gradual smooth boundary.

C2--16 to 70 inches; pale brown (10YR 6/3) sand, brown (10YR 5/3) moist; single grained; loose, nonsticky and nonplastic; slightly alkaline.

Range in Characteristics:

The textural control section (10 to 40 inch zone) contains 1 to 10 percent clay. The organic matter level of the surface horizon is normally less than 0.7 percent. Depth to calcareous material is 40 to more than 60 inches.

A horizon: Percent clay is 1 to 8 percent. Reaction is neutral to slightly alkaline. Hues are 10YR, values 4 to 7 dry, 4 to 6 moist, and chromas 3 or 4.

C horizons: Percent clay is 1 to 10 percent. Reaction is neutral to slightly alkaline. Hues are 10YR.

rev. 6/93
Vona Series

The Vona series consists of very deep, well drained soils on convex upland Plains. These soils formed in wind reworked alluvium from mixed sources. Slopes are 2 to 5 percent. Elevation is 5000 to 5400 feet. The average annual precipitation is about 13 inches, average annual air temperature is 47 degrees F., and the average annual frost free season is about 120 days.

These soils are coarse-loamy, mixed, mesic, Ustollic Haplargids

Typical pedon of Vona sandy loam, in an area of Vona sandy loam, 2 to 5 percent slopes; about 350 feet north and 275 feet west of the southeast corner sec. 24, T.10N., R.66W.

A--0 to 3 inches; brown (10YR 5/3), sandy loam, dark grayish brown (10YR 3/3) moist; moderate fine granular structure; soft, very friable, slightly sticky and slightly plastic; many very fine, and common fine roots; neutral; clear smooth boundary.

BA--3 to 5 inches; pale brown (10YR 6/3) sandy loam, brown (10YR 4/3) moist; weak fine subangular blocky parting to moderate medium and coarse granular structure; slightly hard, very friable, slightly sticky and slightly plastic; common very fine and few fine roots; neutral; clear smooth boundary.

Bt--5 to 13 inches; light yellowish brown (10YR 6/4), sandy loam, brown (10YR 5/3) moist; weak medium subangular blocky parting to moderate medium granular structure; slightly hard, friable, slightly sticky and slightly plastic; few (3 to 8%), faint, continuous clay bridging; few very fine roots; slightly alkaline; clear wavy boundary.

Btk--13 to 29 inches; very pale brown (10YR 7/3), loamy sand, yellowish brown (10YR 5/4) moist; weak medium prismatic structure; slightly hard, very friable, nonsticky and nonplastic; few (3 to 7%), faint, continuous clay bridging; few very fine roots; few (5-9%), distinct secondary lime seams and irregular shaped pockets, strongly effervescent, moderately alkaline; clear wavy boundary.

Bk--29 to 44 inches; very pale brown (10YR 7/4) loamy sand, light yellowish brown (10YR 6/4) moist; weak coarse prismatic structure; loose, slightly sticky and slightly plastic; few (<3%), prominent soft carbonates on sides of ped faces; strongly effervescent, moderately alkaline; clear wavy boundary.

BCK--44 to 53 inches; very pale brown (10YR 7/4) loamy sand, light yellowish brown (10YR 6/4) moist; weak coarse prismatic structure; loose, nonsticky and nonplastic; few (3 to 8%), distinct soft carbonates on sides and seams of ped faces; violently effervescent, strongly alkaline; clear smooth boundary.

C--53 to 72 inches; very pale brown (10YR 7/4) loamy sand, light yellowish brown (10YR 6/4) moist; single grained; loose, nonsticky and nonplastic; violently effervescent, strongly alkaline.

Range in Characteristics:

Thickness to the base of the argillic horizon is 13 to 30 inches. Rock fragments make up 0 to 15 percent by volume throughout the soil profile. The subsoil contains 10 to 18 percent clay. There may be Bk, BC and C horizons present. Depth to calcareous material ranges from 10 to 26 inches.

A horizon: Percent clay is 10 to 18 percent. Reaction is neutral to slightly alkaline. Hues are 10YR, values 4 to 6 dry, 3 to 5 moist, and chromas 2 to 4.

Bt horizons: Percent clay is 12 to 18 percent. Reaction is neutral to moderately alkaline. Hues are 10YR, values 5 or 6 dry, 4 or 5 moist, and chromas 2 through 4.

Bk or C horizons: Percent clay is 8 to 18 percent. Reaction is moderately alkaline. Rock fragments make up 0 to 15 percent by volume.

rev. 6/93
Zigweid Series

The Zigweid series consists of very deep, well drained soils on convex alluvial terraces and upland Plains. These soils formed in alluvium from mixed sources. Slopes are 0 to 5 percent. Elevation is 4800 to 5400 feet. The average annual precipitation is about 13 inches, average annual air temperature is 49 degrees F., and the average annual frost free season is about 120 days.

These soils are fine-loamy, mixed, mesic, Ustollic Camborthids

Typical pedon of Zigweid fine sandy loam, in an area of Zigweid fine sandy loam, 0 to 2 percent slopes; about 1100 feet west and 500 feet north of the southeast corner sec. 7, T.10N., R.65W.

A1--0 to 3 inches; brown (10YR 5/3), fine sandy loam, dark grayish brown (10YR 3/3) moist; weak to moderate medium granular structure; soft, very friable, nonsticky and nonplastic; common fine, very fine and few medium roots; neutral; abrupt smooth boundary.

A2--3 to 9 inches; brown (10YR 5/3) sandy clay loam, dark grayish brown (10YR 3/3) moist; moderate medium granular structure; soft, very friable, slightly sticky and slightly plastic; few fine and very fine roots; neutral; clear smooth boundary.

Bw1--9 to 19 inches; pale brown (10YR 6/3) loam, dark brown (10YR 4/3) moist; weak medium and fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine and few fine roots; slightly effervescent, disseminated fine carbonates, slightly alkaline; gradual smooth boundary.

Bw2--19 to 34 inches; pale brown (10YR 6/3), fine sandy clay loam, dark yellowish brown (10YR 4/4) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few fine roots; carbonates disseminated throughout matrix, strongly effervescent, moderately alkaline; gradual smooth boundary.

Bk1--34 to 44 inches; very pale brown (10YR 7/3) fine sandy loam, pale brown (10YR 6/3) moist; weak coarse subangular blocky structure, soft, very friable, slightly sticky and slightly plastic; few, faint (<3%), medium irregular carbonates as blotches on sides and tops of peds; strongly effervescent, moderately alkaline; gradual wavy boundary.

Bk2--44 to 65 inches; very pale brown (10YR 7/3) sandy loam, pale brown (10YR 6/3) moist; massive; soft, very friable, nonsticky and nonplastic; few, (3 to 8%), distinct, medium soft carbonates on sides of ped faces; violently effervescent, strongly alkaline.

Range in Characteristics:

Depth of secondary carbonates ranges from 9 to 19 inches. Rock fragments make up 0 to 15 percent by volume. The subsoil contains 18

to 35 percent clay, dominantly made up of sandy clay loams. There may be Bk, BC and C horizons present.

A horizon: Percent clay is 10 to 20 percent. Reaction is neutral to slightly alkaline. Hues are 10YR, values 4 to 7 dry, 2 to 5 moist, and chromas 2 or 3.

Bw horizons: Rock fragments make up 0 to 10 percent by volume. Percent clay is 18 to 35 percent. Dominant texture is sandy clay loam. Reaction is slightly alkaline. Hues are 10YR, values 5 or 6 dry, 4 or 5 moist, and chromas 2 through 4.

Bk or C horizons: Percent clay is 10 to 25 percent. Reaction is moderately to strongly alkaline. Rock fragments make up 0 to 15 percent by volume.

Glossary of Terms:

Alkali(sodic) soil - A soil having so high a degree of alkalinity (pH 8.5>) or so high a percentage of exchangeable sodium (15% or more of the total exchangeabl bases), or both, that plant growth is restricted.

Alluvial fan - A low, outspread, relatively flat to gently sloping mass of loose soil, shaped like an open fan or a segment of a cone, deposited by a stream at the place where it issues from a narrow mountain valley upon a broad valley or plain, or where a tributary stream is near or at its junction with the main stream, or where a constriction in a valley abruptly ceases or the gradient of the stream suddenly decreases; it is steepest near the mouth of the valley where its apex points upstream, and it slopes gently and convexly outward with a gradually decreasing gradient.

Alluvium - Unconsolidated clastic material deposited by water such as sand, silt or clay deposited on land by streams.

Argillic horizon - The subsoil horizon characterized by an accumulation of illuvial clay.

Available water 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 in/60in.

Low 3 to 6 in/60in.

Moderate 6 to 9 in/60in.

High 9 to 12 in/60in.

Very high >12 in/60in.

Back slope - The geomorphic component that forms the steepest inclined surface and principal element of many hillsides. Back slopes in profile are commonly steep, are linear and may or may not include cliff segments and descent to a footslope.

Base saturation - The degree to which material having cation-exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, K), expressed as a percentage of the total cation-exchange capacity.

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

Bottom land - The normal floodplain of a stream, subject to flooding.

Breaks - The steep and very steep broken land at the border of an upland summit and that is dissected by ravines.

Buried - Pertaining to geomorphic surfaces, and paleosols covered by a mantle of geologic material, eg: sedimentary.

Butte - An isolated small mountain or hill with steep or precipitous sides and a top variously flat, rounded or pointed that may be a residual mass isolated by erosion or an exposed volcanic neck.

Calcareous soil - The soil containing enough calcium carbonate to effervesce visibly when treated with cold, dilute hydrochloric acid.

Cation exchange capacity - The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity but is more precise in meaning.

Colluvium - Unconsolidated earth material deposited on and at the base of moderately steep and steep slopes by mass wasting (direct gravitational action) and local unconcentrated runoff.

Complex, soil - The 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.

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 to 40 or 80 inches.

Depth, soil - Generally, the thickness of the soil over bedrock. Very deep soils are more than 60 inches deep over bedrock; deep soils, 40 to 60 inches; moderately deep, 20 to 40 inches; shallow, 10 to 20 inches; and very shallow, less than 10 inches.

Depth to rock - Bedrock is too near the surface for the specified use.

Drainageway - A general term for channel or course along which water moves in draining an area.

Draw - A small stream channel, generally more open and with a broader floor than a ravine or gulch.

Eluviation - The movement of material in the true solution or colliodal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Eolian 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 floodplains and coastal plains. Synonym: natural erosion.

Fan terrace - A relict alluvial fan, no longer a site of active deposition, incised by younger and lower alluvial surfaces.

Fill slope - A sloping surface consisting of excavated soil material from a road cut. It commonly is on the downhill side of the road.

First bottom - The normal floodplain of a stream, subject to frequent or occasional flooding.

Floodplain - The nearly level alluvial plain that borders the stream and is subject to flooding unless protected artificially. It is usually a constructional landform built of sediment deposited during overflow and lateral migration of the streams.

Footslope - The inclined surface at the base of a hill. The surface profile is dominantly concave; it is a transition zone between upslope sites of erosion (shoulder, backslope) and downslope sites of deposition (toeslope).

Hill - A natural elevation of the land surface, rising as much as 1,000 feet above the surrounding lowlands, commonly of limited summit area and having a well defined outline; hillsides generally have slopes of more than 15 percent. The distinction between a hill and a mountain is arbitrary and is dependant on local usage.

Hillslope - The steeper part of a hill between its summit and the drainage line, valley flat, or depressional floor at the base of the hill. The landform positions of a simple hillslope includes summit, shoulder, backslope, footslope and toeslope.

Illuviation - The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and is deposited in a lower horizon.

Infiltration rate - The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Interfluve - The relatively dissected upland or ridge between two adjacent valleys containing streams flowing in the same general direction. Any elevated areas between two drainageways that sheds water to those drainageways.

Knoll - A small, low, rounded hill rising above adjacent landforms.

Loess - Fine grained material, dominantly silt-sized particles deposited by wind.

Natric horizon - A special kind of argillic horizon that contains enough exchangeable sodium to have an adverse effect on the physical condition of the subsoil.

Organic matter - Plant and animal residue in the soil in various stages of decomposition. The content of organic matter in the surface is described as follows:

Very low	less than 0.5%
Low	0.5 to 1.0%
Moderate low	1.0 to 2.0%
moderate	2.0 to 4.0%
High	4.0 to 8.0%
Very high	more than 8%

Oxbow - A closely looping stream meander having an extreme curvature such that only a neck of land is left between the two parts of the stream.

Pedisediment - A thin layer of alluvial material that mantles an erosion surface and has been transported to its present position from higher lying areas of the erosion surface.

Pedon - The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit the study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending upon the variability of the soil.

Permeability - The quality of the soil that enables water or air to move downward through the soil 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 traditionally usage in published soil reports. This rate of flow continues to be expressed as "permeability". Terms describing permeability, measured in inches per hour, are as follows:

Extremely slow	0.0 to 0.01 inch
Very slow	0.01 to 0.06 inch
Slow	0.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20.0 inches
Very rapid	20.0 > inches

Playa - the generally dry and nearly level lake plain that occupies the lowest parts of closed depressional areas, such as those in intermontane basin floors. Temporary flooding occurs primarily in response to precipitation and runoff.

Residuum (residual soil material) - Unconsolidated, weathered, or partly weathered mineral material that accumulates by disintegration of bedrock in place.

Rock fragments - Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones and boulders.

Root zone - The part of the soil that can be penetrated by plant roots.

Sand sheet - A large irregular shaped surficial mantle of eolian sand, lacking the discernible slip faces that are common on dunes.

Second bottom - The first terrace above the normal floodplain (or first bottom) of a river.

Shoulder - The landform position that forms the uppermost inclined surface near the top of a hillslope. It comprises the transitional zone from backslope to summit. The surface is dominantly convex in profile and erosional in origin.

Side slope - The slope bounding a drainageway and lying between the drainageway and the adjacent interfluvium. It is generally linear along the slope width and the overland flow is parallel down the slope.

Similar soils - Soils that share limits of diagnostic criteria, behave and perform in a similar manner, and have

similar conservation needs or management requirements for the major land uses in the survey area.

Slickspots - small area on the ground surface denuded of vegetation with a thin crusting of the surface texture. Due to high content of alkali or exchangeable sodium the soil will pond water and hold water for a long time. The soil is dispersed and may appear dry but saturated below 2 inches.

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".

Summit - The topographically highest landform position of the hillslope profile.

Terrace (geologic) - A step like surface, bordering a valley floor or shoreline, that represents the former position of a floodplain, or lake, or sea shore.

Texture, soil - The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing percentage of fine particles are: sand, loamy sand, sandy 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 can be further divided by specifying coarse, fine and very fine.

Toe slope - The landform position that forms the gently inclined surface at the base of a hillslope. Toeslopes in profile are commonly gentle and linear; and are constructional surfaces forming the distal part of a hill slope continuum that grades to valley or closed depression floors.

Topsoil - The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Upland - Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the footslope zone of the hillslope continuum.

Valley fill - In non-glaciated regions, alluvium deposited by heavily loaded streams.

