SOIL SURVEY OF

Delta Area, Utah

Part of Millard County

United States Department of Agriculture
Soil Conservation Service and
United States Department of the Interior
Bureau of Land Management
In cooperation with
Utah Agricultural Experiment Station

This is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and agencies of the States, usually the Agricultural Experiment Stations. In some surveys, other Federal and local agencies also contribute. The Soil Conservation Service has leadership for the Federal part of the National Cooperative Soil Survey.

Major fieldwork for this soil survey was completed in the period 1965–69. Soil names and descriptions were approved in 1970. Unless otherwise indicated, statements in the publication refer to conditions in the county in 1972. This survey was made cooperatively by the Soil Conservation Service, the Bureau of Land Management, and the Utah Agricultural Experiment Station. It is part of the technical assistance furnished to the Delta Soil Conservation District.

HOW TO USE THIS SOIL SURVEY

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

Locating Soils

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

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

Finding and Using Information

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

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

Farmers and those who work with farmers can learn about the use and management of the soils from the section that discusses use and management of the soils for crops, from the soil descriptions, and from the discussion of the capability units.

Ranchers and others can find in the section that discusses use and management of the soils for range groupings of the soils, according to their suitability for range, range site descriptions, and also the names of many of the plants that grow on each range site.

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

Scientists and others can read about how the soils formed and how they are classified in the section "Formation and Classification of Soils."

Newcomers in the survey area will be especially interested in the section "General Soil Map," where broad patterns of soils are described. They will also be interested in the section "Climate."

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SOIL SURVEY OF DELTA AREA, UTAH

PART OF MILLARD COUNTY

BY LAUREL H. STOTT, SOIL CONSERVATION SERVICE

FIELDWORK BY LAUREL H. STOTT, GORDON C. CRANDALL, DELYLE BECKSTRAND, GARTH W. DEISHMAN, AND HAROLD B. MAXWELL, SOIL CONSERVATION SERVICE

UNITED STATES DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE, UNITED STATES DEPARTMENT OF THE INTERIOR, BUREAU OF LAND MANAGEMENT
IN COOPERATION WITH UTAH AGRICULTURAL EXPERIMENT STATION

DELTA AREA, UTAH, PART OF MILLARD COUNTY (elsewhere in this survey referred to as Delta Area) (fig. 1) occupies 575,960 acres, or about 900 square miles. About 70,000 acres is used for irrigated crops. The rest is range or wasteland. About 64,700 acres is playas that produce little or no vegetation.

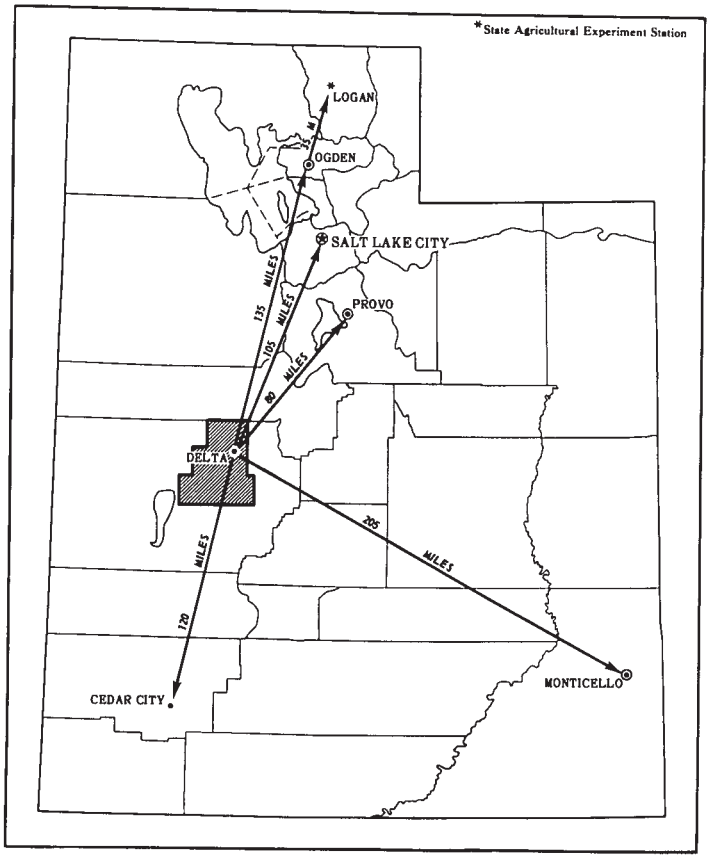

Figure 1.—Location of Delta Area in Utah.

All the survey area is in the Sevier River drainage system. The topography is dominantly nearly level lake plains and flood plains. There are some steep and very steep slopes in the Cricket Mountains and on Pavant Butte. Elevation ranges from about 4,500 to 6,000 feet.

The largest town in the survey area is Delta. Other small towns are Deseret, Hinckley, Oasis, Sutherland, Abraham, and Sugarville.

The main source of income is farming.

How This Survey Was Made

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

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

Soils that have profiles almost alike make up a soil series. Except for different texture in the surface layer, all the soils of one series have major horizons that are similar in thickness, arrangement, and other important characteristics. Each soil series is named for a town or other geographic feature near the place where a soil of that series was first observed and

mapped. Abraham and Sugarloaf, for example, are the names of two soil series. All the soils in the United States having the same series name are essentially alike in those characteristics that affect their behavior in the undisturbed landscape.

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

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

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

Some mapping units are made up of soils of different series, or of different phases within one series. Two such kinds of mapping units are shown on the soil map of Delta Area: soil complexes and soil associations.

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

A soil association is made up of adjacent soils that occur as areas large enough to be shown individually on the soil map but are shown as one unit because the time and effort of delineating them separately cannot be justified. There is a considerable degree of uniformity in pattern and relative extent of the dominant soils, but the soils may differ greatly one from another. The name of an association consists of the names of the dominant soils, joined by a hyphen. Poganeab-Uffens association is an example.

In most areas surveyed there are places where the soil material is so rocky, so shallow, so severely eroded, or so variable that it has not been classified by soil series. These places are shown on the soil map and are described in the survey, but they are called land types and are given descriptive names. Stony colluvial land is a land type in this survey area.

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

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

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

General Soil Map

The general soil map at the back of this survey shows, in color, the soil associations in Delta Area. A soil association is a landscape that has a distinctive proportional pattern of soils. It generally consists of one or more major soils and at least one minor soil, and it is named for the major soils. The soils in one association may occur in another, but in a different pattern.

A map showing soil association is useful to people who want a general idea of the soils in an area, who want to compare different parts of an area, or who want to know the location of large tracts that are suitable for a certain kind of farming or other land use. Such a map is not suitable for planning the management of a farm or field, because the soils in any one association ordinarily differ in slope, depth, stoniness, salinity, alkali, drainage, and other characteristics that affect management.

The eight soil associations in Delta Area are discussed in the following pages.

1. *Yuba-Uffens-Uvada association*

Deep, well drained and moderately well drained, strongly saline to very strongly saline and moderately alkali to strongly alkali silty clay loams, sandy clay loams, and silt loams; on deltas, beach bars, and flood plains

This association makes up about 11 percent of the survey area. It is about 20 percent Yuba soils, 15 percent Uffens soils, 15 percent Uvada soils, 15 percent Playas, and 10 percent Abbott soils. Minor soils make up the remaining 25 percent.