CASE	FREQ	SOILCODE	COMP1	AREA (m2)	ACRES
2	8	1	Arvada	1,995,481.859375	493.09434
3	6	2	Ascalon	122,182.023438	30.19183
4	11	3	Ascalon	1,609,979.953125	397.83474
5	3	4	Avar	2,699,234.984375	666.99554
6	1	5	Bankard	816,938.937500	201.87002
7	14	6	Cushman	2,420,242.898438	598.05509
8	6	7	Edgar	3,993,633.953125	986.84851
9	3	8	Kim & inclusions	449,235.023438	111.00840
10	2	9	Nucla	711,382.375000	175.78642
11	22	11	Olney	12,464,518.382813	3,080.04980
12	14	12	Olney	2,836,441.218750	700.89994
13	16	13	Otero	1,438,696.320313	355.50963
14	8	14		782,552.375000	193.37291
15	13	15	Pleasant	234,327.601563	57.90361
16	13	16	Remmit	4,172,005.382813	1,030.92505
17	15	17	Remmit	3,891,826.882813	961.69143
18	4	18	Remmit	1,331,498.328125	329.02042
19	6	19	Remmit	2,799,681.007813	691.81629
20	12	20	Renohill	1,640,854.679688	405.46405
21	10	21	Ulm	3,196,308.312500	789.82504
22	10	22	Ulm	1,646,345.359375	406.82082
23	24	23	Ulm	5,586,685.445313	1,380.50014
24	1	24	Vona	29,964.968750	7.40450
25	12	25	Vona	2,148,903.406250	531.00563
26	5	26	Vona	1,670,615.046875	412.81799
27	2	27	Valent	672,754.875000	166.24136
28	5	28	Zeigweid	2,425,627.562500	599.38566
29	5	29	Zeigweid	852,919.000000	210.76089
30	19	30	Zeigweid	3,921,617.140625	969.05277

~16927

Renohill is 2.4%

1 - Arvada-Manzanola complex, 0 to 2 percent slopes
Arvada & similar inclusions - 60 pct
Manzanola & similar inclusions - 25 pct
Contrasting inclusions - 15 pct

Arvada Soil

Position on Landscape:shallow, concave depresssions or swales along low terraces and firstbottomlands
Slope Range:0 to 2 percent
Native Existing Plants:Alkali sacaton, Western wheatgrass, Inland saltgrass, Fourwing saltbush, Blue grama, Ring muhly
Rock Fragments on Surface:gravelly, .1 to .5% surface covered
Organic Mat on Surface:in some places .5 in. inch, in some places denuded of vegetation
Typical Profile:
0 - 3in. - sandy clay loam
3 - 8in. - clay loam
8 - 32in. - clay
32 - 54in. - clay
54 - 63in. - stratified sandy loam to clay loam
63 - 75in. - stratified sandy clay loam to sandy loam
75 - 85in. - clay
Depth Class:very deep (60 inches+)
Drainage:moderately well drained
Permeability:slow, (<0.06in/hr)
Available Water Capacity:9.2 inches/75in.
Potential Rooting Depth:very deep (60+ inches)
Runoff:slow
Hazard of Erosion by Water:slight

Manzanola Soil

Position on Landscape:convex elongated irregular shaped mound-like ridges, nearly level to very gently rippled bottomlands or low terraces
Slope Range:0 to 2 percent
Native Existing Plants:Western wheatgrass, Alkali sacaton, Blue grama, Inland saltgrass, Fourwing saltbush, Fringed sage, Common sunflower, Ring muhly
Rock Fragments on Surface:none
Organic Mat on Surface:none
Typical Profile:
0 - 5in. - loam
5 - 25in. - clay loam
25 - 50in. - sandy clay loam
50 - 60in. - loamy fine sand
Depth Class:very deep (60 inches+)
Drainage:well drained
Permeability:slow, (0.6-2.0in/hr)
Available Water Capacity:8.81 inches/60in.
Potential Rooting Depth:very deep (60+ inches)
Runoff:slow
Hazard of Erosion by Water:slight

Included Similar and Dissimilar Soils

Avar fine sandy loam in shallow depressions and oxbows. Avar soils have less than 35% clay throughout the subsoil and usually contain lesser quantities of gypsum salts below a depth of 24 inches. Arvada-like soils in low swales. These soils are similar to Arvada but differ due to somewhat poorly internal drainage in the substratum due to a seasonal fluctuating water table to a depth of 2 feet. Kim fine sandy loam on convex toeslopes. Kim soils lack a dark colored surface layer with little or no diagnostic subsoil features. These soils contain more sodium saturation in the subsoil. Olney fine sandy loam on adjacent toeslopes and interfluvies. Olney soils have a structural subsoil with a significant clay increase in the subsoil due to clay movement into the subsoil, dropping off in quantity as depth increases. Renohill-like loam on adjacent footslopes and toeslopes. Renohill soils developed in shale colluvium and residuum. These soils are moderately deep to shale and steeper slopes.

Major Management Factors

Soil Related Factors: water holding capacity, concentration of sodium and sulfate salts in the subsoil, slow or very slow permeability and percolation rates into the subsoil, and rare flooding hazard

rev. 4/94

2 - Ascalon fine sandy loam, 0 to 2 percent slopes
Ascalon & similar inclusions - 80 pct
Contrasting inclusions - 20 pct

Ascalon Soil

Position on Landscape: slightly concave to nearly level Uplands
Slope Range: 0 to 2 percent
Native Existing Plants: Western wheatgrass, Buffalograss, Blue grama,
Ring muhly, Prickly pear cactus, Green needlegrass
Rock Fragments on Surface: none
Organic Mat on Surface: none
Typical Profile:
 0 - 4in. - fine sandy loam
 4 - 21in. - sandy clay loam
 21 - 33in. - sandy clay loam
 33 - 65in. - sandy loam
Depth Class: very deep (>60in.)
Drainage: well drained
Permeability: moderate (2.0-6.0in/hr)
Available Water Capacity: 9.2 inches/65in.
Potential Rooting Depth: very deep (>60 inches)
Runoff: slow
Hazard of Erosion by Water: slight

Included Similar and Dissimilar Soils

Olney fine sandy loam soil occurs on slightly higher (topographical position) convex elongated interfluves.
Nucla loam occurs on slightly convex fan terraces and adjoining toeslopes. Nucla soils have a dark colored surface layer and very similar subsoil and substratum characteristics of the Edgar soil.
Avar-like soil with gravelly loam surface that occurs on concave pockets on second bottoms and fan terraces. Some small (less than 50 ft. in diameter) are barren of any vegetation, like slickspots.
Owl Creek soil with a loam or sandy loam surface that occurs on concave pockets and slightly elongated depressional areas on the interfluves and Uplands. The Owl Creek soil has a buried dark colored horizon within 27 inches of the surface.
Zigweid fine sandy loam soil occurs on slightly higher (topographical position) convex interfluves. This soil does not have evidence of clay elluviation in the subsoil.

Major Management Factors

Soil Related Factors: subject to wind erosion when denuded of vegetation
rev. 4/94

3 - Ascalon fine sandy loam, 2 to 5 percent slopes

Ascalon & similar inclusions - 70 pct

Contrasting inclusions - 30 pct

Ascalon Soil

Position on Landscape: slightly concave to nearly level Uplands.

Slope Range: 2 to 5 percent

Native Existing Plants: Western wheatgrass, Buffalograss, Blue grama, Ring muhly, Prickly pear cactus, Green needlegrass

Rock Fragments on Surface: none

Organic Mat on Surface: none

Typical Profile:

0 - 4in. - fine sandy loam

4 - 21in. - sandy clay loam

21 - 33in. - sandy clay loam

33 - 65in. - sandy loam

Depth Class: very deep (>60in.)

Drainage: well drained

Permeability: moderate (2.0-6.0in/hr)

Available Water Capacity: 9.2 inches/65in.

Potential Rooting Depth: very deep (>60 inches)

Runoff: slow

Hazard of Erosion by Water: slight

Included Similar and Dissimilar Soils

Olney fine sandy loam soil occurs on slightly higher (topographical position) convex uplands.

Nucla loam occurs on slightly convex adjacent fan terraces and adjoining toeslopes. Nucla soils have a dark colored surface layer and very similar subsoil and substratum characteristics of the Edgar soil.

Owl Creek soil with a loam or sandy loam surface that occurs on concave pockets and slightly elongated depressional areas on uplands. The Owl Creek soil has a buried dark colored horizon within 27 inches of the surface.

Zigweid fine sandy loam soil occurs on slightly higher (topographical position) convex interfluvies. This soil does not have evidence of clay illuviation in the subsoil.

Remmit fine sandy loam soil occurs on convex footslopes. This soil does not have evidence of clay illuviation in the subsoil and has less than 18 percent clay in the subsoil.

Major Management Factors

Soil Related Factors: subject to wind erosion when denuded of vegetation

rev. 4/94

4 - Avar-Manzanola complex, 0 to 2 percent slopes

Avar & similar inclusions - 65 pct

Manzanola & similar inclusions - 20 pct

Contrasting inclusions - 15 pct

Avar Soil

Position on Landscape:shallow, concave depresssions or swales along low terraces and second bottoms

Slope Range:0 to 2 percent

Native Existing Plants:Alkali sacaton, Western wheatgrass, Inland saltgrass, Fourwing saltbush, Blue grama, Ring muhly

Rock Fragments on Surface:gravelly, .1 to .5% surface covered

Organic Mat on Surface:in some places .5 in. inch, in some places denuded of vegetation

Typical Profile:

0 - 5in. - fine sandy loam

5 - 12in. - clay loam*

12 - 19in. - sandy clay loam

19 - 45in. - loam

45 - 72in. - fine sandy loam

* - This horizon has a SAR of 19

Depth Class:very deep (60 inches+)

Drainage:well drained

Permeability:slow, (0.06-0.6in/hr)

Available Water Capacity:8.74 inches/60in.

Potential Rooting Depth:very deep (60+ inches)

Runoff:slow

Hazard of Erosion by Water:slight

Hazard Due to Flooding: slight

Manzanola Soil

Position on Landscape:convex elongated irregular shaped knoll-like ridges, nearly level to very gentle rippled second bottom or low terraces

Slope Range:0 to 2 percent

Native Existing Plants:Western wheatgrass, Alkali sacaton, Blue grama, Inland saltgrass, Fourwing saltbush, Fringed sage, Common sunflower, Green needlegrass, Ring muhly

Rock Fragments on Surface:none

Organic Mat on Surface:none

Typical Profile:

0 - 2in. - loam

2 - 13in. - clay loam

13 - 23in. - clay loam

23 - 60in. - fine sandy loam

Depth Class:very deep (60 inches+)

Drainage:well drained

Permeability:slow, (0.6-2.0in/hr)

Available Water Capacity:8.72 inches/60in.

Potential Rooting Depth:very deep (60+ inches)

Runoff:slow

Hazard of Erosion by Water:slight

Hazard Due to Flooding: slight

Included Similar and Dissimilar Soils

Arvada loam in shallow depressions, slickspots and oxbows. Arvada soils have greater than 35% clay throughout the subsoil and usually contain higher quantities of gypsum salts below a depth of 18 inches. Arvada-like soils in depressional sites. These soils are similar to Arvada but differ due to somewhat poorly to moderately well internal drainage in the substratum due to a seasonal fluctuating water table to a depth of 2 feet. Kim fine sandy loam on convex adjoining toeslopes. Kim soils lack a dark colored surface layer with little or no diagnostic subsoil features. These soils contain more sodium saturation in the subsoil. Olney fine sandy loam on adjacent toeslopes. Olney soils have a structural subsoil with a significant clay increase in the subsoil due to elluviation of clay .

Major Management Factors

Soil Related Factors: water holding capacity, concentration of sodium and sulfate salts in the subsoil, potential to overflow or flooding

rev. 4/94

5 - Ustic Torrifluvents, 0 to 2 percent slopes
Ustic Torrifluvents & similar inclusions - 70 pct
Contrasting inclusions - 30 pct

Ustic Torrifluvents

Position on Landscape: nearly level first bottoms, old oxbows and spits along streams

Slope Range: 0 to 2 percent

Native Existing Plants: Western wheatgrass, Willow, Blue grama, Ring muhly, Prickly pear cactus, Fourwing saltbush, Plains cottonwood, Sand buckwheat

Rock Fragments on Surface: none

Organic Mat on Surface: none

Typical Profile:

0 - 4in. - sand

4 - 39in. - stratified sand to loamy sand

39 - 65in. - very gravelly sand

Depth Class: very deep (>60in.)

Drainage: somewhat excessively drained

Permeability: very rapid (20.0+in/hr)

Available Water Capacity: 1.4 inches/65in.

Potential Rooting Depth: very deep (>60 inches)

Runoff: slow

Hazard of Erosion by Water: moderate

Flooding: rare to frequent

Included Similar and Dissimilar Soils

Remmit fine sandy loam soil occurs on adjacent convex toeslopes. This soil does not have evidence of clay illuviation in the subsoil and has less than 18 percent clay in the subsoil.

Vona sandy loam soil occurs on narrow adjacent toeslopes. This soil does have evidence of clay illuviation in the subsoil and has less than 18 percent clay in the subsoil.

Altvan-like sandy loam soil occurs on convex flattened ridges and narrow adjacent toeslopes. This soil does have evidence of clay illuviation in the subsoil and has less than 18 percent clay in the subsoil. This soil contains very gravelly sand at depths between 20 to 35 inches.

Major Management Factors

Soil Related Factors: subject to rare or frequent flooding and short duration seasonal watertable in April to May.

rev. 4/94

6 - Cushman fine sandy loam, 2 to 5 percent slopes

Cushman & similar inclusions - 75 pct

Contrasting inclusions - 25 pct

Cushman Soil

Position on Landscape: slightly concave to nearly level fan terraces and to gently sloping Uplands.

Slope Range: 2 to 5 percent

Native Existing Plants: Western wheatgrass, Inland saltgrass, Fourwing saltbush, Blue grama, Ring muhly, Buffalograss, Prickly pear cactus

Rock Fragments on Surface: none

Organic Mat on Surface: none

Typical Profile:

0 - 4in. - fine sandy loam

4 - 21in. - sandy clay loam

21 - 30in. - sandy clay loam

30 +in. - Soft sandstone with lenses of shale

Depth Class: moderately deep (20 to 40in.)

Drainage: well drained

Permeability: moderate (2.0-6.0in/hr)

Available Water Capacity: 5.2 inches/30in.

Potential Rooting Depth: moderately deep (20-40 inches)

Runoff: slow

Hazard of Erosion by Water: slight

Included Similar and Dissimilar Soils

Olney fine sandy loam soil occurs on slightly higher (topographical position) convex elongated interfluves.

Nucla loam occurs on slightly convex adjacent fan terraces and adjoining toeslopes. Nucla soils have a dark colored surface layer and very similar subsoil and substratum characteristics of the Edgar soil.

Avar-like soil soil with gravelly loam surface that occurs on concave pockets and slightly depressional areas. Some small (less than 50 ft. in diameter) are barren of any vegetation, like slickspots.

Major Management Factors

Soil Related Factors: subject to wind erosion when denuded of vegetation

rev. 4/94

7 - Edgar loam, 0 to 2 percent slopes
Edgar & similar inclusions - 85 pct
Contrasting inclusions - 15 pct

Edgar Soil

Position on Landscape:slightly elongated concave swales or the nearly level second bottom of Cow Creek

Slope Range:0 to 2 percent

Native Existing Plants: Western wheatgrass, Inland saltgrass, Fourwing saltbush, Blue grama, Ring muhly, Buffalograss, Prickly pear cactus

Rock Fragments on Surface:gravelly, .1 to .5% surface covered

Organic Mat on Surface:none

Typical Profile:

0 - 10in. - loam

10 - 24in. - loam

24 - 52in. - loam

52 - 72in. - loam

Depth Class:very deep (60 inches+)

Drainage:well drained

Permeability:moderate (2.0-6.0in/hr)

Available Water Capacity:10.2 inches/60in.