Elevation ranges from 4,500 to 4,800 feet. The climate is arid. Average annual precipitation ranges from 6 to 8 inches, and the average annual air temperature is 49° to 52° F. The frost-free period averages 115 to 120 days. Native vegetation is shadscale,

greasewood, kochia, picklewood, Nuttalls saltbush, bud sagebrush, and alkali sacaton.

Yuba soils are moderately well drained. These soils have a surface layer of light-gray, strongly alkaline silty clay loam underlain by light-gray and white, moderately alkaline heavy silty clay loam.

Uffens soils are well drained. These soils have a surface layer of light-gray, strongly alkaline silt loam and a subsoil of light brownish-gray and very pale brown, very strongly alkaline heavy sandy clay loam.

Uvada soils are well drained. These soils have a surface layer of light-gray, very strongly alkaline silt loam. The subsoil is brown and light-brown, very strongly alkaline and strongly alkaline silty clay and heavy silty clay loam.

Playas are flat-bottomed depressions of very strongly saline silty clay loam or silty clay sediment. Abbott soils have a surface layer of gray, strongly alkaline silty clay underlain by gray, strongly alkaline and very strongly alkaline silty clay and clay.

Permeability is moderately slow to very slow. Runoff is slow to very slow. All the soils are sodium and salt affected.

This association is used for range. It provides limited grazing for livestock. The areas are not suitable for seeding, because precipitation is limited and the soils have a high salt and alkali content.

2. *Yenrab-Uvada association*

Deep, well drained and somewhat excessively drained, strongly saline to very strongly saline and moderately alkali to strongly alkali sands and silt loams; on terraces and plains

This association makes up about 10 percent of the survey area. It is about 80 percent Yenrab soils and 13 percent Uvada soils. Minor soils make up the remaining 7 percent.

Elevation ranges from 4,500 to 4,800 feet. The climate is arid. The average annual precipitation ranges from 6 to 10 inches, and the average annual air temperature is 49° to 52° F. The frost-free period averages 115 to 125 days. Native vegetation is horsebrush, yellowbrush, scurfpea, shadscale, bud sagebrush, greasewood, Indian ricegrass, and pickleweed.

Yenrab soils are somewhat excessively drained. These soils have a surface layer of pale-brown, strongly alkaline fine sand underlain by light brownish-gray, strongly alkaline sand. They are sodium affected.

Uvada soils are well drained. These soils have a surface layer of light-gray, very strongly alkaline silt loam and silty clay loam and a subsoil of brown and light-brown, very strongly alkaline and strongly alkaline silty clay and heavy silty clay loam. They are sodium and salt affected.

Permeability is rapid to very slow. Runoff is slow. Yenrab soils are subject to soil blowing.

This association is used for range. It provides limited grazing for livestock. The areas are not suitable for seeding, because precipitation is limited and the soils have a high salt and alkali content.

3. *Abraham-Anco-Abbott association*

Deep, somewhat poorly drained and poorly drained, slightly saline to strongly saline and slightly alkali loams, silty clay loams, and silty clays; on lake plains and flood plains

This association makes up about 21 percent of the survey area. It is about 32 percent Abraham soils, 24 percent Anco soils, 22 percent Abbott soils, and 11 percent Poganeab soils. Minor soils make up the remaining 11 percent.

Elevation ranges from 4,500 to 4,800 feet. The climate is arid. Average annual precipitation is 6 to 8 inches, and average air temperature is 49° to 52° F. The frost-free period averages 115 to 120 days. Native vegetation is greasewood, shadscale, and seepweed.

Abraham soils have a surface layer of brown, strongly alkaline loam or silty clay loam. It is underlain by pale-brown and light-gray, strongly alkaine loam, silt loam, and very fine sandy loam.

Anco soils have a surface layer of light brownish-gray, moderately alkaline silty clay loam. It is underlain by light brownish-gray and light-gray, moderately alkaline silty clay loam that is stratified with silt loam and loamy fine sand.

Abbott soils have a surface layer of gray, strongly alkaline silty clay. It is underlain by gray, strongly and very strongly alkaline silty clay and clay.

Permeability is moderate to slow. Runoff is slow to ponded.

This association is used for irrigated crops and range. The areas that are used for irrigated crops need drainage and leaching of salts annually to maintain good growth of crops. The range areas provide limited grazing for livestock. This association also provides food and cover for pheasants. The areas are not suitable for seeding, because precipitation is limited and the soils have a high salt and alkali content.

4. *Playas-Saltair association*

Playas and deep, poorly drained and very poorly drained, very strongly saline and moderately alkali silt loams on lake plains and flood plains

This association makes up about 10 percent of the survey area. It is about 47 percent Playas and 39 percent Saltair soils. Minor soils make up the remaining 14 percent.

Elevation ranges from 4,550 to 4,650 feet. The climate is arid. The average annual precipitation ranges from 6 to 8 inches, and the average annual air temperature is 49° to 52° F. The frost-free period averages 115 to 120 days. Native vegetation is alkali sacaton, saltgrass, pickleweed, salicornia, and greasewood.

Playas are level depressions of very strongly saline silty clay loam and silty clay sediment. They are very strongly saline and have little or no vegetation.

Saltair soils have a surface layer of gray, moderately alkaline silt loam underlain by gray and light-gray, moderately alkaline to strongly alkaline silt loam. They are very strongly saline.

Saltair soils in this association are moderately permeable. Runoff is very slow or ponded.

This association is used for range and wildlife habitat. The areas are not suitable for seeding, because precipitation is low and they have a high salt content.

5. *Uvada-Playas-Goshute association*

Deep, well drained, strongly saline to very strongly saline and moderately alkali to strongly alkali silt loams and gravelly silt loams and Playas; on lake plains and terraces

This association makes up about 23 percent of the survey area. It is about 57 percent Uvada soils, 18 percent Playas, and 9 percent Goshute soils. Minor soils make up the remaining 16 percent.

Elevation ranges from 4,500 to 4,800 feet. The climate is arid. The average annual precipitation ranges from 6 to 8 inches, and the average air temperature is 49° to 57° F. The frost-free period averages 115 to 120 days. Native vegetation is shadscale, kochia, seepweed, pickleweed, greasewood, bud sagebrush, alkali sacaton, and Indian ricegrass.

Uvada soils have a surface layer of light-gray, very strongly alkaline silt loam and a subsoil of brown and light-brown very strongly alkaline and strongly alkaline silty clay and heavy silty clay loam. They are sodium and salt affected.

The Playas are level depressions of very strongly saline silty clay loam and silty clay sediment.

Goshute soils have a surface layer of light-gray, strongly alkaline gravelly silt loam and a subsoil of pale-brown, very strongly alkaline silty clay loam. They are underlain by fine gravel. They are moderately alkali to strongly alkali and strongly saline or very strongly saline.

Permeability is moderately slow to very slow. Runoff is medium to slow.

This association is used for range. It provides limited grazing for livestock. The areas are not suitable for seeding, because precipitation is limited and the soils have a high salt and alkali content.

6. *Hiko Springs-Checkett-Rock land association*

Deep and shallow, well drained and excessively drained sandy loams, very cobbly loams, and Rock land; on terraces and mountainsides

This association makes up about 7 percent of the survey area. It is about 44 percent Hiko Springs soils, 13 percent Checkett soils, and 13 percent Rock land. Minor soils make up the remaining 30 percent.

Elevation ranges from 4,550 to 6,000 feet. The climate is arid. The average annual precipitation ranges from 6 to 9 inches, and the average annual air temperature is 48° to 52° F. The frost-free period averages 115 to 120 days. Native vegetation is shadscale, bud sagebrush, big sagebrush, rabbitbrush, horsebrush, squirreltail, and Indian ricegrass.

Hiko Springs soils have a surface layer of pale-brown, strongly alkaline sandy loam. The underlying material is very pale brown and light yellowish-brown, strongly alkaline gravelly sandy loam and sandy clay loam that grades to reddish yellow, very strongly alkaline gravelly clay loam.

Checkett soils have a surface layer of pale-brown, moderately alkaline very cobbly loam. The subsoil is brown, moderately alkaline very cobbly clay loam. Bedrock is at a depth of 14 to 19 inches.

Rock land consists of rock outcrop and very shallow, very cobbly soils underlain by bedrock.

Permeability is moderate to moderately rapid. Runoff is medium or rapid.

This association is used for range. It provides limited grazing for livestock. The areas are not suitable for seeding, because precipitation is low. Some areas are also very cobbly and shallow.

7. *Sugarloaf-Yenrab-Lava flows association*

Deep, somewhat excessively drained, slightly alkali to moderately alkali sandy loams and sands and Lava flows; on high lake terraces, beach bars, and benches

This association makes up about 12 percent of the survey area. It is about 74 percent Sugarloaf soils, 11 percent Yenrab soils, and 11 percent Lava flows. The remaining 4 percent is Curdli soils and Rock land.

Elevation ranges from 4,600 to 4,950 feet. The climate is arid and semiarid. The average annual precipitation ranges from 6 to 10 inches, and the average annual air temperature is 49° to 52° F. The frost-free period averages 115 to 125 days. Native vegetation is shadscale, big sagebrush, horsebrush, bud sagebrush, greasewood, galleta, and Indian ricegrass.

Sugarloaf soils have a surface layer of pale-brown, strongly alkaline sandy loam underlain by light-gray, strongly alkaline sandy loam and light brownish-gray, moderately alkaline loamy fine sand. Volcanic cinders and gravelly sand are below a depth of 40 to 58 inches.

Yenrab soils have a surface layer of pale-brown, strongly alkaline fine sand and are underlain by light brownish-gray, strongly alkaline sand. They are sodium affected.

Lava flows are mostly exposed basalt rocks. In places Lava flows are covered with a thin layer of soil.

Permeability is rapid. Runoff is medium or slow.

This association is used for range. It provides limited grazing for livestock. Areas are not suitable for seeding, because precipitation is low. Sugarloaf soils are used as a source of cinders by the State Road Department.

8. *Yenrab-Drum-Yuba association*

Deep, moderately well drained and somewhat excessively drained, strongly saline to very strongly saline and moderately alkali sands, loams, and silty clay loams; on terraces, lake plains, and flood plains

This association makes up about 6 percent of the survey area. It is about 32 percent Yenrab soils, 10 percent Drum soils, and 8 percent Yuba soils. The remaining 50 percent is mostly Kessler soils, the strongly alkali affected Uvada soils, the strongly salt affected Saltair soils, Escalante soils, and the gypsiferous Kanosh soils.

Elevation ranges from 4,500 to 4,800 feet. The climate is arid and semiarid. The average annual precipitation ranges from 6 to 10 inches, and the average annual air temperature is 49° to 52° F. The frost-free period averages 115 to 125 days. Native vegetation is big sagebrush, rabbitbrush, Indian ricegrass, and galleta on the soils that have moderate or slight salt concentrations. Vegetation on soils with a high sodium and salt content is shadscale, greasewood, saltgrass, alkali sacaton, seepweed, and Nuttalls saltbush.

Yenrab soils have a surface layer of pale-brown, strongly alkaline fine sand underlain by light brown-

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

Soil	Acres	Percent	Soil	Acres	Percent
Abbott silty clay	20,405	3.5	Modena sandy loam	580	.1
Abbott silty clay, strongly saline	14,095	2.5	Musinia silt loam	980	.2
Abbott silty clay, wet	675	.1	Pahranagat loam	665	.1
Abbott silty clay, sandy substratum	960	.2	Penoyer silt loam	4,135	.7
Abbott silty clay, sandy substratum, strongly saline	610	.1	Penoyer silt loam, strongly saline	3,395	.6
Abraham loam	11,825	2.1	Playas	61,615	10.7
Abraham loam, strongly saline	13,925	2.4	Playas-Abbott association	5,110	.9
Abraham silty clay loam	7,265	1.3	Poganeab silty clay loam	6,015	1.0
Abraham silty clay loam, strongly saline	6,830	1.2	Poganeab silty clay loam, strongly saline	6,025	1.0
Alluvial land	3,715	.7	Poganeab silty clay loam, sandy substratum	1,325	.2
Alluvial land, wet	3,445	.6	Poganeab-Uffens association	1,625	.3
Anco silty clay loam	12,775	2.2	Saltair silt loam	19,515	3.4
Anco silty clay loam, strongly saline	17,215	3.0	Saltair silt loam, deep water table	2,500	.4
Anco silty clay loam, sandy substratum	2,030	.4	Saltair silty clay loam, very strongly calcareous variant	2,450	.4
Bluewing very cobbly loam, 3 to 10 percent slopes, eroded	3,075	.5	Shear silty clay, 1 to 5 percent slopes	2,520	.4
Cache silty clay loam	1,060	.2	Stony colluvial land	1,235	.2
Checkett-Rock land association	10,635	1.9	Sugarloaf sandy loam, 0 to 10 percent slopes	50,205	8.7
Curdli loam	6,425	1.1	Sugarloaf-Rock land association	1,465	.3
Deseret silt loam	700	.1	Swasey very cobbly loam, 3 to 10 percent slopes	2,390	.4
Drum loam	4,510	.8	Toddler sandy clay loam	8,170	1.4
Duggins silty clay	580	.1	Uffens silt loam	8,800	1.5
Dune land	3,560	.6	Uffens-Swasey complex, 0 to 10 percent slopes	2,050	.4
Escalante sandy loam, 1 to 5 percent slopes	1,110	.2	Uffens-Uvada silt loams, eroded	2,640	.5
Escalante-Yenrab complex, undulating	1,600	.3	Uvada silt loam	86,100	14.9
Goshute gravelly silt loam	12,300	2.1	Uvada silt loam, strongly saline	2,610	.5
Hiko Springs sandy loam, 3 to 10 percent slopes, eroded	16,635	2.9	Uvada-Toddler complex, eroded	985	.2
Hiko Springs very gravelly loam, hardpan variant, 3 to 10 percent slopes	1,735	.3	Uvada-Yenrab complex, undulating	5,930	1.0
Kanosh very fine sandy loam	1,555	.3	Woodrow silt loam	685	.1
Kessler loam, 1 to 5 percent slopes	1,885	.3	Yenrab fine sand, undulating	43,020	7.5
Kessler loam, strongly saline, 1 to 5 percent slopes	840	.1	Yenrab fine sand, high rainfall, undulating	10,275	1.8
Kessler silt loam, 1 to 2 percent slopes	780	.1	Yenrab sandy loam, 1 to 10 percent slopes	720	.1
Lahontan silty clay	2,990	.5	Yenrab-Lava flows association	13,445	2.3
Lahontan silty clay loam, sandy subsoil variant	4,530	.8	Yenrab-Uffens complex, 0 to 10 percent slopes	6,370	1.1
Lava flows	1,800	.3	Yuba silty clay loam	14,920	2.6
Mellor silt loam	850	.2	Gravel pits	565	.1
			Total	575,960	100.0

ish-gray, strongly alkaline sand. They are sodium affected.