Potential Rooting Depth:very deep (60+ inches)

Runoff:slow

Hazard of Erosion by Water:slight

Included Similar and Dissimilar Soils

Haverson-like loam soil occurs on slightly higher (topographical position) convex elongated interfluves. This soil contains finer textured lenses of silts and/or clays throughout the underlying materials to a depth of 40 inches or more.

Nucla loam occurs on slightly convex ridges within the second bottom position and adjoining toeslopes. Nucla soils have a dark colored surface layer and very similar subsoil and substratum characteristics of the Edgar soil.

Haverson-like soil soil with gravelly loam surface that occurs on convex, flattened interfluves. This soil contains lenses of fine gravel below depths of 30 inches.

Major Management Factors

Soil Related Factors: concentration of calcium carbonates in the surface layer, rare potential to overflow or flooding

rev. 4/94

8 - Kim-Cushman complex, 2 to 5 percent slopes

Kim & similar inclusions - 50 pct
Cushman & similar inclusions - 35 pct
Contrasting inclusions - 15 pct

Kim Soil

Position on Landscape:slightly, concave to convex gently sloping uplands

Slope Range:2 to 5 percent

Native Existing Plants: Western wheatgrass, Buffalograss, Fourwing saltbush, Blue grama, Ring muhly

Rock Fragments on Surface:gravelly, <0.1% surface covered

Organic Mat on Surface:none

Typical Profile:

0 - 5in. - sandy loam

5 - 19in. - loam*

19 - 45in. - loam

45 - 72in. - fine sandy loam

Depth Class:very deep (60 inches+)

Drainage:well drained

Permeability:moderate, (0.6-2.0in/hr)

Available Water Capacity:9.6 inches/60in.

Potential Rooting Depth:very deep (60+ inches)

Runoff:slow

Hazard of Erosion by Water:slight

Cushman Soil

Position on Landscape:convex elongated irregular shaped knoll-like ridges, gently sloping to rolling uplands.

Slope Range:2 to 5 percent

Native Existing Plants:Western wheatgrass, Blue grama, Inland saltgrass, Fringed sage, Common sunflower, Green needlegrass, Ring muhly

Rock Fragments on Surface:none

Organic Mat on Surface:none

Typical Profile:

0 - 5in. - loam

5 - 14in. - sandy clay loam

14 - 20in. - sandy clay loam

20 - 30in. - sandy loam

30 +in. - Soft sandstone

Depth Class:moderately deep (20 to 40 in.)

Drainage:well drained

Permeability:moderate(0.6-2.0in/hr)

Available Water Capacity:5.72 inches/60in.

Potential Rooting Depth:moderately deep (20-40 inches)

Runoff:slow

Hazard of Erosion by Water:slight

Included Similar and Dissimilar Soils

Kim-like fine sandy loam on convex side slopes and adjoining toeslopes.

These Kim-like soils have a thick dark colored surface layer with little or no diagnostic subsoil features. These soils contain more sodium saturation in the substratum.

Olney fine sandy loam on adjacent toeslopes. Olney soils have a structural subsoil with a significant clay increase in the subsoil due to clay movement into the subsoil.

Remmit sandy loam on convex side slopes and adjoining toeslopes. Remmit soils lack a dark colored surface layer with a slight clay increase in the subsoil but less than 18 percent.

Cushman-like fine sandy loam on convex side slopes. These soils lack a dark colored surface layer and have buff colored siltstone/sandstone within 20 inches.

Major Management Factors

Soil Related Factors: water holding capacity of the Cushman soil, potential for wind erosion if the soil is denuded or overgrazed

rev. 4/94

9 - Nucla loam, 0 to 2 percent slopes
Nucla & similar inclusions - 70 pct
Contrasting inclusions - 30 pct

Nucla Soil

Position on Landscape: slightly concave to nearly level interfluves and nearly level uplands

Slope Range: 0 to 2 percent

Native Existing Plants: Western wheatgrass, Buffalograss, Blue grama, Ring muhly, Prickly pear cactus

Rock Fragments on Surface: none

Organic Mat on Surface: none

Typical Profile:

0 - 9in. - loam

9 - 21in. - heavy loam

21 - 33in. - light sandy clay loam

33 - 65in. - loam

Depth Class: very deep (>60in.)

Drainage: well drained

Permeability: moderate (2.0-6.0in/hr)

Available Water Capacity: 10.3 inches/65in.

Potential Rooting Depth: very deep (>60 inches)

Runoff: slow

Hazard of Erosion by Water: slight

Included Similar and Dissimilar Soils

Olney fine sandy loam soil occurs on slightly higher (topographical position) convex elongated interfluves. The Olney soil has evidence of clay accumulation in the subsoil and lacks a dark colored surface layer. Nucla-like soil occurs on slightly convex adjacent fan terraces and toeslopes. This inclusion has a dark colored surface layer 5 to 8 inches thick and overlies soft siltstone at depths of 40 inches or more.

Owl Creek soil with a loam or sandy loam surface that occurs on concave pockets and slightly elongated depressional areas on the interfluve. The Owl Creek soil has a buried dark colored horizon within 27 inches of the surface.

Zigweid fine sandy loam soil occurs on slightly higher (topographical position) convex interfluves. This soil does not have evidence of clay illuviation in the subsoil.

Remmit fine sandy loam soil occurs on convex toeslopes. This soil does not have evidence of clay illuviation in the subsoil and has less than 18 percent clay in the subsoil.

Major Management Factors

Soil Related Factors: subject to wind erosion when denuded of vegetation

10 - Olney fine sandy loam, 0 to 2 percent slopes
Olney & similar inclusions - 75 pct
Contrasting inclusions - 25 pct

Olney Soil

Position on Landscape: slightly concave to nearly level terraces and to gently sloping Uplands.

Slope Range: 0 to 2 percent

Native Existing Plants: Western wheatgrass, Green needlegrass, Blue grama, Ring muhly, Buffalograss, Prickly pear cactus

Rock Fragments on Surface: none

Organic Mat on Surface: none

Typical Profile:

- 0 - 4in. - fine sandy loam
- 4 - 21in. - sandy clay loam
- 21 - 30in. - sandy clay loam
- 30 - 49in. - sandy loam
- 49 - 62in. - loamy sand

Depth Class: very deep (>60in.)

Drainage: well drained

Permeability: moderate (2.0-6.0in/hr)

Available Water Capacity: 9.0 inches/62in.

Potential Rooting Depth: very deep (>60 inches)

Runoff: slow

Hazard of Erosion by Water: slight

Included Similar and Dissimilar Soils

Owl Creek fine sandy loam soil occurs on slightly concave (topographical position) slopes of stream terraces. Owl Creek soils have a buried surface horizon below the depth of 24 inches.

Nucla loam occurs on slightly convex adjacent alluvial fans and adjoining toeslopes. Nucla soils have a dark colored surface layer and very similar subsoil and substratum characteristics of the Edgar soil.

Avar-like soil soil with gravelly loam surface that occurs on concave pockets and slightly depressional areas on the second bottom. Some small areas (less than 50 ft. in diameter) are barren of any vegetation, could be denoted as slickspots.

Zigweid sandy loam soil occurs on a slightly convex alluvial fan and has no clay accumulation by illuviation on ped faces in the subsoil.

Haplustert clay soil occurs in deflation basins, playas and swales. This soil has greater than 40 percent clay below 6 inches and does not have a 10 inch or more thick dark colored surface horizon.

Major Management Factors

Soil Related Factors: subject to wind erosion when denuded of vegetation

11 - Olney fine sandy loam, 2 to 5 percent slopes
Olney & similar inclusions - 70 pct
Contrasting inclusions - 30 pct

Olney Soil

Position on Landscape: slightly concave to nearly level strath terraces and to gently sloping Uplands

Slope Range: 2 to 5 percent

Native Existing Plants: Western wheatgrass, Green needlegrass, Blue grama, Ring muhly, Buffalograss, Prickly pear cactus

Rock Fragments on Surface: none

Organic Mat on Surface: none

Typical Profile:

- 0 - 4in. - fine sandy loam
- 4 - 21in. - sandy clay loam
- 21 - 30in. - sandy clay loam
- 30 - 49in. - sandy loam
- 49 - 62in. - loamy sand

Depth Class: very deep (>60in.)

Drainage: well drained

Permeability: moderate (2.0-6.0in/hr)

Available Water Capacity: 9.0 inches/62in.

Potential Rooting Depth: very deep (>60 inches)

Runoff: slow

Hazard of Erosion by Water: slight

Included Similar and Dissimilar Soils

Owl Creek fine sandy loam soil occurs on slightly concave (topographical position) slopes of stream terraces. Owl Creek soils have a buried horizon below the depth of 24 inches.

Vona sandy loam occurs on convex side-slopes and adjoining toeslopes. Vona soils have a subsoil with less than 18 percent clay.

Remmit sandy loam occurs on convex side-slopes and adjoining toeslopes. Remmit soils have a subsoil with less than 18 percent clay and no evidence of clay illuviation on faces of peds.

Zigweid sandy loam soil occurs on slightly convex toeslopes and on alluvial fans and has no clay accumulation by illuviation on ped faces in the subsoil.

Pleasant-like fine sandy loam soil occurs in playas and swales. This soil has greater than 40 percent clay below 6 inches and does not have a 10 inch or more thick dark colored surface horizon.

Major Management Factors

Soil Related Factors: subject to wind erosion when denuded of vegetation

rev. 11/93

12 - Olney-Owl Creek complex, 0 to 2 percent slopes
Olney & similar inclusions - 45 pct
Owl Creek & similar inclusions - 35 pct
Contrasting inclusions - 20 pct

Olney Soil

Position on Landscape:slightly convex along fan terraces.
Slope Range:0 to 2 percent
Native Existing Plants: Western wheatgrass, Sand muhly, Fourwing saltbush, Blue grama, Buffalograss, Ring muhly, Prairie Sandreed
Rock Fragments on Surface:none
Organic Mat on Surface:none
Typical Profile:
0 - 5in. - fine sandy loam
5 - 12in. - sandy clay loam
12 - 19in. - sandy clay loam
19 - 34in. - sandy loam
34 - 72in. - loamy sand
Depth Class:very deep (60 inches+)
Drainage:well drained
Permeability:moderate (2.0-0.6in/hr)
Available Water Capacity:8.9 inches/72in.
Potential Rooting Depth:very deep (60+ inches)
Runoff:slow
Hazard of Erosion by Water:slight

Owl Creek Soil

Position on Landscape:slightly concave, nearly level fan terraces
Slope Range:0 to 2 percent
Native Existing Plants:Western wheatgrass, Alkali sacaton, Blue grama, Inland saltgrass, Fourwing saltbush, Fringed sage, Common sunflower, Green needlegrass, Ring muhly
Rock Fragments on Surface:none
Organic Mat on Surface:none
Typical Profile:
0 - 4in. - fine sandy loam
4 - 12in. - fine sandy loam
12 - 21in. - sandy clay loam
21 - 25in. - loam
25 - 35in. - clay loam
35 - 48in. - gravelly sandy clay loam
48 - 80in. - very gravelly loamy sand
Depth Class:very deep (60 inches+)
Drainage:well drained
Permeability:slow, (0.6-2.0in/hr)
Available Water Capacity:8.7 inches/80in.
Potential Rooting Depth:very deep (60+ inches)
Runoff:slow
Hazard of Erosion by Water:slight

Included Similar and Dissimilar Soils

Vona loamy sand on elongated crowns of the fan terraces. These soils have less than 18% clay throughout the subsoil.

Altvan soils occur on narrow ridges of the fan terraces. These soils are similar to Owl Creek but differ in that very gravelly sand occurs between 20 to 40 inches of the surface.

Kim fine sandy loam on convex adjacent footslopes and adjoining toeslopes. Kim soils lack a dark colored surface layer with little or no diagnostic subsoil features. These soils contain more sodium saturation in the subsoil.

Remmit fine sandy loam on adjacent footslopes. Remmit soils have a structural subsoil with less than 18 percent clay in the subsoil.

Major Management Factors

Soil Related Factors: if vegetation is denuded the potential for wind erosion is moderate to high.

rev. 4/94

13 - Otero-Altvan complex, 6 to 15 percent slopes

Otero & similar inclusions - 45 pct

Altvan & similar inclusions - 35 pct

Contrasting inclusions - 20 pct

Otero Soil

Position on Landscape:slight to moderately, convex rolling uplands

Slope Range:6 to 15 percent

Native Existing Plants: Western wheatgrass, Buffalograss, Sand buckwheat, Blue grama, Ring muhly

Rock Fragments on Surface:gravelly, 0 to .1% surface covered

Organic Mat on Surface:none

Typical Profile:

0 - 4in. - sandy loam

4 - 12in. - sandy loam

12 - 38in. - sandy loam

38 - 62in. - loamy sand

Depth Class:very deep (60 inches+)

Drainage:well drained

Permeability:moderate, (2.0-6.0in/hr)

Available Water Capacity:7.6 inches/62in.

Potential Rooting Depth:very deep (60+ inches)

Runoff:medium

Hazard of Erosion by Water:slight to moderate

Altvan Soil

Position on Landscape:convex elongated irregular shaped knoll-like ridges, and shoulders of the ridges on rolling uplands.

Slope Range:6 to 15 percent

Native Existing Plants: Blue grama, Western wheatgrass, Fringed sage, Green needlegrass, Ring muhly

Rock Fragments on Surface:cobble, 0.1 to 1.0%

Organic Mat on Surface:none

Typical Profile:

0 - 5in. - sandy loam

5 - 14in. - sandy clay loam

14 - 23in. - sandy loam

23 - 60in. - very gravelly sand

Depth Class:very deep (> 60 in.)

Drainage:somewhat excessively drained

Permeability:moderate(0.6-2.0in/hr to 23 inches)

Available Water Capacity:5.1 inches/60in.

Potential Rooting Depth:moderately deep (20-40 inches)

Runoff:medium

Hazard of Erosion by Water:moderate

Included Similar and Disimilar Soils

Kim-like fine sandy loam on convex hillslopes and adjoining toeslopes. These Kim-like soils have a thick dark colored surface layer with little

or no diagnostic subsoil features. These soils contain more sodium saturation in the subsoil.

Remmit-like sandy loam on slightly convex hillslopes. Remmit soils lack a dark colored surface layer with a slight clay increase in the subsoil but less than 18 percent. The substratum may contain 10 to 20 percent coarse fragments below 40 inches.

Altvan-like gravelly sandy loam on convex shoulders of the hillslopes. These soils have a dark colored surface layer, very thin zone of clay accumulation and have coarse sand or very gravelly sand at depths less than 20 inches.

Major Management Factors

Soil Related Factors: water holding capacity, concentration of sodium and sulfate salts in the subsoil, potential to overflow or flooding

rev. 4/94

14 - Owl Creek-Olney complex, 0 to 2 percent slopes
Owl Creek & similar inclusions - 45 pct
Olney & similar inclusions - 40 pct
Contrasting inclusions - 15 pct

Owl Creek Soil

Position on Landscape:slightly concave, nearly level terraces and aluvial fans.

Slope Range:0 to 2 percent

Native Existing Plants:Western wheatgrass, Blue grama, Inland saltgrass, Fourwing saltbush, Fringed sage, Common sunflower, Green needlegrass, Ring muhly

Rock Fragments on Surface:none

Organic Mat on Surface:none

Typical Profile:

- 0 - 4in. - fine sandy loam
- 4 - 12in. - fine sandy loam
- 12 - 21in. - sandy clay loam
- 21 - 25in. - loam
- 25 - 35in. - clay loam
- 35 - 48in. - gravelly sandy clay loam
- 48 - 80in. - very gravelly loamy sand

Depth Class:very deep (60 inches+)

Drainage:well drained

Permeability:slow, (0.6-2.0in/hr)

Available Water Capacity:8.7 inches/80in.