Drum soils are moderately well drained. These soils have a surface layer of light-gray, strongly alkaline loam underlain by very pale brown and light-gray, strongly alkaline silty clay loam. They are strongly saline.

Yuba soils are moderately well drained. These soils have a surface layer of light-gray, strongly alkaline silty clay loam underlain by light-gray and white, moderately alkaline heavy silty clay loam. They are very strongly saline.

Permeability is rapid to slow. Runoff is slow or very slow.

This association is used mostly for range. Some areas are used for irrigated crops. The areas are not suitable for seeding, because of limited precipitation. Several of the soils have a high sodium and salt content.

Descriptions of the Soils

This section describes the soil series, which are groups of similar soils, and the single soils, or mapping units, of the Delta Area. The acreage and proportionate extent of each mapping unit are given in table 1.

The procedure in this section is first to describe the soil series and then the mapping units in the series. Thus, to get full information on any one mapping unit, it is necessary to read the description of that unit and also the description of the soil series to which it belongs. Not all mapping units are members of a soil series. Dune land, Lava flows, Playas, Rock land, and Stony colluvial land are miscellaneous land types and do not belong to a soil series; nevertheless, they are listed in alphabetic order if they are not in associations with soils.

The mapping units in this survey are not all of equal intensity or degree of precision. Mapping units in parts of the survey area that are cultivated, or mostly cultivated, contain less than 20 percent of soils other than those shown in the name of the unit. In the tracts not cultivated, mapping units are less precise.

Unless stated otherwise, the colors shown in this section are those of a dry soil. Color designations are those of the Munsell system.

Preceding the name of each mapping unit is a

symbol that identifies the mapping unit on the detailed soil map. Listed at the end of each description of a mapping unit are the capability unit and range site in which the mapping unit has been placed. The page on which each capability unit and each range site is described can be found by referring to the "Guide to Mapping Units" at the back of this survey.

Many terms used in the soil descriptions and other sections are defined in the Glossary and in the "Soil Survey Manual" (*3*).[1]

Most soils in the survey area contain quantities of soluble salts or alkali, or both. In many soils the concentration of salts and alkali is moderate to strong, and in others it is very strong. Low areas receive salty runoff or seepage water from surrounding high areas.

Abbott Series

The Abbott series consists of poorly drained soils. These soils formed in lake sediment and alluvium on deltas and flood plains. Slopes range from 0 to 3 percent. Native vegetation is greasewood, shadscale, halogeton, and inkweed. Elevation ranges from 4,500 to 4,700 feet. Average annual precipitation is 6 to 8 inches, and the average annual air temperature is 49° to 52° F. The frost-free period is 115 to 120 days. These soils are associated with Abraham, Anco, and Poganeab soils.

In a representative profile the surface layer is gray silty clay about 8 inches thick. The underlying material to a depth of 40 inches is gray silty clay and clay that has mottles of olive brown. Below this to a depth of 60 inches or more, it is stratified light olive-gray, light brownish-gray, and light-gray silt loam and silty clay loam. In places the profile is sandy below a depth of 40 inches. The profile is strongly alkaline to very strongly alkaline.

Permeability is slow. The soils are slightly saline to strongly saline. Effective rooting depth is 60 inches or more.

Areas of these soils are used for irrigated crops and for range. The principal irrigated crops are alfalfa, alfalfa seed, and barley.

Representative profile of Abbott silty clay, one-half mile east of Topaz chicken ranch, 160 feet west and 75 feet south of the northeast corner of sec. 23, T. 16 S., R. 8 W.:

A1—0 to 8 inches, gray (2.5Y 6/1) silty clay, gray (2.5Y 5/1) when moist; very weak, medium, subangular blocky structure that parts to weak, fine, granular; extremely hard, very firm, sticky and very plastic; many fine and very fine roots; few fine and very fine tubular pores; strongly calcareous; strongly alkaline; abrupt, smooth boundary.

C1—8 to 22 inches, gray (2.5Y 6/1) silty clay, gray (2.5Y 5/1) when moist; few, fine, distinct, olive-brown (2.5Y 4/4) mottles; weak, medium, subangular blocky structure that parts to weak, fine, granular; extremely hard, very firm, sticky and very plastic; many fine roots; common fine and very fine tubular pores; strongly calcareous; strongly alkaline; clear, smooth boundary.

C2—22 to 40 inches, gray (2.5Y 6/1) clay, gray (2.5Y 5/1) when moist; common, fine, distinct, light olive-brown (2.5Y 5/6) mottles; massive; extremely hard, very firm, sticky and very plastic; few fine roots; few fine tubular pores; strongly calcareous; strongly alkaline; abrupt, smooth boundary.

C3—40 to 54 inches, light olive-gray (5Y 6/2) silty clay loam, olive gray (5Y 5/2) when moist; common, fine, distinct, olive (5Y 5/4) mottles; massive; hard, firm, sticky and very plastic; few fine roots; common fine tubular pores and few medium tubular pores; strongly calcareous; strongly alkaline; abrupt, smooth boundary.

C4—54 to 61 inches, light brownish-gray (2.5Y 6/2) silt loam, grayish brown (2.5Y 5/2) when moist; few, fine, faint, light olive-brown (2.5Y 5/4) mottles; massive; very friable, slightly sticky and slightly plastic; few fine roots; common fine tubular pores and few medium tubular pores; strongly calcareous; very strongly alkaline; clear, smooth boundary.

C5—61 to 68 inches, light-gray (10YR 7/2) silt loam, grayish brown (10YR 5/2) when moist; common, fine, distinct, light olive-brown (2.5Y 5/6) mottles; massive; very firm, sticky and very plastic; few fine roots; common fine tubular pores; strongly calcareous; very strongly alkaline.

Hue throughout the profile is 10YR, 2.5Y, or 5Y, but it is dominantly 2.5Y. During seasonal dry periods, these soils develop cracks that are ½ to 1 inch wide and 20 inches or more deep. Chroma of 1 or less or distinct or prominent mottles that have chroma of 2 or less are above a depth of 20 inches.

The A1 horizon has value of 5 to 7 when dry and 4 to 6 when moist, and chroma is 1 or 2. It is dominantly silty clay, but it ranges to silty clay loam. It ranges from 3 to 11 inches in thickness.

The upper part of the C horizon has value of 6 or 7 when dry and 4 to 6 when moist, and chroma is 0 to 2. The upper part of the C horizon is silty clay and clay and is 11 to 20 inches thick. The lower part of the C horizon has value of 6 to 8 when dry and 4 to 6 when moist, and chroma is 1 or 2. The lower part of the C horizon is clay to sand, but it is dominantly silty clay or clay. Above a depth of 40 inches, the content of clay averages 40 to 50 percent.

Aa—Abbott silty clay. This soil has the profile described as representative of the series. Slopes range from 0 to 1 percent. This soil is artificially drained, and the water table is below a depth of 5 feet. Runoff is slow. The hazard of erosion is slight. The available water capacity is 10 to 11 inches to a depth of 5 feet. The amount of water available to plants, however, is only 2.5 to 8 inches because of the salt concentration.