Potential Rooting Depth:very deep (60+ inches)

Runoff:slow

Hazard of Erosion by Water:slight

Olney Soil

Position on Landscape:slightly convex along terraces and interfluves.

Slope Range:0 to 2 percent

Native Existing Plants: Western wheatgrass, Sand muhly, Fourwing saltbush, Blue grama, Buffalograss, Ring muhly, Prairie Sandreed

Rock Fragments on Surface:none

Organic Mat on Surface:none

Typical Profile:

- 0 - 5in. - fine sandy loam
- 5 - 12in. - sandy clay loam
- 12 - 19in. - sandy clay loam
- 19 - 34in. - sandy loam
- 34 - 72in. - loamy sand

Depth Class:very deep (60 inches+)

Drainage:well drained

Permeability:moderate (2.0-0.6in/hr)

Available Water Capacity:8.9 inches/72in.

Potential Rooting Depth:very deep (60+ inches)

Runoff:slow

Hazard of Erosion by Water:slight

Included Similar and Dissimilar Soils

Kim-like fine sandy loam on convex side slopes and adjoining toeslopes. These Kim-like soils have a thick dark colored surface layer with little

or no diagnostic subsoil features. These soils contain more sodium saturation in the subsoil than the Olney series. Olney fine sandy loam occurs on nearly level concave plains and terraces. Olney soils have a structural subsoil with a significant clay increase in the subsoil due to elluviation of clay into the subsoil, dropping off in quantity as depth increases. Remmit sandy loam on convex side slopes and adjoining toeslopes. Remmit soils lack a dark colored surface layer with a slight clay increase in the subsoil but less than 18 percent. Cushman-like fine sandy loam on convex side slopes. These soils lack a dark colored surface layer and have buff colored siltstone/sandstone within 40 inches.

Major Management Factors

Soil Related Factors: susceptibility to wind erosion

rev. 4/94

15 - Pleasant-Typic Haplustert, 0 to 1 percent slope
Pleasant & similar inclusions - 50 pct
Typic Pellustert & similar inclusions - 45 pct
Contrasting inclusions - 5 pct

Pleasant Soil

Position on Landscape: concave to nearly level upland swales
Slope Range: 0 to 1 percent
Native Existing Plants: Western wheatgrass, Buffalograss, Blue grama
Rock Fragments on Surface: none
Organic Mat on Surface: none
Typical Profile:
 0 - 5in. - silty clay loam
 5 - 25in. - silty clay
 25 - 50in. - clay
 50 - 72in. - clay loam
Depth Class: very deep (60 inches+)
Drainage: well drained
Permeability: very slow (<0.06in/hr)
Available Water Capacity: 12.0 inches/60in.
Potential Rooting Depth: very deep (60+ inches)
Runoff: slow to ponded
Hazard of Erosion by Water: slight to depositional

Typic Haplustert Soil

Position on Landscape: concave to nearly level swales and playas
Slope Range: 0 to 1 percent
Native Existing Plants: barren, annual weeds, Blue grama
Rock Fragments on Surface: none
Organic Mat on Surface: none
Typical Profile:
 0 - 5in. - clay
 5 - 14in. - clay
 14 - 31in. - clay *
 31 - 51in. - loamy fine sand
 51 - 71in. - fine sand
 * slickensides evident to 30% of this horizon
Depth Class: very deep (>60 in.)
Drainage: well drained
Permeability: very slow (<0.06in/hr)
Available Water Capacity: 6.5 inches/60in.
Potential Rooting Depth: deep (40-60 inches)
Runoff: slow or ponded
Hazard of Erosion by Water: slight or depositional

Included Similar and Dissimilar Soils

Renohill fine sandy loam on adjacent toeslopes, footslopes and side slopes. Renohill soils have a structural subsoil with a significant clay increase in the subsoil due to elluviation of clay. Soft shale occurs within to 20 to 40 inches.
Ulm loam soils occur on the rim area of the playa. Ulm soils do not exhibit slickensides and low chroma colors in the surface 30 inches.

Major Management Factors

Soil Related Factors: water holding capacity, high shrink-swell capacity,
rare ponding frequency

rev. 4/94

16 - Remmit loamy sand, 2 to 5 percent slopes
Remmit & similar inclusions - 70 pct
Contrasting inclusions - 30 pct

Remmit Soil

Position on Landscape: gently sloping to rolling interfluves and uplands.
Slope Range: 2 to 5 percent
Native Existing Plants: Western wheatgrass, Buffalograss, Blue grama, Ring muhly, Prickly pear cactus, FourWing Saltbush, Green needlegrass
Rock Fragments on Surface: none
Organic Mat on Surface: none
Typical Profile:
 0 - 4in. - loamy sand
 4 - 21in. - sandy loam
 21 - 38in. - loamy sand
 38 - 65in. - loamy sand
Depth Class: very deep (>60in.)
Drainage: well drained
Permeability: moderate (2.0-6.0in/hr)
Available Water Capacity: 7.3 inches/65in.
Potential Rooting Depth: very deep (>60 inches)
Runoff: slow
Hazard of Erosion by Water: slight

Included Similar and Dissimilar Soils

Vona loamy sand soil occurs on slightly higher (topographical position) convex elongated interfluves and adjacent toeslopes. The Vona soils have evidence of clay illuviation in the subsoil with less than 18 percent clay.

Owl Creek soil with a loam or sandy loam surface that occurs on concave pockets and slightly elongated depressional areas on terraces. The Owl Creek soil has a buried dark colored horizon within 27 inches of the surface.

Zigweid fine sandy loam soil occurs on slightly higher (topographical position) uplands and interfluves. This soil does have greater than 18 percent clay in the subsoil.

Major Management Factors

Soil Related Factors: subject to wind erosion when denuded of vegetation

rev. 4/94

17 - Remmit loamy sand, 5 to 12 percent slopes
Remmit & similar inclusions - 70 pct
Contrasting inclusions - 30 pct

Remmit Soil

Position on Landscape: slightly convex and rolling interfluves and uplands

Slope Range: 5 to 12 percent

Native Existing Plants: Western wheatgrass, Buffalograss, Blue grama, Ring muhly, Prickly pear cactus, Green needlegrass, Sand buckwheat

Rock Fragments on Surface: none

Organic Mat on Surface: none

Typical Profile:

0 - 4in. - loamy sand

4 - 21in. - sandy loam

21 - 38in. - loamy sand

38 - 65in. - loamy sand

Depth Class: very deep (>60in.)

Drainage: well drained

Permeability: moderate (2.0-6.0in/hr)

Available Water Capacity: 7.3 inches/65in.

Potential Rooting Depth: very deep (>60 inches)

Runoff: medium

Hazard of Erosion by Water: slight

Included Similar and Dissimilar Soils

Vona loamy sand soil occurs on slightly higher (topographical position) convex elongated areas on interfluves. The Vona soils have evidence of clay elluviation in the subsoil with less than 18 percent clay.

Zigweid fine sandy loam soil occurs on gentler sloping uplands and convex interfluves. This soil does have greater than 18 percent clay in the subsoil.

Altvan sandy loam soil occurs on edges of the old fan terraces and convex interfluves. This soil does have greater than 18 percent clay in the subsoil and a very gravelly substratum within 36 inches of the surface.

Major Management Factors

Soil Related Factors: subject to wind erosion when denuded of vegetation

rev. 4/94

or no diagnostic subsoil features. These soils contain more sodium saturation in the subsoil.

Olney fine sandy loam on adjacent toeslopes. Olney soils have a structural subsoil with a significant clay increase in the subsoil due to clay movement into the subsoil, dropping off in quantity as depth increases.

Midway-like sandy loam on convex side slopes. Midway soils lack a dark colored surface layer with a slight clay increase than Renohill in the subsoil but less than 20 inches to shale.

Cushman-like fine sandy loam on convex footslopes and sideslopes. These soils lack a dark colored surface layer and have buff colored siltstone/sandstone within 20 inches.

Major Management Factors

Soil Related Factors: water holding capacity, slope, depth to shale or sandstone

rev. 4/94

18 - Remmit sandy loam, 0 to 2 percent slopes
Remmit & similar inclusions - 70 pct
Contrasting inclusions - 30 pct

Remmit Soil

Position on Landscape: gently sloping to rolling interfluves and uplands
Slope Range: 0 to 2 percent

Native Existing Plants: Western wheatgrass, Buffalograss, Blue grama,
Ring muhly, Prickly pear cactus, FourWing Saltbush, Green needlegrass

Rock Fragments on Surface: none

Organic Mat on Surface: none

Typical Profile:

0 - 4in. - sandy loam

4 - 21in. - sandy loam

21 - 38in. - loamy sand

38 - 65in. - loamy sand

Depth Class: very deep (>60in.)

Drainage: well drained

Permeability: moderate (2.0-6.0in/hr)

Available Water Capacity: 7.6 inches/65in.

Potential Rooting Depth: very deep (>60 inches)

Runoff: slow

Hazard of Erosion by Water: slight

Included Similar and Dissimilar Soils

Vona loamy sand soil occurs on slightly higher (topographical position)
convex elongated interfluves. The Vona soils have evidence of clay
elluviation in the subsoil with less than 18 percent clay.

Kim-like soil with a loamy sand or sandy loam surface that occurs on
convex interfluves. The Kim-like soil does not have any diagnostic
subsoil horizons.

Zigweid fine sandy loam soil occurs on convex interfluves and toeslopes.
This soil does have greater than 18 percent clay in the subsoil.

Major Management Factors

Soil Related Factors: subject to wind erosion when denuded of vegetation

rev. 4/94

19 - Remmit sandy loam, 2 to 5 percent slopes
Remmit & similar inclusions - 70 pct
Contrasting inclusions - 30 pct

Remmit Soil

Position on Landscape: gently sloping to rolling interfluves and uplands
Slope Range: 2 to 5 percent

Native Existing Plants: Western wheatgrass, Buffalograss, Blue grama,
Ring muhly, Prickly pear cactus, Green needlegrass

Rock Fragments on Surface: none

Organic Mat on Surface: none

Typical Profile:

0 - 4in. - sandy loam

4 - 21in. - sandy loam

21 - 38in. - loamy sand

38 - 65in. - loamy sand

Depth Class: very deep (>60in.)

Drainage: well drained

Permeability: moderate (2.0-6.0in/hr)

Available Water Capacity: 7.6 inches/65in.

Potential Rooting Depth: very deep (>60 inches)

Runoff: slow

Hazard of Erosion by Water: slight

Included Similar and Dissimilar Soils

Vona loamy sand soil occurs on slightly higher (topographical position)
convex elongated interfluves. The Vona soils have evidence of clay
illuviation in the subsoil with less than 18 percent clay.

Kim-like soil with a loamy sand or sandy loam surface that occurs on
convex interfluves and fan terraces. The Kim-like soil does not have any
diagnostic subsoil horizons.

Zigweid fine sandy loam soil occurs on convex toeslopes. This soil does
have greater than 18 percent clay in the subsoil.

Major Management Factors

Soil Related Factors: subject to wind erosion when denuded of vegetation

rev. 4/94

20 - Renohill-Cushman complex, 9 to 15 percent slopes

Renohill & similar inclusions - 45 pct

Cushman & similar inclusions - 40 pct

Contrasting inclusions - 15 pct

Renohill Soil

Position on Landscape:slightly, concave to convex rolling to steep uplands.

Slope Range:9 to 15 percent

Native Existing Plants: Western wheatgrass, Buffalograss, Fourwing saltbush, Blue grama, Ring muhly

Rock Fragments on Surface:gravelly, .1 to .3% surface covered

Organic Mat on Surface:none

Typical Profile:

0 - 5in. - sandy loam

5 - 19in. - clay loam

19 - 31in. - clay loam

31+in. - Weathered shale

Depth Class:moderately deep (20 to 40inches+)

Drainage:well drained

Permeability:slow (0.6-2.0in/hr)

Available Water Capacity:5.9 inches/31in.

Potential Rooting Depth:moderately deep (20 to 40 inches)

Runoff:slow

Hazard of Erosion by Water:moderate

Cushman Soil

Position on Landscape:convex elongated irregular shaped knoll-like ridges, sloping to rolling uplands.

Slope Range:9 to 15 percent

Native Existing Plants:Western wheatgrass, Blue grama, Inland saltgrass, Fringed sage, Common sunflower, Green needlegrass, Ring muhly

Rock Fragments on Surface:none

Organic Mat on Surface:none

Typical Profile:

0 - 5in. - loam

5 - 14in. - sandy clay loam

14 - 20in. - sandy clay loam

20 - 30in. - sandy loam

30 +in. - Soft sandstone

Depth Class:moderately deep (20 to 40 in.)

Drainage:well drained

Permeability:moderate(0.6-2.0in/hr)

Available Water Capacity:5.72 inches/60in.

Potential Rooting Depth:moderately deep (20-40 inches)

Runoff:medium

Hazard of Erosion by Water:moderate

Included Similar and Dissimilar Soils

Kim-like fine sandy loam on convex side slopes and adjoining toeslopes. These Kim-like soils have a thick dark colored surface layer with little

or no diagnostic subsoil features. These soils contain more sodium saturation in the subsoil.

Olney fine sandy loam on adjacent toeslopes. Olney soils have a structural subsoil with a significant clay increase in the subsoil due to clay movement into the subsoil, dropping off in quantity as depth increases.

Midway-like sandy loam on convex side slopes. Midway soils lack a dark colored surface layer with a slight clay increase than Renohill in the subsoil but less than 20 inches to shale.

Cushman-like fine sandy loam on convex footslopes and sideslopes. These soils lack a dark colored surface layer and have buff colored siltstone/sandstone within 20 inches.

Major Management Factors

Soil Related Factors: water holding capacity, slope, depth to shale or sandstone

rev. 4/94

21 - Ulm fine sandy loam, 0 to 2 percent slopes

Ulm & similar inclusions - 70 pct

Contrasting inclusions - 30 pct

Ulm Soil

Position on Landscape: nearly level to gently sloping on broad fan terraces and interfluves.

Slope Range: 0 to 2 percent

Native Existing Plants: Western wheatgrass, Buffalograss, Blue grama, Ring muhly, Prickly pear cactus, FourWing Saltbush

Rock Fragments on Surface: none

Organic Mat on Surface: none

Typical Profile:

0 - 6in. - fine sandy loam

6 - 10in. - loam

10 - 26in. - clay loam

26 - 35in. - sandy clay loam

35 - 60in. - loamy sand

Depth Class: very deep (>60in.)

Drainage: well drained

Permeability: moderate (0.6-2.0in/hr)

Available Water Capacity: 7.2 inches/60in.

Potential Rooting Depth: very deep (>60 inches)

Runoff: slow

Hazard of Erosion by Water: slight

Included Similar and Dissimilar Soils

Renohill loam soil occurs on slightly higher (topographical position) convex elongated hillslopes, adjacent toeslopes and footslopes. The Renohill soils have evidence of clay elluviation in the subsoil and are moderately deep (20 to 40 inches) to shale.

Owl Creek soil with a loam or fine sandy loam surface that occurs on concave pockets and slightly elongated depressional areas. The Owl Creek soil has a buried dark colored horizon within 27 inches of the surface and contains less than 35 percent clay in the subsoil.