Included with this soil in mapping are small areas of Abraham loam, Anco silty clay loam, and Poganeab silty clay loam.

This soil is used mainly for irrigated crops of alfalfa, alfalfa seed, and barley. Capability unit IIIw-275, irrigated; not assigned to a range site.

Ab—Abbott silty clay, strongly saline. This soil has a profile similar to the one described as representative of the series, but it is strongly saline. In some places, below a depth of 40 inches, it has strata of sand. Slopes are 0 to 3 percent. Runoff is slow. The hazard of erosion is slight. The available water capacity is 10 to 11 inches for a 5-foot profile because of the salt concentration; however, the amount of water available to plants is only 1.5 to 3.5 inches. This soil must be leached of excess salts before cropping. It is artificially drained, and the water table is below 5 feet.

Included with this soil in mapping are small areas of Anco silty clay loam, strongly saline; Anco silty

[1] Italic numbers in parentheses refer to Literature Cited, p. 73.

clay loam, sandy substratum; Lahontan silty clay; Lahontan silty clay loam, sandy subsoil variant; Shear silty clay, 1 to 5 percent slopes; and Yuba silty clay loam.

This soil is used for range, or it is idle. Natural vegetation is greasewood and salt-tolerant forbs. Capability units IIIw–275, irrigated, and VIIs–D8, nonirrigated; Desert Alkali Flats range site.

AE—Abbott silty clay, wet. This soil has a profile similar to the one described as representative of the series, but it has a water table at a depth of 30 to 40 inches and is strongly saline. Slopes range from 0 to 1 percent. Runoff is slow or ponded. The hazard of erosion is slight to none. The available water capacity is 10 to 11 inches for a 5-foot profile. This soil is in areas where the drainage water from irrigated crops accumulates. It must be drained and leached of salt before it can be cropped.

Included with this soil in mapping are small areas of Abbott silty clay, strongly saline, and Anco silty clay loam, strongly saline.

This soil is used for range. Native vegetation is mainly saltgrass. Capability unit VIIw–28, nonirrigated; Salt Meadow range site.

Af—Abbott silty clay, sandy substratum. This soil has a profile similar to the one described as representative of the series, but it has thin strata of sand or sandy loam between depths of 25 and 40 inches and is in almost all places sandy below a depth of about 40 inches. Slopes range from 0 to 1 percent. Runoff is slow. The hazard of erosion is slight. The available water capacity is 8 to 9 inches for a 5-foot profile. The amount of water available to plants is only 2 to 7.5 inches, however, because of the salt concentration. This soil is slightly saline to moderately saline. It has been artificially drained, and the water table is generally below a depth of 5 feet.

Included with this soil in mapping are small areas of Abbott silty clay.

The soil is used principally for irrigated crops of alfalfa, alfalfa seed, and barley. Capability unit IIIw–275, irrigated; not assigned to a range site.

Ag—Abbott silty clay, sandy substratum, strongly saline. This soil has a profile similar to the one described as representative of the series, but it is strongly saline, has thin strata of sand or sandy loam between the depths of 25 and 40 inches, and is nearly always sandy below a depth of about 40 inches. Slopes range from 0 to 1 percent. Runoff is slow. The hazard of erosion is slight. The available water capacity is 8 to 9 inches for a 5-foot profile. The amount of water available to plants is only 1.5 to 3.5 inches, however, because of the high salt concentration. This soil must be leached of salt before it can be cropped. It is artificially drained, and the water table is generally below a depth of 5 feet. The coarse-textured material below a depth of 40 inches improves drainability.

Included with this soil in mapping are small areas of Abbott silty clay, strongly saline, and Anco silty clay loam, strongly saline.

This soil is used for range, or it is idle. Native vegetation is greasewood and salt-tolerant forbs. Capability Unit IIIw–275, irrigated, and VIIs–D8, nonirrigated; Desert Alkali Flats range site.

Abraham Series

The Abraham series consists of somewhat poorly drained soils. These soils formed in lake sediment and alluvium on deltas and flood plains. Slopes range from 0 to 2 percent. Native vegetation is greasewood, shadscale, seepweed, saltgrass, and halogeton. Elevation ranges from 4,500 to 4,700 feet. Average annual precipitation is 6 to 8 inches, and the average annual air temperature is 49° to 52° F. The frost-free period is 115 to 120 days. These soils are associated with Abbott, Anco, and Penoyer soils.

In a representative profile the surface layer is brown loam about 7 inches thick. The underlying material to a depth of 26 inches is pale-brown loam, silt loam, and very fine sandy loam. Below this, to a depth or 57 inches or more, it is light-gray, stratified very fine sandy loam, silt loam, and loamy fine sand that has distinct yellowish-brown mottles. The profile is strongly alkaline.

Permeability is moderate. The soils range from slightly saline to strongly saline. Effective rooting depth is 57 inches or more. These soils are artificially drained, and the water table is usually below a depth of 5 feet.

These soils are used for irrigated crops and range. The main irrigated crops are alfalfa, alfalfa seed, barley, and silage corn.

Representative profile of Abraham loam, 1,000 feet northwest of the Hinckley cemetery, sec. 7, T. 17 S., R. 8 W:

Ap—0 to 7 inches, brown (10YR 5/3) loam, dark grayish brown (10YR 4/2) when moist; weak, fine, granular structure; hard, friable, slightly sticky and slightly plastic; common fine and very fine roots; common fine tubular pores; strongly calcareous; strongly alkaline; clear, smooth boundary.

C1—7 to 15 inches, pale-brown (10YR 6/3) loam, dark grayish brown (10YR 4/2) when moist; weak, fine, granular structure; hard, friable, slightly sticky and slightly plastic; common fine roots; many fine tubular pores; strongly calcareous; strongly alkaline; abrupt, smooth boundary.

C2—15 to 18 inches, pale-brown (10YR 6/3) silt loam, grayish brown (10YR 5/2) when moist; common, fine, distinct, yellowish-brown (10YR 5/6) mottles; weak, medium, subangular blocky structure; very hard, friable, slightly sticky and slightly plastic; very few fine roots; many fine tubular pores; strongly calcareous; strongly alkaline; abrupt, smooth boundary.

C3—18 to 26 inches, pale-brown (10YR 6/3) very fine sandy loam, grayish brown (10YR 5/2) when moist; few, fine, distinct, yellowish-brown (10YR 5/6) mottles; massive; slightly hard, very friable, nonsticky and nonplastic; very few fine roots; common very fine pores; strongly calcareous; strongly alkaline; clear, smooth boundary.

C4—26 to 29 inches, light-gray (10YR 7/2) silt loam, grayish brown (10YR 5/2) when moist; common, fine, distinct, yellowish-brown (10YR 5/6) mottles; massive; hard, friable, slightly sticky and plastic; few fine roots; few medium and fine tubular pores; strongly calcareous; strongly alkaline; abrupt, wavy boundary.

C5—29 to 33 inches, light-gray (10YR 7/2) loamy fine sand, grayish brown (10YR 5/2) when moist; few, fine, distinct, yellowish-brown (10YR 5/6) mottles; massive; loose, nonsticky and nonplastic; few fine roots; few fine tubular pores; moderately calcareous; strongly alkaline; clear, wavy boundary.

C6—33 to 43 inches, light-gray (10YR 7/2) very fine sandy loam, grayish brown (10YR 5/2) when moist; few,

fine, distinct, yellowish-brown (10YR 5/6) mottles; massive; soft, friable, nonsticky and slightly plastic; few fine roots; many fine tubular pores; strongly calcareous; strongly alkaline; gradual, smooth boundary.

C7—43 to 57 inches, very pale brown (10YR 7/3) heavy silt loam, grayish brown (10YR 5/2) when moist; few, fine, distinct, yellowish-brown (10YR 5/6) mottles; weak, medium and fine, blocky structure; hard, friable, slightly sticky and plastic; few very fine roots; few fine tubular pores; strongly calcareous; strongly alkaline.

The Ap horizon has value of 5 to 7 when dry and 4 or 5 when moist and chroma of 2 or 3. It is loam or silty clay loam and is 5 to 10 inches thick. The part of the C horizon between the depths of 10 and 40 inches has hue of 10YR and 2.5Y, value of 6 or 7 when dry and 4 or 5 when moist, and chroma of 2 or 3. It is dominantly very fine sandy loam and silt loam. Layers of heavy silt loam or loamy fine sand are in places. The average clay content is less than 18 percent, and less than 15 percent of the sand is coarser than very fine sand. In places mottles are above a depth of 40 inches, but there is little evidence of reduction or segregation of iron.

Ah—Abraham loam. This soil has the profile described as representative of the series. Slopes range from 0 to 1 percent. Runoff is slow. The hazard of erosion is slight. Available water capacity is 8 to 9.5 inches to a depth of 5 feet. The amount of water available to plants, however, is only 5 to 9 inches because of the salt concentration. This soil is slightly saline or moderately saline.

Included with this soil in mapping are small areas of Abraham silty clay loam and Abraham loam, strongly saline. Also included is a soil that is similar to this Abraham soil, but it is more than 15 percent sand coarser than very fine sand. Areas of Anco silty clay loam and Poganeab silty clay loam are also included.

This soil is used mainly for irrigated crops of alfalfa, alfalfa seed, barley, and silage corn. Capability units IIw–27, irrigated, and VIIs–D8, nonirrigated; Desert Alkali Flats range site.

Ak—Abraham loam, strongly saline. This soil has a profile similar to the one described as representative of the series, but it is strongly saline. Slopes range from 0 to 2 percent. Runoff is slow. The hazard of erosion is slight. The available water capacity is 8 to 9.5 inches to a depth of 5 feet. The amount of water available to plants, however, is only 2 to 3.5 inches because of the salt concentration. This soil must be leached of salt before cropping.

Included with this soil in mapping are small areas of Penoyer silt loam, strongly saline; Abraham silty clay loam, strongly saline; Anco silty clay loam, strongly saline; Uffens silt loam; and Uvada silt loam. Also included is a soil that is similar to this Abraham soil, but it is more than 15 percent sand coarser than very fine sand.

This soil is used for range, or it is idle. Native vegetation is greasewood, shadscale, seepweed, saltgrass, and halogeton. Capability units IIw–27, irrigated, and VIIs–D8, nonirrigated; Desert Alkali Flats range site.

Am—Abraham silty clay loam. This soil has a profile similar to the one described as representative of the series, but the surface layer is silty clay loam. Slopes range from 0 to 1 percent. Runoff is slow. The hazard of erosion is slight. The available water capacity is 8 to 9.5 inches for a 5-foot profile. The amount of water available to plants is only 5 to 8 inches, however, because of the salt concentration. This soil is slightly saline to moderately saline.

Included with this soil in mapping are small areas of Abraham silty clay loam, strongly saline; Anco silty clay loam; and Poganeab silty clay loam.

This soil is used mainly for irrigated crops of alfalfa, alfalfa seed, barley, and silage corn. Capability unit IIw–27, irrigated; not assigned to a range site.

An—Abraham silty clay loam, strongly saline. This soil has a profile similar to the one described as representative of the series, but the surface layer is silty clay loam and the soil is strongly saline. Slopes range from 0 to 1 percent. Runoff is slow. The hazard of erosion is slight. The available water capacity is 8 to 9.5 inches for a 5-foot profile. The amount of water available to plants, however, is only 2 to 3.5 inches because of the salt concentration. This soil must be leached of salt before it can be cropped.

Included with this soil in mapping are small areas of Anco silty clay loam, strongly saline; Abraham silty clay loam; and Penoyer silt loam, strongly saline.

This soil is used for range, or it is idle. Native vegetation is greasewood, shadscale, seepweed, saltgrass, and halogeton. Capability units IIw–27, irrigated, and VIIs–D8, nonirrigated; Desert Alkali Flats range site.

Alluvial Land

AO—Alluvial land. Alluvial land is along river bottoms and on flood plains. It consists dominantly of silty clay loam and silty clay materials that are stratified with other materials ranging from silt loam to sand. The materials vary greatly within a short distance. They are strongly saline and very strongly saline.

This land type has no value for crops. Vegetation is sparse and consists mainly of greasewood and tamarisk. Capability unit VIIIs–8, nonirrigated; not assigned to a range site.

Alluvial Land, Wet

Ar—Alluvial land, wet. Alluvial land, wet, is on bottom lands along the Sevier River and on flood plains near the river. It consists dominantly of moderately well drained and somewhat poorly drained silty clay loam or silt loam that is stratified with silty clay or sand. The materials vary greatly within a short distance. They are generally strongly saline. Some areas are undulating. Included with this unit in mapping are some steep banks.

Some areas of this land type are used for cattle range. Vegetation is greasewood, saltgrass, and tamarisk. Capability unit VIIw–28, nonirrigated; Salt Meadow range site.

Anco Series

The Anco series consists of somewhat poorly drained soils. These soils formed in lake sediment and alluvium on deltas and flood plains. Slopes range from 0 to 1 percent. Native vegetation is greasewood, shadscale, saltbush, inkweed, and halogeton. Elevation ranges

from 4,500 to 4,800 feet. Average annual precipitation is 6 to 8 inches, and the average annual air temperature is 49° to 52° F. The frost-free period is 115 to 120 days. These soils are associated with Abbott, Abraham, and Poganeab soils.

In a representative profile the surface layer is light brownish-gray silty clay loam about 7 inches thick. The underlying material to a depth of 61 inches or more is light brownish-gray and light-gray silty clay loam that has strata of silty loam and loamy fine sand. The profile is moderately alkaline.

Permeability is moderately slow. These soils are slightly saline to strongly saline. Effective rooting depth is 60 inches or more. These soils are artificially drained, and the water table is usually below a depth of 5 feet.

These soils are used for irrigated crops and range. The main irrigated crops are alfalfa, alfalfa seed, barley, and silage corn.

Representative profile of Anco silty clay loam, 4.5 miles east and 0.6 mile south of Deseret junction, SW¼NE¼ of sec. 6, T. 18 S., R. 6 W.:

Ap—0 to 7 inches, light brownish-gray (10YR 6/2) silty clay loam, dark grayish brown (10YR 5/2) when moist; weak, coarse, platy structure that parts to weak, fine, granular; hard, friable, slightly sticky and slightly plastic; common medium and fine roots; few fine tubular pores; strongly calcareous; moderately alkaline; clear, smooth boundary.