Ulm loam-like soil occurs on slightly higher (topographical position) convex broad interfluves and uplands. This soil does have 35 percent or more clay in the subsoil with a dark colored surface layer 10 inches or more thick.

Arvada clay loam-like soil occurs on like topographical position as the Ulm soil. This soil does have 35 percent or more clay in the subsoil with a dark colored surface layer 6 inches or more thick with sodium salts in the subsoil and a seasonal watertable within 48 inches of the surface.

Major Management Factors

Soil Related Factors: subject to wind erosion when denuded of vegetation

22 - Ulm-Renohill complex, 2 to 5 percent slopes

Ulm & similar inclusions - 55 pct

Renohill & similar inclusions - 30pct

Contrasting inclusions - 15 pct

Ulm Soil

Position on Landscape: gently sloping on hillslopes and uplands

Slope Range: 2 to 5 percent

Native Existing Plants: Western wheatgrass, Buffalograss, Blue grama, Ring muhly, Prickly pear cactus, Fourwing Saltbush

Rock Fragments on Surface: none

Organic Mat on Surface: none

Typical Profile:

0 - 6in. - fine sandy loam

6 - 10in. - loam

10 - 26in. - clay loam

26 - 35in. - sandy clay loam

35 - 60in. - loamy sand

Depth Class: very deep (>60in.)

Drainage: well drained

Permeability: moderate (0.6-2.0in/hr)

Available Water Capacity: 7.2 inches/60in.

Potential Rooting Depth: very deep (>60 inches)

Runoff: slow

Hazard of Erosion by Water: slight

Renohill Soil

Position on Landscape: gently sloping to rolling convex uplands

Slope Range: 2 to 5 percent

Native Existing Plants: Western wheatgrass, Buffalograss, Fourwing saltbush, Blue grama, Ring muhly

Rock Fragments on Surface: gravelly, .1 to .3% surface covered

Organic Mat on Surface: none

Typical Profile:

0 - 5in. - sandy loam

5 - 19in. - clay loam

19 - 31in. - clay loam

31+in. - Weathered shale

Depth Class: moderately deep (20 to 40inches+)

Drainage: well drained

Permeability: slow (0.6-2.0in/hr)

Available Water Capacity: 5.9 inches/31in.

Potential Rooting Depth: moderately deep (20 to 40 inches)

Runoff: slow

Hazard of Erosion by Water: moderate

Included Similar and Dissimilar Soils

Midway-like sandy loam on convex side slopes and adjoining toeslopes. Midway soils lack a dark colored surface layer with a slight clay increase than Renohill in the subsoil but less than 20 inches to shale. Cushman-like fine sandy loam on convex mid and toeslopes. These soils lack a dark colored surface layer and have buff colored siltstone/sandstone within 20 inches.

Owl Creek soil with a loam or fine sandy loam surface that occurs on concave pockets on Uplands. The Owl Creek soil has a buried dark colored horizon within 27 inches of the surface and contains less than 35 percent clay in the subsoil.

Ulm loam-like soil occurs on slightly higher (topographical position) convex broad hillslopes. This soil does have 35 percent or more clay in the subsoil with a dark colored surface layer 10 inches or more thick.

Arvada clay loam-like soil occurs on footslopes and toeslopes. This soil does have 35 percent or more clay in the subsoil with a dark colored surface layer 6 inches or more thick with sodium salts in the subsoil and a seasonal watertable within 48 inches of the surface.

Major Management Factors

Soil Related Factors: subject to wind erosion when denuded of vegetation

rev. 4/94

23 - Ulm-Renohill complex, 5 to 9 percent slopes

Ulm & similar inclusions - 45 pct

Renohill & similar inclusions - 40 pct

Contrasting inclusions - 15 pct

Ulm Soil

Position on Landscape: moderately sloping to rolling hillslopes and Uplands

Slope Range: 5 to 9 percent

Native Existing Plants: Western wheatgrass, Buffalograss, Blue grama, Ring muhly, Prickly pear cactus, Fourwing Saltbush

Rock Fragments on Surface: none

Organic Mat on Surface: none

Typical Profile:

0 - 6in. - fine sandy loam

6 - 10in. - loam

10 - 26in. - clay loam

26 - 35in. - sandy clay loam

35 - 60in. - loamy sand

Depth Class: very deep (>60in.)

Drainage: well drained

Permeability: moderate (0.6-2.0in/hr)

Available Water Capacity: 7.2 inches/60in.

Potential Rooting Depth: very deep (>60 inches)

Runoff: slow

Hazard of Erosion by Water: slight

Renohill Soil

Position on Landscape: moderately sloping to rolling convex uplands

Slope Range: 5 to 9 percent

Native Existing Plants: Western wheatgrass, Buffalograss, Fourwing saltbush, Blue grama, Ring muhly

Rock Fragments on Surface: gravelly, .1 to .3% surface covered

Organic Mat on Surface: none

Typical Profile:

0 - 5in. - sandy loam

5 - 19in. - clay loam

19 - 31in. - clay loam

31+in. - Weathered shale

Depth Class: moderately deep (20 to 40inches+)

Drainage: well drained

Permeability: slow (0.6-2.0in/hr)

Available Water Capacity: 5.9 inches/31in.

Potential Rooting Depth: moderately deep (20 to 40 inches)

Runoff: slow

Hazard of Erosion by Water: moderate

Included Similar and Dissimilar Soils

Midway-like sandy loam on convex hillslopes and adjoining toeslopes. Midway soils lack a dark colored surface layer with a slight clay increase than Renohill in the subsoil but less than 20 inches to shale. Cushman-like fine sandy loam on convex sideslopes. These soils lack a dark colored surface layer and have buff colored siltstone/sandstone within 20 inches.

Ulm loam-like soil occurs on mid-slopes (topographical position) of the convex broad hillslopes. This soil does have 35 percent or more clay in the subsoil with a dark colored surface layer 10 inches or more thick. Arvada clay loam-like soil occurs on lower concave toeslopes or footslopes. This soil does have 35 percent or more clay in the subsoil with a dark colored surface layer 6 inches or more thick with sodium salts in the subsoil and a seasonal watertable within 48 inches of the surface.

Major Management Factors

Soil Related Factors: subject to wind erosion when denuded of vegetation

rev. 4/94

24 - Vona loamy sand, 2 to 5 percent slopes

Vona & similar inclusions - 75 pct

Contrasting inclusions - 25 pct

Vona Soil

Position on Landscape: gently sloping to rolling interfluves and uplands.

Slope Range: 2 to 5 percent

Native Existing Plants: Western wheatgrass, Sand dropseed, Sandhills
muhly, Prickly pear cactus, Prairie sandreed, Blue grama

Rock Fragments on Surface: none

Organic Mat on Surface: none

Typical Profile:

0 - 4in. - loamy sand

4 - 22in. - sandy loam

22 - 31in. - loamy sand

31 - 68in. - sand

68 - 79in. - sandy clay loam

Depth Class: very deep (>60in.)

Drainage: well drained

Permeability: rapid (6.0-20.0in/hr)

Available Water Capacity: 5.4 inches/68in.

Potential Rooting Depth: very deep (>60 inches)

Runoff: slow

Hazard of Erosion by Water: slight

Included Soils

Valent loamy fine sand soil occurs on slightly higher (topographical position) convex elongated sand sheets. The Valent soils have no evidence of clay illuviation in the underlying material.

Owl Creek soil with a sandy loam surface that occurs on concave pockets and slightly elongated alluvial fans. The Owl Creek soil has a buried dark colored horizon within 27 inches of the surface.

Zigweid fine sandy loam soil occurs on slightly higher (topographical position) convex interfluves. This soil does have greater than 18 percent clay in the subsoil.

Major Management Factors

Soil Related Factors: subject to wind erosion when denuded of vegetation

rev. 4/94

25 - Vona sandy loam, 2 to 5 percent slopes
Vona & similar inclusions - 75 pct
Contrasting inclusions - 25 pct

Vona Soil

Position on Landscape: gently sloping to rolling flattened ridges and uplands.

Slope Range: 2 to 5 percent

Native Existing Plants: Western wheatgrass, Sand dropseed, Sandhills muhly, Prickly pear cactus, Prairie sandreed, Blue grama

Rock Fragments on Surface: none

Organic Mat on Surface: none

Typical Profile:

- 0 - 4in. - sandy loam
- 4 - 19in. - sandy loam
- 19 - 41in. - loamy sand
- 41 - 68in. - sand

Depth Class: very deep (>60in.)

Drainage: well drained

Permeability: rapid (6.0-20.0in/hr)

Available Water Capacity: 5.4 inches/68in.

Potential Rooting Depth: very deep (>60 inches)

Runoff: slow

Hazard of Erosion by Water: slight

Included Soils

Valent loamy fine sand soil occurs on slightly higher (topographical position) a convex elongated sand sheet. The Valent soils have no evidence of clay illuviation in the underlying material.

Owl Creek soil with a sandy loam surface that occurs on concave pockets and slightly elongated depressional areas of the adjoining alluvial fan. The Owl Creek soil has a buried dark colored horizon within 27 inches of the surface.

Zigweid fine sandy loam soil occurs on slightly higher (topographical position) convex interfluvial. This soil does have greater than 18 percent clay in the subsoil.

Major Management Factors

Soil Related Factors: subject to wind erosion when denuded of vegetation

rev. 4/94

26 - Vona-Cushman-Otero association, 5 to 20 percent slopes
Vona & similar inclusions - 35 pct
Cushman & similar inclusions - 30 pct
Otero & similar inclusions - 25 pct
Contrasting inclusions - 10 pct

-Vona Soil

Position on Landscape: - gently sloping to rolling
hillslopes and uplands
Slope Range: -5 to 12 percent
Native Existing Plants: - Western wheatgrass, Sand dropseed,
Sandhills muhly, Prickly pear cactus, Prairie sandreed, Blue
grama, Yucca
Rock Fragments on Surface: -none
Organic Mat on Surface: -none
Typical Profile:
- 0 - 4in. - sandy loam
- 4 - 19in. - sandy loam
- 19 - 41in. - loamy sand
- 41 - 68in. - sand
Depth Class: - very deep (>60in.)
Drainage: -well drained
Permeability: -rapid (6.0-20.0in/hr)
Available Water Capacity: -5.4 inches/68in.
Potential Rooting Depth: -very deep (>60 inches)
Runoff: -slow
Hazard of Erosion by Water: -slight

Cushman Soil

Position on Landscape: -convex elongated irregular spur-like
ridges, of the hillslopes and uplands.
Slope Range: -10 to 20 percent
Native Existing Plants: -Western wheatgrass, Blue grama,
Yucca, Fringed sage, Ring muhly, Sand dropseed
Rock Fragments on Surface: -none
Organic Mat on Surface: -none
Typical Profile:
- 0 - 5in. - sandy loam
- 5 - 14in. - sandy clay loam
- 14 - 22in. - loamy sand
- 22 +in. - Soft sandstone
Depth Class: -moderately deep (20 to 40 in.)
Drainage: -well drained
Permeability: -moderate(0.6-2.0in/hr)
Available Water Capacity: -2.7 inches/22in.
Potential Rooting Depth: -moderately deep (20-40 inches)
Runoff: -slow
Hazard of Erosion by Water: -slight

-Otero Soil

Position on Landscape: -moderately steep convex toeslopes of upland ridges
Slope Range: -5 to 12 percent
Native Existing Plants: - Western wheatgrass, Buffalograss, Sand buckwheat, Blue grama, Ring muhly
Rock Fragments on Surface: -gravelly, 0 to .1% surface covered
Organic Mat on Surface: -none
Typical Profile:
- 0 - 4in. - sandy loam
- 4 - 12in. - sandy loam
- 12 - 38in. - sandy loam
- 38 - 62in. - loamy sand
Depth Class: -very deep (60 inches+)
Drainage: -well drained
Permeability: -moderate, (2.0-6.0in/hr)
Available Water Capacity: -7.6 inches/62in.
Potential Rooting Depth: -very deep (60+ inches)
Runoff: -medium
Hazard of Erosion by Water: -slight to moderate

Included Similar and Disimilar Soils

-Kim-like sandy loam on toeslopes occurring in the concave draws. These Kim-like soils have a thick dark colored surface layer with little or no diagnostic subsoil features. These soils contain more sodium saturation in the subsoil.
-Remmit sandy loam on side slopes and toeslopes. Remmit soils lack a dark colored surface layer with a slight clay increase in the subsoil but less than 18 percent demonstrating illuviation of clay.
-Cushman-like fine sandy loam on convex footslopes. These soils lack a dark colored surface layer and have buff colored siltstone/sandstone within 20 inches.
Midway-like sandy loam soils occurring on the crown or shoulder of hillslopes. These soils exhibit shale at 10 to 20 inches with some rock-like structure from shale in the subsoil.

Major Management Factors

Soil Related Factors: - water holding capacity, concentration of sodium and sulfate salts in the subsoil, potential to overflow or flooding

rev. 4/94

27 - Valent fine sand, 2 to 5 percent slopes

Valent & similar inclusions - 80 pct

Contrasting inclusions - 20 pct

Valent Soil

Position on Landscape: gently sloping to a rolling flattened sand sheet.

Slope Range: 2 to 5 percent

Native Existing Plants: Sand dropseed, Blue grama, Sandhills muhly,
Prickly pear cactus, Yucca, Prairie sandreed

Rock Fragments on Surface: none

Organic Mat on Surface: none

Typical Profile:

0 - 4in. - fine sand

4 - 51in. - sand

51 - 68in. - coarse sand

Depth Class: very deep (>60in.)

Drainage: somewhat excessively drained

Permeability: rapid (6.0-20.0in/hr)

Available Water Capacity: 2.5 inches/68in.

Potential Rooting Depth: very deep (>60 inches)

Runoff: slow

Hazard of Erosion by Water: slight

Included Similar and Dissimilar Soils

Vona loamy sand soil occurs on slightly higher (topographical position) convex elongated interfluvies. The Vona soils have evidence of clay illuviation in the subsoil with less than 18 percent clay.

Remmit loamy sand soil occurs on slightly less sloping (topographical position) convex toeslopes. This soil has 10 to 18 percent clay in the subsoil.

Major Management Factors

Soil Related Factors: subject to wind erosion when denuded of vegetation

rev. 4/94

28 - Zeigweid fine sandy loam, 0 to 2 percent slopes

Zeigweid & similar inclusions - 75 pct

Contrasting inclusions - 25 pct

Zeigweid Soil

Position on Landscape: nearly level uplands

Slope Range: 0 to 2 percent

Native Existing Plants: Western wheatgrass, Buffalograss, Blue grama, Ring muhly, Prickly pear cactus, Green needlegrass, Sand buckwheat

Rock Fragments on Surface: none

Organic Mat on Surface: none

Typical Profile:

0 - 4in. - fine sandy loam

4 - 34in. - sandy loam

34 - 44in. - coarse sandy loam

44 - 65in. - loamy sand

Depth Class: very deep (>60in.)

Drainage: well drained

Permeability: moderate (2.0-6.0in/hr)

Available Water Capacity: 7.2 inches/65in.

Potential Rooting Depth: very deep (>60 inches)

Runoff: slow

Hazard of Erosion by Water: slight

Included Similar and Dissimilar Soils

Vona loamy sand soil occurs on slightly higher (topographical position) convex elongated interfluvies. The Vona soils have evidence of clay elluviation in the subsoil with less than 18 percent clay, evidence of secondary lime accumulation below 18 inches and lacks a dark colored surface horizon.