C1—7 to 16 inches, light brownish-gray (10YR 6/2) silty clay loam, dark grayish brown (10YR 4/2) when moist; few, fine, faint, brown to dark-brown (10YR 4/3) mottles; weak, coarse, platy structure that parts to weak, fine, blocky structure; hard, firm, sticky and very plastic; common fine roots; few fine tubular pores; strongly calcareous; moderately alkaline; clear, smooth boundary.

C2—16 to 21 inches, light brownish-gray (10YR 6/2) heavy silty clay loam, grayish brown (10YR 5/2) when moist; few, fine, faint, brown to dark-brown (10YR 4/3) mottles; massive; hard, firm, very sticky and very plastic; few fine roots; few fine tubular pores; strongly calcareous; moderately alkaline; gradual, smooth boundary,

C3—21 to 33 inches, light-gray (10YR 7/2) silt loam, grayish brown (10YR 5/2) when moist; common, fine, faint, brown to dark-brown (10YR 4/3) mottles; massive; hard, friable, slightly sticky and slightly plastic; few fine roots; few fine tubular pores; strongly calcareous; moderately alkaline; smooth boundary.

C4—33 to 41 inches, light brownish-gray (2.5Y 6/2) loamy fine sand, grayish brown (2.5Y 5/2) when moist; common, medium, distinct, dark yellowish-brown (10YR 4/4) mottles; massive; soft, loose; few fine roots; few fine interstitial pores; strongly calcareous; moderately alkaline; abrupt, smooth boundary.

C5—41 to 49 inches, light-gray (10YR 7/2) silty clay loam, grayish brown (10YR 5/2) when moist; common, medium, distinct, dark yellowish-brown (10YR 3/4) mottles; massive; hard, firm, sticky and very plastic; few fine roots; few fine tubular pores; strongly calcareous; moderately alkaline; abrupt, smooth boundary.

C6—49 to 61 inches, light-gray (10YR 7/2) silt loam, grayish brown (10YR 5/2) when moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; few fine roots; few fine tubular pores; strongly calcareous; moderately alkaline.

The Ap horizon has value of 6 or 7 when dry and 4 or 5 when moist, and chroma is 2. It is heavy silt loam and silty clay loam, 6 to 9 inches thick. The C horizon is dominantly silty clay loam and silt loam stratified with layers ranging to fine sandy loam, sandy loam, and loamy fine sand. The average clay content above a depth of 40 inches is 27 to 35 percent. Chroma of 2 or less, or distinct or prominent mottles are between depths of 20 and 40 inches. Faint mottles are above a depth of 20 inches in places.

As—Anco silty clay loam. This soil has the profile described as representative of the series. Slopes range from 0 to 1 percent. Runoff is slow. The hazard of erosion is slight. The available water capacity is about 10 to 11 inches for a 5-foot profile. The amount of water available to plants, however, is only 2.5 to 8 inches because of the salt concentration. This soil is slightly saline to moderately saline.

Included with this soil in mapping are small areas of Abbott silty clay and Abraham silty clay loam.

This soil is used mainly for irrigated crops of alfalfa, alfalfa seed, barley, and silage corn. Capability unit IIw–27, irrigated; not assigned to a range site.

At—Anco silty clay loam, strongly saline. This soil has a profile similar to the one described as representative of the series, but it is strongly saline. Slopes range from 0 to 1 percent. Runoff is slow. The hazard of erosion is slight. The available water capacity is 10 to 11 inches for a 5-foot profile. The amount of water available to plants, however, is only 1.5 to 3.5 inches because of the salt concentration. This soil must be leached of salt before it can be cropped.

Included with this soil in mapping are small areas of Abbott silty clay and Abraham silty clay loam.

This soil is used for range, or it is idle. Native vegetation is greasewood, shadscale, saltbrush, inkweed, and halogeton. Capability units IIw–27, irrigated, and VIIs–D8, nonirrigated; Desert Alkali Flats range site.

Av—Anco silty clay loam, sandy substratum. This soil has a profile similar to the one described as representative of the series, but the substratum below a depth of about 40 inches is loamy fine sand or sand. The coarse-textured material below a depth of 40 inches improves the drainability of the soil. Slopes range from 0 to 1 percent. Runoff is slow. The hazard of erosion is slight. The available water capacity is 7.5 to 9 inches for a 5-foot profile. The amount of water available to plants, however, is only 5 to 8.5 inches because of the salt concentration. This soil is slightly saline to moderately saline.

Included with this soil in mapping are small areas of Abbott silty clay, strongly saline, and Abraham loam, strongly saline.

This soil is used for irrigated crops of alfalfa hay, alfalfa seed, barley, and silage corn. Capability unit IIw–27, irrigated; not assigned to a range site.

Bluewing Series

The Bluewing series consists of somewhat excessively drained soils. These soils formed in alluvium from mixed igneous and sedimentary rocks on outwash fans and high and intermediate lake terraces. Slopes range from 3 to 10 percent. Native vegetation is shadscale, bud sagebrush, Brigham tea, cheatgrass, Indian ricegrass, galleta, winter fat, and annual forbs. Elevation ranges from 4,750 to 5,050 feet. Average annual precipitation is 6 to 8 inches, and the average annual air temperature is 49° to 52° F. The frost-free period is

115 to 125 days. These soils are associated with Checkett and Hiko Springs soils.

In a representative profile the surface layer is very pale brown very cobbly loam about 6 inches thick. The underlying material extends to a depth of 60 inches or more. The upper 4 inches is very pale brown gravelly silt loam; the lower 50 inches is light yellowish-brown and very pale brown very gravelly sand. The profile is strongly alkaline to very strongly alkaline.

Permeability is rapid. Available water capacity is about 2 to 3 inches for a 5-foot profile. The water supplying capacity is 4 to 5 inches. Effective rooting depth is 36 to 60 inches.

The areas of these soils are used for range.

Representative profile of Bluewing very cobbly loam, 3 to 10 percent slopes, eroded, approximately 2 miles southwest of Cricket Mountain microwave tower, NE¼ of sec. 27, T. 20 S., R. 10 W.:

A1—0 to 6 inches, very pale-brown (10YR 7/3) very cobbly loam, brown (10YR 5/3) when moist; weak, fine, granular structure; soft, friable, nonsticky and nonplastic; common fine roots; common fine interstitial pores; strongly calcareous; strongly alkaline; clear, smooth boundary.

C1—6 to 10 inches, very pale-brown (10YR 8/4) gravelly silt loam, pale brown (10YR 6/3) when moist; weak, fine, granular structure; slightly hard, friable, slightly sticky and slightly plastic; few fine roots; common fine pores; strongly calcareous; very strongly alkaline; clear, smooth boundary.

C2—10 to 20 inches, light yellowish-brown (10YR 6/4) very gravelly sand, yellowish-brown (10YR 5/4) when moist; single grained; loose; few fine roots; few fine interstitial pores; strongly calcareous; strongly alkaline; gradual, wavy boundary.

C3—29 to 60 inches, very pale-brown (10YR 7/4) very gravelly sand, yellowish-brown (10YR 5/4) when moist; single grained; loose; few fine roots; few fine interstitial pores; strongly calcareous; moderately alkaline.

Depth to bedrock is generally more than 60 inches. In some areas, however, fractured bedrock is between depths of 40 and 60 inches. The A1 horizon has value of 6 or 7 when dry and chroma of 2 and 3. It is very cobbly loam or very cobbly sandy loam that is 50 to 80 percent cobbles and gravel. The C horizon has hue of 10YR or 7.5 YR, value of 6 to 8 when dry and 4 to 6 when moist, and chroma of 3 or 4. It is dominantly very gravelly sand and very gravelly coarse sand that is 50 to 80 percent gravel.