Cushman-like soil occurs on gentle sloping uplands, hill slopes and convex broad shoulders. This soil does have greater than 18 percent clay in the subsoil and is moderately deep (20 to 40 inches) to soft sandstone.

Altvan sandy loam soil occurs on edges of the fan terraces and convex broad hill slopes. This soil does have greater than 18 percent clay in the subsoil and a very gravelly substratum within 30 inches of the surface.

Valent loamy fine sand soil occurs on a more rolling narrow sand sheet. This soil contains less than 10 percent clay throughout the underlying material.

Major Management Factors

Soil Related Factors: subject to wind erosion when denuded of vegetation

rev. 4/94

29 - Zeigweid fine sandy loam, 2 to 5 percent slopes
Zeigweid & similar inclusions - 75 pct
Contrasting inclusions - 25 pct

Zeigweid Soil

Position on Landscape: nearly level uplands

Slope Range: 2 to 5 percent

Native Existing Plants: Western wheatgrass, Buffalograss, Blue grama, Ring muhly, Prickly pear cactus, Green needlegrass, Sand buckwheat

Rock Fragments on Surface: none

Organic Mat on Surface: none

Typical Profile:

0 - 4in. - fine sandy loam

4 - 34in. - sandy loam

34 - 44in. - coarse sandy loam

44 - 65in. - loamy sand

Depth Class: very deep (>60in.)

Drainage: well drained

Permeability: moderate (2.0-6.0in/hr)

Available Water Capacity: 7.2 inches/65in.

Potential Rooting Depth: very deep (>60 inches)

Runoff: slow

Hazard of Erosion by Water: slight

Included Similar and Dissimilar Soils

Vona loamy sand soil occurs on slightly higher (topographical position) convex elongated interfluves. The Vona soils have evidence of clay illuviation in the subsoil with less than 18 percent clay, evidence of secondary lime accumulation below 18 inches and lacks a dark colored surface horizon.

Cushman-like soil occurs on gentle sloping upland plains and convex broad hillside shoulders. This soil does have greater than 18 percent clay in the subsoil and is moderately deep (20 to 40 inches) to soft sandstone.

Altvan sandy loam soil occurs on edges of the old terraces and convex broad ridges. This soil does have greater than 18 percent clay in the subsoil and a very gravelly substratum within 30 inches of the surface.

Valent loamy fine sand soil occurs on a more gently rolling sand sheet. This soil contains less than 10 percent clay throughout the underlying material.

Major Management Factors

Soil Related Factors: subject to wind erosion when denuded of vegetation

rev. 4/94

30 - Zeigweid fine sandy loam, 5 to 9 percent slopes
Zeigweid & similar inclusions - 70 pct
Contrasting inclusions - 30 pct

Zigweid Soil

Position on Landscape: rolling to sloping uplands

Slope Range: 5 to 9 percent

Native Existing Plants: Western wheatgrass, Sand dropseed, Blue grama, Ring muhly, Prickly pear cactus, Green needlegrass, Sand buckwheat

Rock Fragments on Surface: none

Organic Mat on Surface: none

Typical Profile:

0 - 4in. - fine sandy loam

4 - 34in. - sandy loam

34 - 44in. - coarse sandy loam

44 - 65in. - loamy sand

Depth Class: very deep (>60in.)

Drainage: well drained

Permeability: moderate (2.0-6.0in/hr)

Available Water Capacity: 7.2 inches/65in.

Potential Rooting Depth: very deep (>60 inches)

Runoff: medium

Hazard of Erosion by Water: slight

Included Similar and Dissimilar Soils

Vona loamy sand soil occurs on convex elongated interfluvies and uplands. The Vona soils have evidence of clay illuviation in the subsoil with less than 18 percent clay, evidence of secondary lime accumulation below 18 inches and lacks a dark colored surface horizon.

Cushman-like soil occurs on gentle sloping uplands and convex broad hillside shoulders. This soil does have greater than 18 percent clay in the subsoil and is moderately deep (20 to 40 inches) to soft sandstone.

Altvan sandy loam soil occurs on edges of the fan terraces and hillslopes. This soil does have greater than 18 percent clay in the subsoil and a very gravelly substratum within 24 inches of the surface.

Valent loamy fine sand soil occurs on a more rolling sand sheet. This soil contains less than 10 percent clay throughout the underlying material.

Major Management Factors

Soil Related Factors: subject to wind erosion when denuded of vegetation

rev. 4/94

Yonker

CENTRAL PLAINS EXPERIMENTAL RANGE STATION

A Cooperative Effort by:

Colorado State University - Extension Service
USDA - Soil Conservation Service



CENTRAL PLAINS EXPERIMENTAL RANGE STATION MANUSCRIPT OUTLINE:

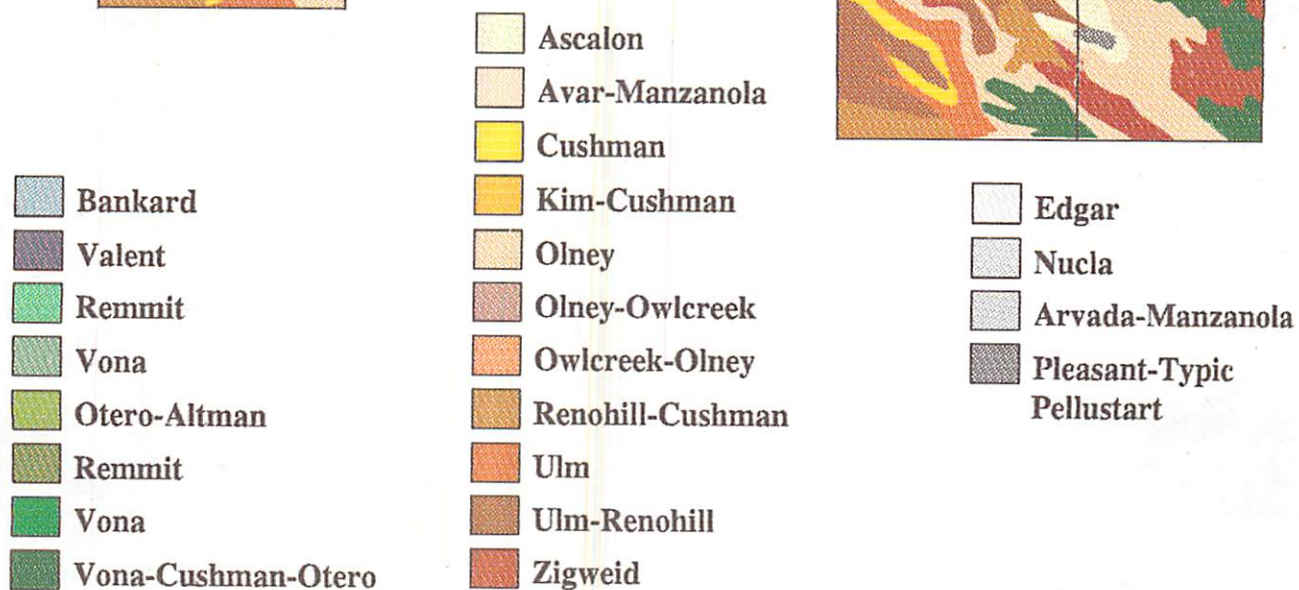
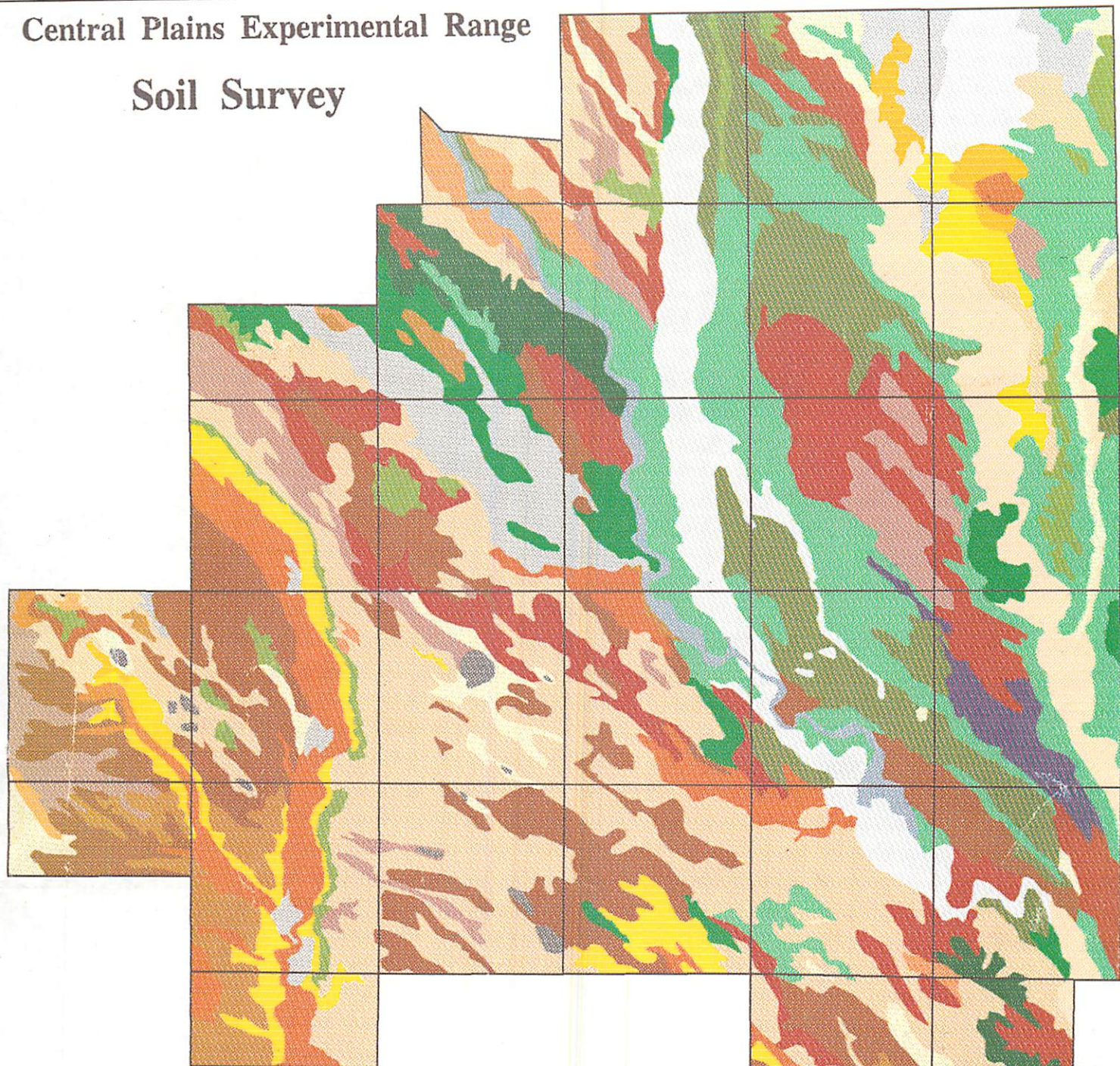
September 8, 1994

by: Michael Petersen, USDA-SCS
Gene Kelly, PhD; CSU

-
- I. Introduction of the LTER Program at the Nunn, CO LTER Site
 - A. Information of the ecological research since 1960's
 - B. Why this site was selected
 - C. Existing soil survey
 - condition of Order III soil survey and needs of more intense soil survey in 1990
 - II. Past Investigations on LTER site
 - A. Types of ecological research
 - 1]. Herbaceous/Range grasses
 - 2]. Animal: cattle, antelope, rodents, etc
 - 3]. Hydrology
 - 4]. Geomorphology
 - 5]. Remote sensing
 - 6]. Pedology
 - III. Pedology data
 - A. Paleosols - distribution & landscape position
 - 1]. Genesis & morphology
 - 2]. Chemical & physical characteristics
 - 3]. Literature search & data
 - 4]. Summaries
 - B. Research from X-ray and Salinity mapping(J.Doolittle study)
 - C. Data from meterological station
 - IV. Graphics for enhancment of report
 - A. Map of soil survey (Order II)
 - B. Geomorphic map
 - C. Map of soil site locations(transects) of data obtained
 - D. Figures, tables and charts
 - 1]. Interpretive tables of soil survey
 - V. Listing of contributing authors and field research workers
 - VI. Glossaries of soil terms
 - VII. References for report
 - A. Thesis reports - where, who & when
 - B. Published reports ?

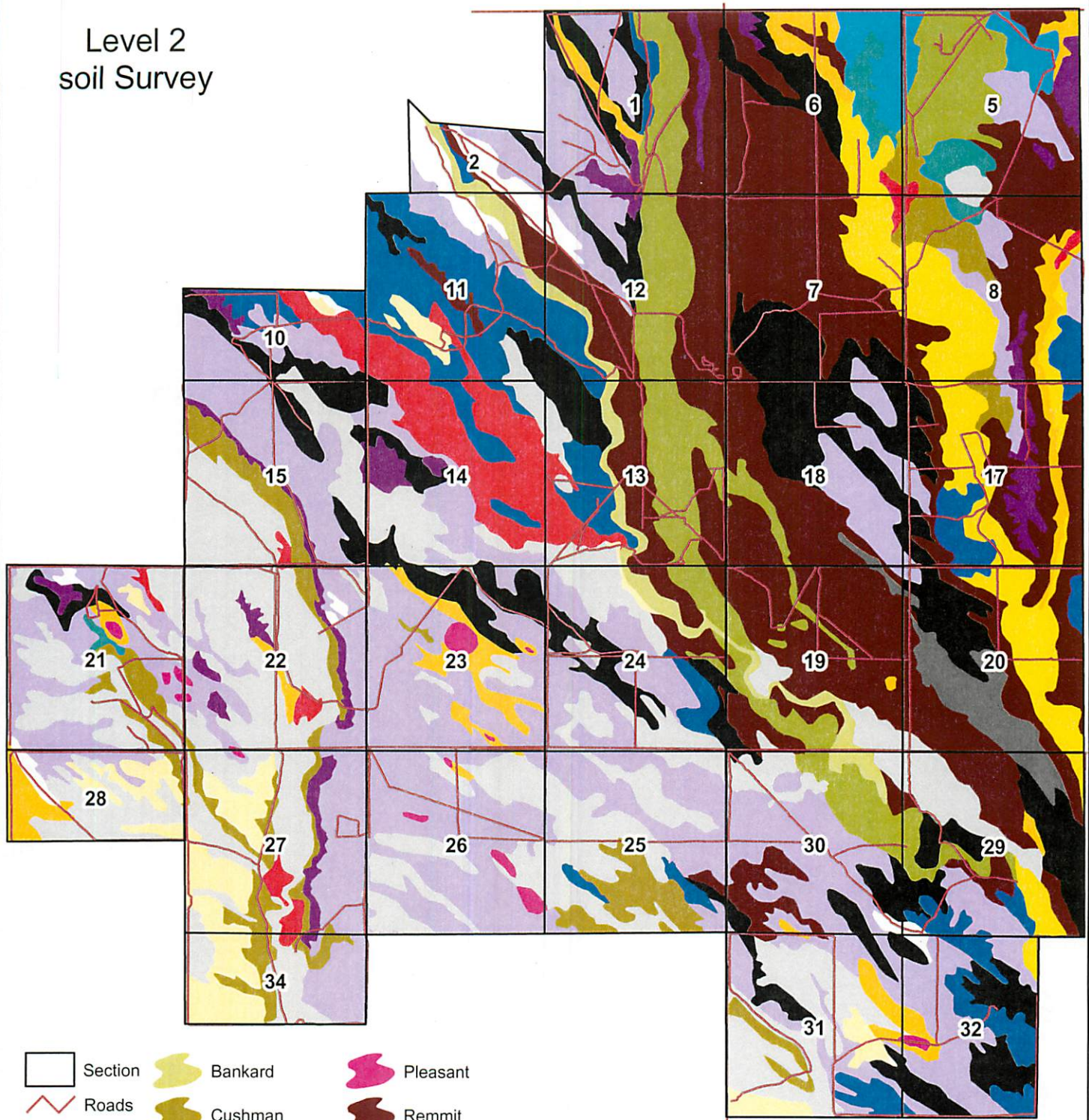
Central Plains Experimental Range

Soil Survey



Central Plains Experimental Range

Level 2
soil Survey

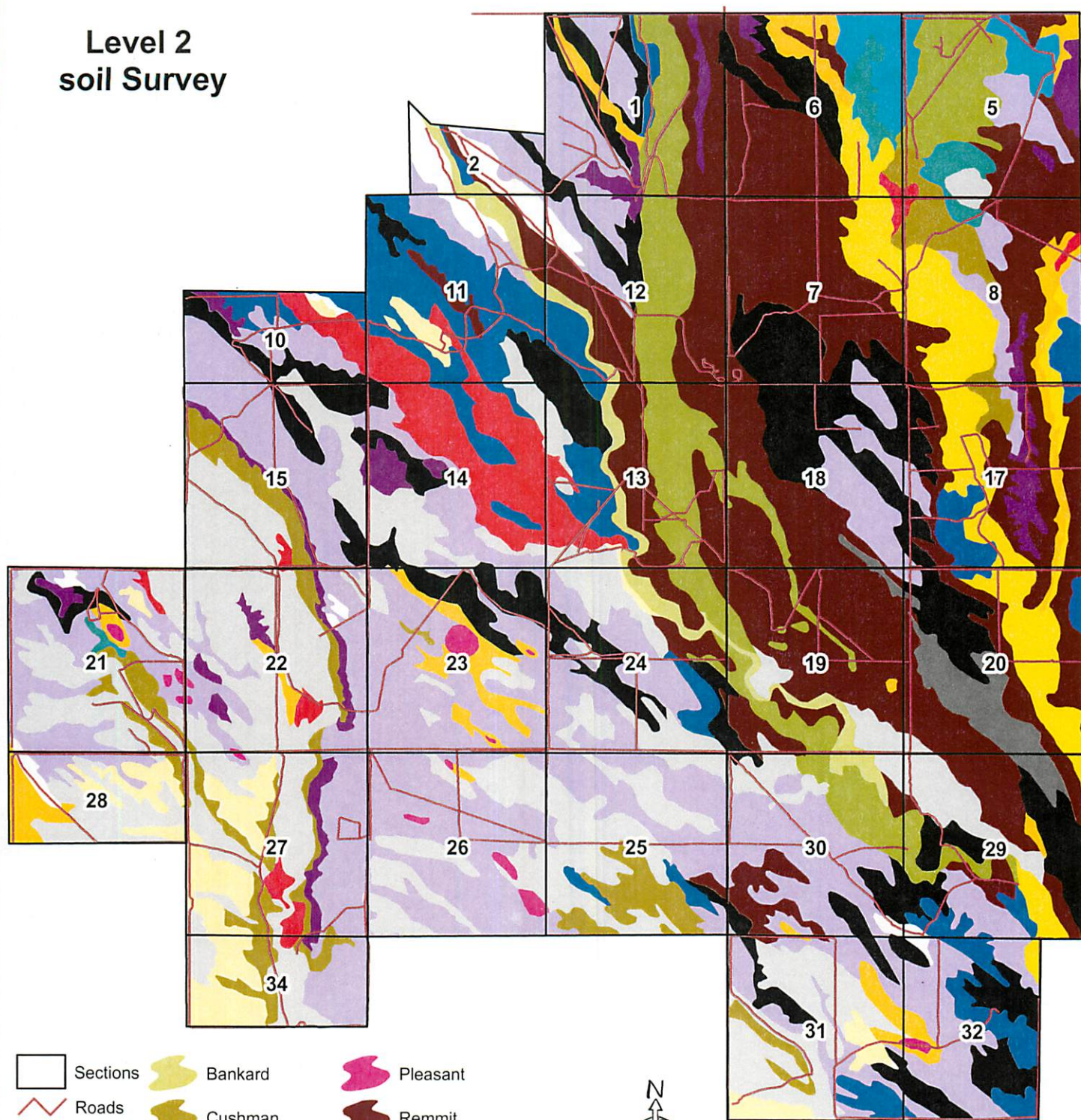


0 0.5 1 2 Miles



Central Plains Experimental Range

Level 2 soil Survey

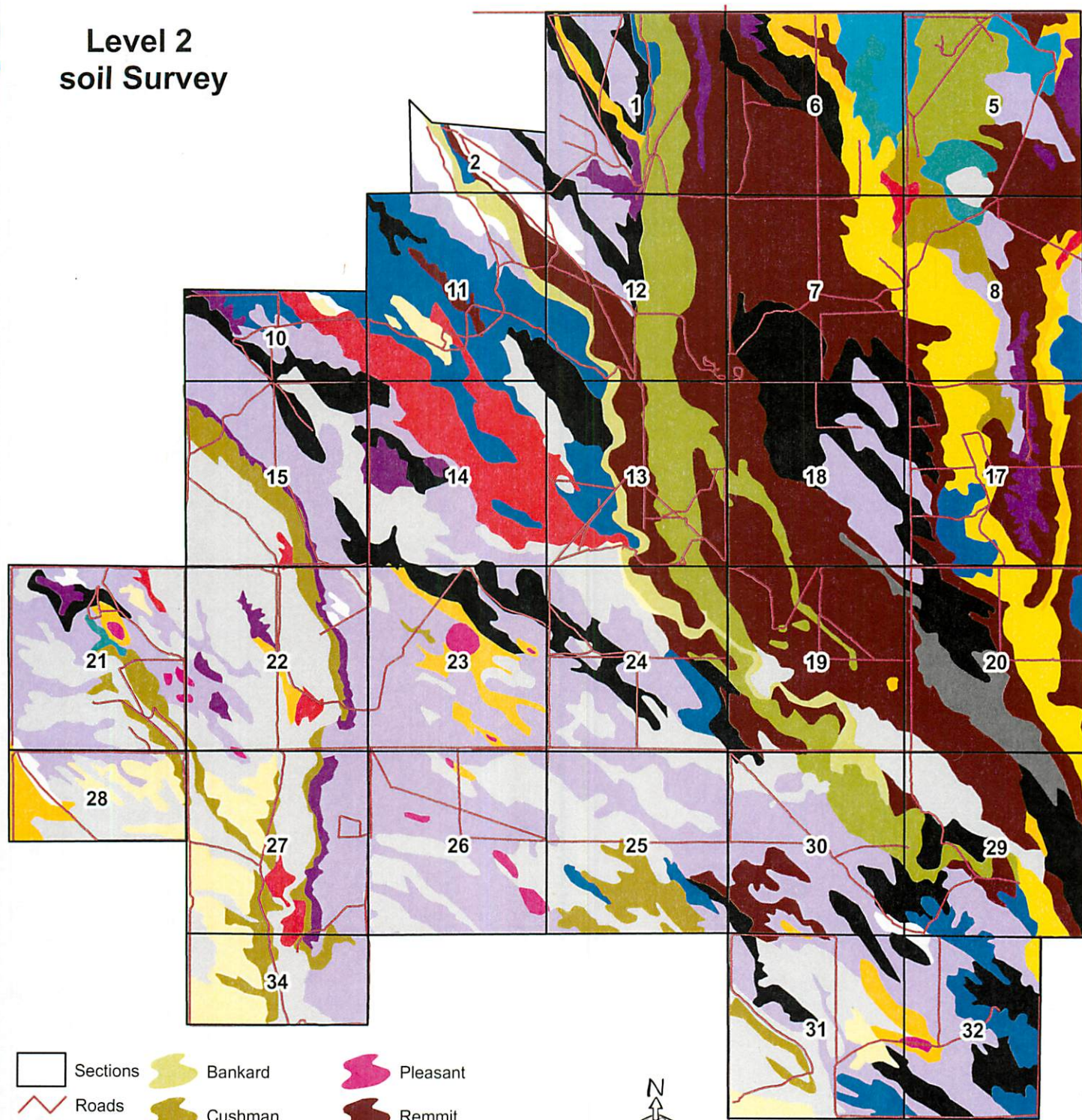


0 0.5 1 2 Miles



Central Plains Experimental Range

Level 2 soil Survey



- | | | |
|--------------------|------------------|----------|
| Sections | Bankard | Pleasant |
| Roads | Cushman | Remmit |
| CPER Soils | Edgar | Renohill |
| Soil Series | Kim & inclusions | Ulm |
| Arvada | Nucla | Valent |
| Ascalon | Olney | Vona |
| Avar | Otero | Zeigweid |

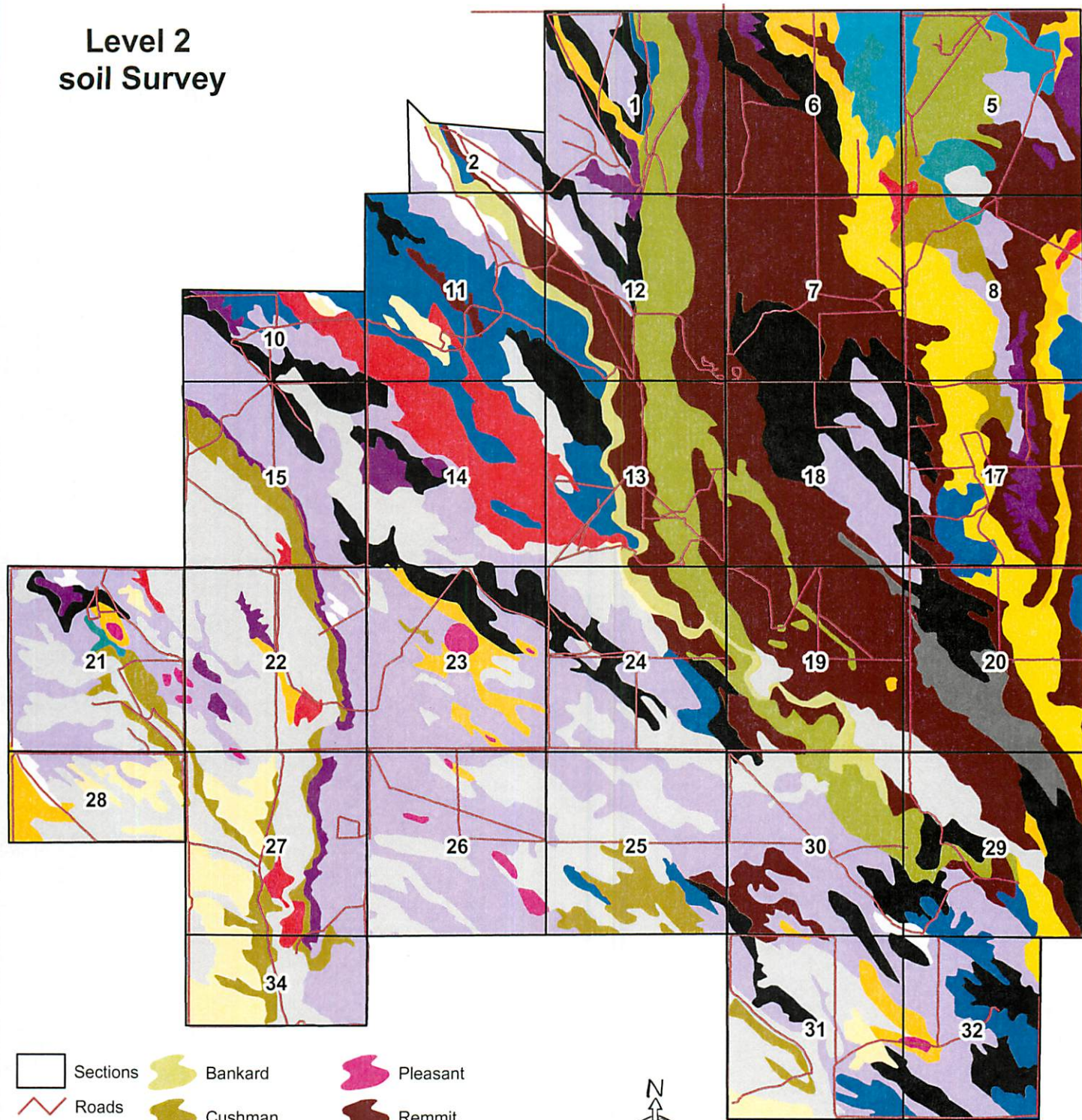


0 0.5 1 2 Miles



Central Plains Experimental Range

Level 2 soil Survey

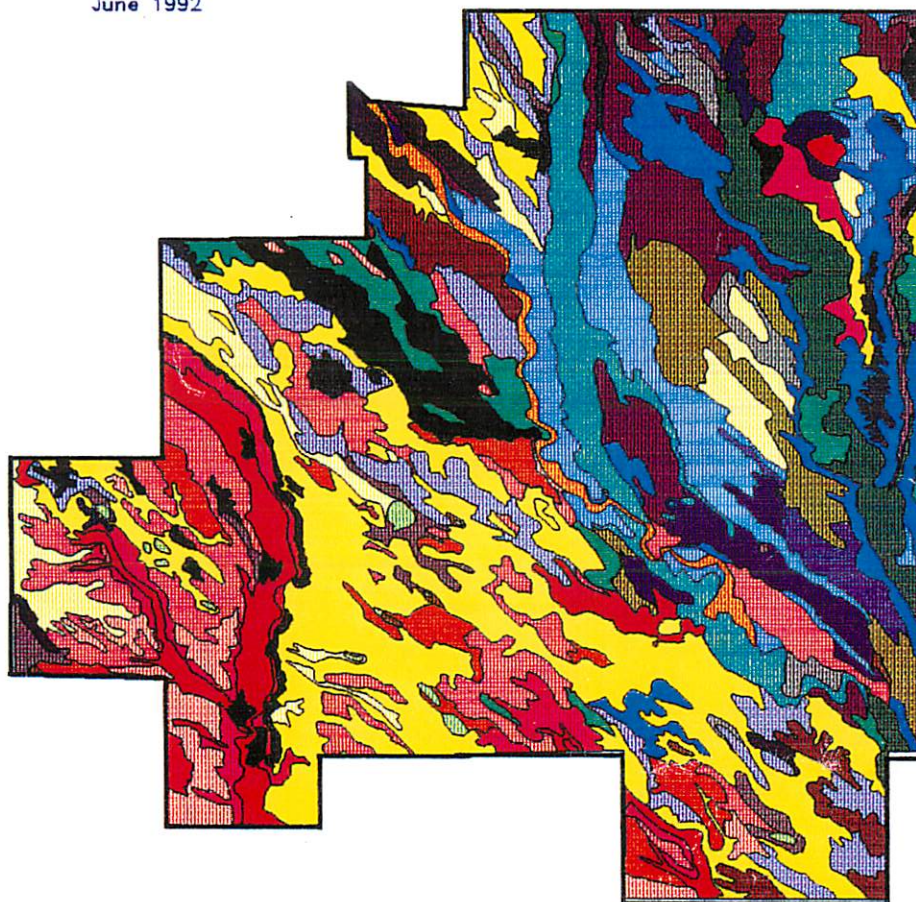


0 0.5 1 2 Miles



SOILS MAP for the CENTRAL PLAINS EXPERIMENTAL RANGE

Map Compilation by
Dan Palic
Great Plains Systems Research
USDA-ARS
June 1992

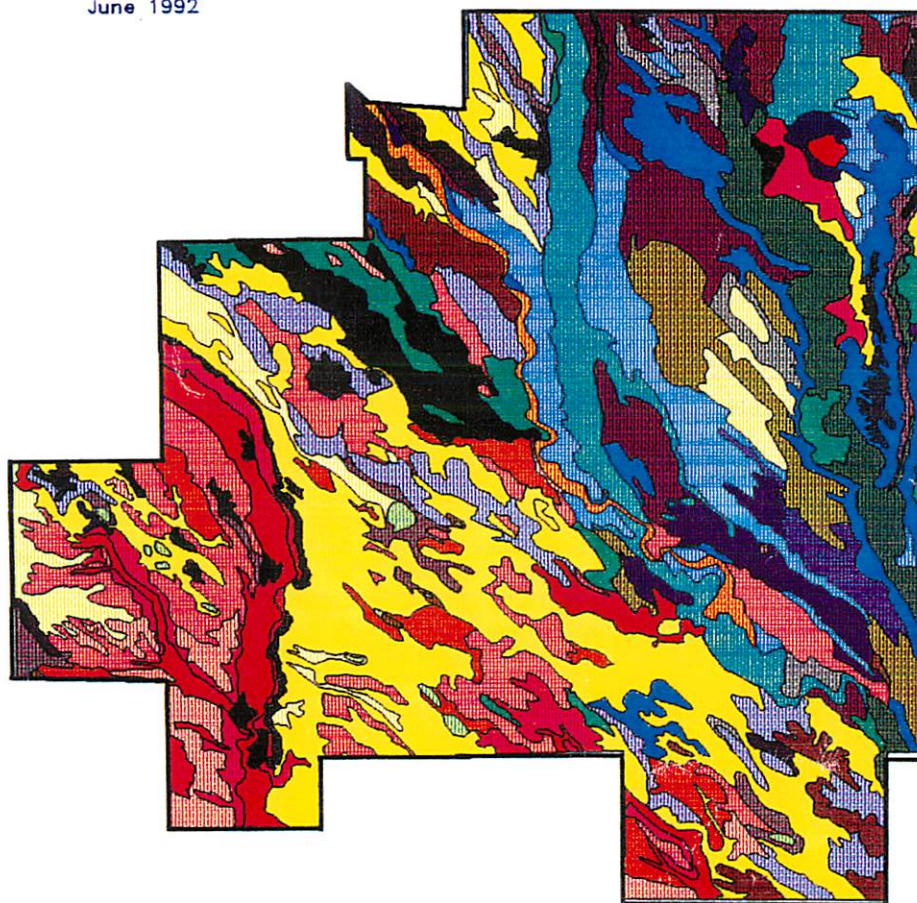


5 km

- Arvada-Manzanola complex, 0 to 2% slopes
- Ascalon fine sandy loam, 0 to 2% slopes
- Ascalon fine sandy loam, 2 to 5% slopes
- Avar fine sandy loam, 0 to 2% slopes
- Bankard sand, 0 to 2% slopes
- Cushman fine sandy loam, 2 to 5% slopes
- Edgar loam, 0 to 2% slopes
- Kim-Cushman complex, 2 to 5% slopes
- Nucla loam, 0 to 2% slopes
- Olney fine sandy loam, 2 to 5% slopes
- Olney-Owlcreek complex, 0 to 2% slopes
- Otero-Altvan complex, 6 to 15% slopes
- Owlcreek-Olney complex, 0 to 2% slopes
- Pleasant-Typic Pellustert complex, 0 to 1% slopes
- Remmit loamy sand, 2 to 5% slopes
- Remmit loamy sand, 5 to 12% slopes
- Remmit sandy loam, 0 to 2% slopes
- Remmit sandy loam, 2 to 5% slopes
- Renohill-Cushman complex, 9 to 15% slopes
- Ulm fine sandy loam, 0 to 2% slopes
- Ulm-Renohill complex, 2 to 5% slopes
- Ulm-Renohill complex, 5 to 12% slopes
- Vona loamy sand, 2 to 5% slopes
- Vona sandy loam, 2 to 5% slopes
- Vona-Cushman-Otero association, 5 to 20% slopes
- Valent fine sand, 2 to 5% slopes
- Zigweid fine sandy loam, 0 to 2% slopes
- Zigweid fine sandy loam, 2 to 5% slopes
- Zigweid fine sandy loam, 5 to 9% slopes

SOILS MAP for the CENTRAL PLAINS EXPERIMENTAL RANGE

Map Compilation by
Dan Palic
Great Plains Systems Research
USDA-ARS
June 1992

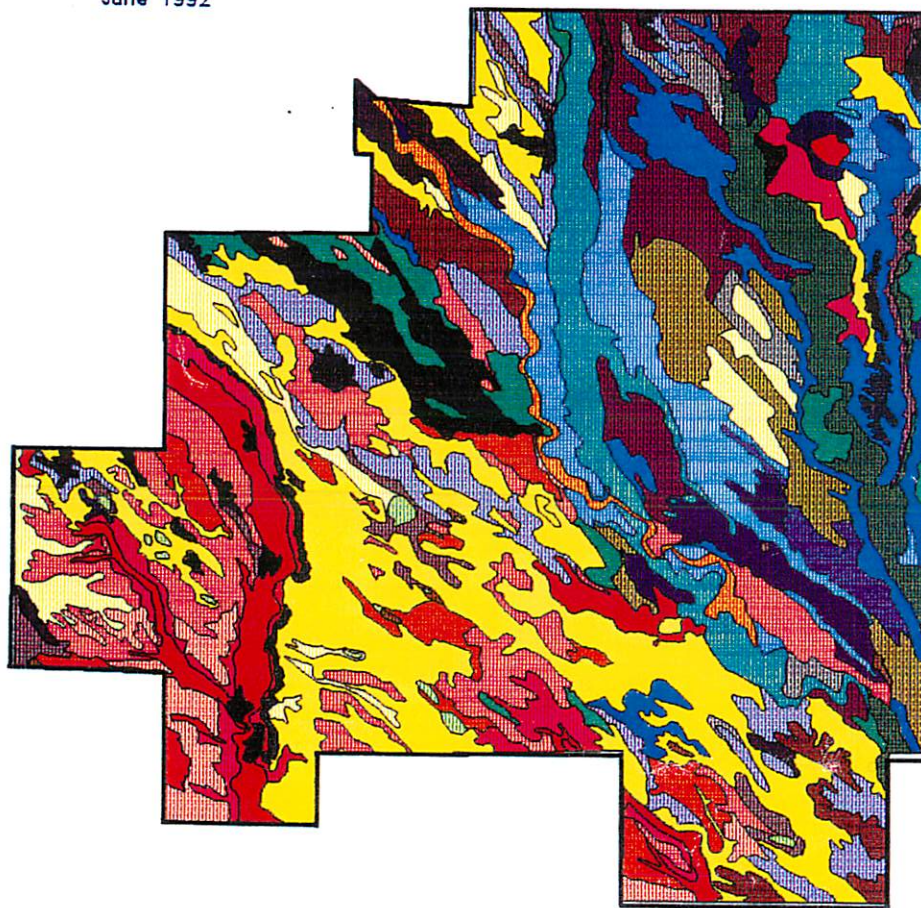


5 km

- Arvada-Manzanola complex, 0 to 2% slopes
- Ascalon fine sandy loam, 0 to 2% slopes
- Ascalon fine sandy loam, 2 to 5% slopes
- Avar fine sandy loam, 0 to 2% slopes
- Bankard sand, 0 to 2% slopes
- Cushman fine sandy loam, 2 to 5% slopes
- Edgar loam, 0 to 2% slopes
- Kim-Cushman complex, 2 to 5% slopes
- Nucla loam, 0 to 2% slopes
- Olney fine sandy loam, 2 to 5% slopes
- Olney-Owlcreek complex, 0 to 2% slopes
- Otero-Altvay complex, 6 to 15% slopes
- Owlcreek-Olney complex, 0 to 2% slopes
- Pleasant-Typic Pellustert complex, 0 to 1% slopes
- Remmit loamy sand, 2 to 5% slopes
- Remmit loamy sand, 5 to 12% slopes
- Remmit sandy loam, 0 to 2% slopes
- Remmit sandy loam, 2 to 5% slopes
- Renohill-Cushman complex, 9 to 15% slopes
- Ulm fine sandy loam, 0 to 2% slopes
- Ulm-Renohill complex, 2 to 5% slopes
- Ulm-Renohill complex, 5 to 12% slopes
- Vona loamy sand, 2 to 5% slopes
- Vona sandy loam, 2 to 5% slopes
- Vona-Cushman-Otero association, 5 to 20% slopes
- Valent fine sand, 2 to 5% slopes
- Zigweid fine sandy loam, 0 to 2% slopes
- Zigweid fine sandy loam, 2 to 5% slopes
- Zigweid fine sandy loam, 5 to 9% slopes

SOILS MAP for the CENTRAL PLAINS EXPERIMENTAL RANGE

Map Compilation by
Dan Palic
Great Plains Systems Research
USDA-ARS
June 1992

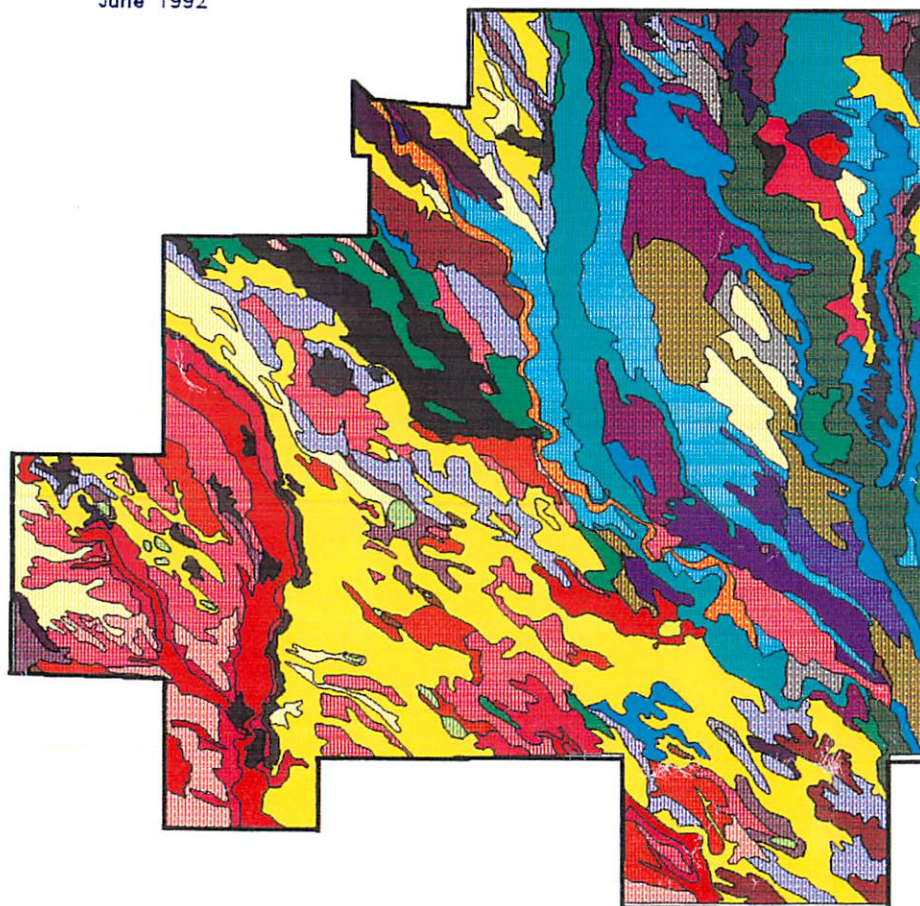


5 km

- Arvada-Manzanola complex, 0 to 2% slopes
- Ascalon fine sandy loam, 0 to 2% slopes
- Ascalon fine sandy loam, 2 to 5% slopes
- Avar fine sandy loam, 0 to 2% slopes
- Bankard sand, 0 to 2% slopes
- Cushman fine sandy loam, 2 to 5% slopes
- Edgar loam, 0 to 2% slopes
- Kim-Cushman complex, 2 to 5% slopes
- Nucla loam, 0 to 2% slopes
- Olney fine sandy loam, 2 to 5% slopes
- Olney-Owlcreek complex, 0 to 2% slopes
- Otero-Altvan complex, 6 to 15% slopes
- Owlcreek-Olney complex, 0 to 2% slopes
- Pleasant-Typic Pellustert complex, 0 to 1% slopes
- Remmit loamy sand, 2 to 5% slopes
- Remmit loamy sand, 5 to 12% slopes
- Remmit sandy loam, 0 to 2% slopes
- Remmit sandy loam, 2 to 5% slopes
- Renohill-Cushman complex, 9 to 15% slopes
- Ulm fine sandy loam, 0 to 2% slopes
- Ulm-Renohill complex, 2 to 5% slopes
- Ulm-Renohill complex, 5 to 12% slopes
- Vona loamy sand, 2 to 5% slopes
- Vona sandy loam, 2 to 5% slopes
- Vona-Cushman-Otero association, 5 to 20% slopes
- Valent fine sand, 2 to 5% slopes
- Zigweid fine sandy loam, 0 to 2% slopes
- Zigweid fine sandy loam, 2 to 5% slopes
- Zigweid fine sandy loam, 5 to 9% slopes

SOILS MAP for the CENTRAL PLAINS EXPERIMENTAL RANGE

Map Compilation by
Dan Palic
Great Plains Systems Research
USDA-ARS
June 1992



5 km

-  Arvada-Manzanola complex, 0 to 2% slopes
-  Ascalon fine sandy loam, 0 to 2% slopes
-  Ascalon fine sandy loam, 2 to 5% slopes
-  Avar fine sandy loam, 0 to 2% slopes
-  Bankard sand, 0 to 2% slopes
-  Cushman fine sandy loam, 2 to 5% slopes
-  Edgar loam, 0 to 2% slopes
-  Kim-Cushman complex, 2 to 5% slopes
-  Nucla loam, 0 to 2% slopes
-  Olney fine sandy loam, 2 to 5% slopes
-  Olney-Owlcreek complex, 0 to 2% slopes
-  Otero-Allvan complex, 6 to 15% slopes
-  Owlcreek-Olney complex, 0 to 2% slopes
-  Pleasant-Typic Pellustert complex, 0 to 1% slopes
-  Remmit loamy sand, 2 to 5% slopes
-  Remmit loamy sand, 5 to 12% slopes
-  Remmit sandy loam, 0 to 2% slopes
-  Remmit sandy loam, 2 to 5% slopes
-  Renohill-Cushman complex, 9 to 15% slopes
-  Ulm fine sandy loam, 0 to 2% slopes
-  Ulm-Renohill complex, 2 to 5% slopes
-  Ulm-Renohill complex, 5 to 12% slopes
-  Vona loamy sand, 2 to 5% slopes
-  Vona sandy loam, 2 to 5% slopes
-  Vona-Cushman-Otero association, 5 to 20% slopes
-  Valent fine sand, 2 to 5% slopes
-  Zigweid fine sandy loam, 0 to 2% slopes
-  Zigweid fine sandy loam, 2 to 5% slopes
-  Zigweid fine sandy loam, 5 to 9% slopes