BLC2—Bluewing very cobbly loam, 3 to 10 percent slopes, eroded. This soil is in the southwestern part of the survey area, about 12 to 15 miles west of Clear Lake. Runoff is medium. The hazard of erosion is moderate. Shallow gullies are about every 200 to 400 feet.

Included with this soil in mapping are small areas of Checkett very cobbly loam, 20 to 40 percent slopes; Hiko Springs sandy loam, 3 to 10 percent slopes, eroded; rock outcrops; and Uvada silt loam.

This soil is used for range. Capability unit VIIe-D, nonirrigated; Desert Gravelly Loam range site.

Cache Series

The Cache series consists of poorly drained soils. These soils formed in lake sediment and alluvium on deltas and flood plains. Slopes range from 0 to 1 percent. Native vegetation is saltgrass and smotherweed. Elevation ranges from 4,500 to 4,550 feet. Average annual precipitation is 6 to 8 inches, and the average annual air temperature is 49° to 52° F. The frost-free period is 115 to 120 days. These soils are associated with Yuba soils.

In a representative profile the surface layer is light-gray silty clay loam about 5 inches thick. The underlying material extends to a depth of 65 inches or more. The upper 13 inches is light-gray silty clay loam; the middle 19 inches is very pale brown and light-gray silty clay; and the lower 28 inches is stratified grayish-brown, light-gray, and white silty clay loam. The profile is moderately alkaline to strongly alkaline.

Permeability is slow. The soils are very strongly saline. The available water capacity is 10 to 11 inches for a 5-foot profile. Effective rooting depth is 48 to 60 inches. Depth to the water table is 10 to 50 inches, depending on the time of the year.

These soils are used for range and wildlife.

Representative profile of Cache silty clay loam, 7 miles west of Sugarville Church house on the west side of Topas slough, SW¼ of sec. 6, T. 16 S., R. 8 W.:

A11sa—0 to 1 inch, light-gray (5Y 7/2) silt loam; light olive brown (2.5Y 5/4) when moist; massive; soft, friable, slightly sticky and slightly plastic; few fine roots; common very fine tubular pores; moderately calcareous; strongly alkaline; abrupt, wavy boundary.

A12sa—1 to 5 inches, light-gray (2.5Y 7/2) clay loam, dark grayish-brown (2.5Y 5/2) when moist; weak, fine, subangular blocky structure; slightly hard, friable, slightly sticky and plastic; common fine and few very fine roots; few fine and many very fine tubular pores; common fine salt flecks; strongly calcareous; strongly alkaline; clear, wavy boundary.

C1sa—5 to 18 inches, light-gray (2.5Y 7/2) light silty clay loam; light olive gray (5Y 6/2) when moist; common, fine and medium, distinct, olive (5Y 5/4) mottles; moderate, fine, subangular blocky structure; hard, firm, sticky and plastic; common fine and very fine roots; few fine and many very fine tubular pores; thin lenses of very fine sandy loam soil; strongly calcareous; moderately alkaline; clear, wavy boundary.

C2sa—18 to 30 inches, very pale brown and pink (10YR 7/3 and 7.5YR 7/3) light silty clay; brown (10YR 5/3 and 7.5YR 5/3) when moist; common, fine, prominent, greenish-gray (5GY 6/1) mottles in and around root channels; moderate, fine, blocky structure; very hard, firm, very sticky and very plastic; few fine and very fine roots; few fine and common very fine tubular pores; common fine salt flecks; strongly calcareous; strongly alkaline; clear, smooth boundary.

C3sa—30 to 34 inches, very pale brown (10YR 7/3) light silty clay; brown (10YR 5/3) when moist; few, fine, prominent, greenish-gray (5GY 6/1) mottles in root channels; moderate, fine, blocky structure; hard, firm, sticky and plastic; few very fine roots; common very fine tubular pores; strongly calcareous; moderately alkaline; abrupt, wavy boundary.

C4gsa—34 to 37 inches, light-gray (5Y 8/1) light silty clay; olive gray (5Y 5/2) when moist; few, fine and medium, distinct, brown (10YR 4/3) mottles; weak, fine and medium, subangular blocky structure; hard, firm, sticky and plastic; few very fine roots; few fine and common very fine tubular pores; strongly calcareous; moderately alkaline; abrupt, smooth boundary.

A1bgsa—37 to 40 inches, grayish-brown (2.5Y 5/1) heavy silty clay loam; black (10YR 2/1) when moist; few, fine and medium; distinct, olive (5Y 5/4) mottles; weak, very fine, subangular blocky structure; hard, firm, sticky and plastic; few very fine roots; common very fine tubular pores; moderately calcareous; moderately alkaline; clear, wavy boundary.

C5g—40 to 48 inches, light-gray (5Y 7/1) heavy silty clay loam, gray (5Y 6/1) when moist; few, fine, dis-

tinct, pale-olive (5Y 6/4) and yellowish-brown (10YR 5/6) mottles; moderate, fine, blocky structure; very hard, firm, very sticky and very plastic; few very fine roots; few fine and common very fine tubular pores; strongly calcareous; moderately alkaline; clear, irregular boundary.

C6g—48 to 57 inches, white (5Y 8/1) silty clay loam; light olive gray (5Y 6/2) when moist; massive; hard, friable, sticky and plastic; few very fine roots; few fine and common very fine tubular pores; 5 to 10 percent is small shells; very strongly calcareous; moderately alkaline; clear, wavy boundary.

C7g—57 to 65 inches, light-gray (5Y 7/1) heavy silty clay loam; light olive gray (5Y 6/2) when moist; weak, fine and very fine, subangular blocky structure; very hard, firm, sticky and plastic; few very fine roots; common very fine tubular pores; strongly calcareous; moderately alkaline.

Horizons of salt accumulation are above a depth of 40 inches. The A1 horizon has value of 7 or 8 when dry and 5 or 6 when moist, and chroma is 2 to 4. It is silty clay loam 5 to 11 inches thick. The C horizon has hue of 7.5YR to 5Y, value of 7 or 8 when dry and 5 to 7 when moist, and chroma of 1 to 3. It is light silty clay loam to silty clay that has common, fine and medium, distinct and prominent mottles. The clay content averages 35 to 45 percent.

CA—Cache silty clay loam. This soil is in the Clear Lake area. Slopes range from 0 to 1 percent. Runoff is very slow or ponded. The hazard of erosion is slight.

Included with this soil in mapping are small areas of Yuba silty clay loam.

This soil is used for range and wildlife. Capability unit VIIw–28, nonirrigated; Salt Meadow range site.

Checkett Series

The Checkett series consists of excessively drained soils. These soils formed in residuum from igneous and sedimentary rocks on ridgetops and mountain slopes. Slopes range from 20 to 40 percent. Native vegetation is big sagebrush, Indian ricegrass, galleta, shadscale, horsebrush, and squirreltail. Elevation ranges from 5,300 to 6,000 feet. Average annual precipitation is 7 to 9 inches, and average annual air temperature is 48° to 51° F. The frost-free period is 115 to 120 days. These soils are associated with Bluewing and Hiko Springs soils.

In a representative profile the surface layer is pale-brown very cobbly loam about 2 inches thick. The subsoil is brown very cobbly clay loam about 14 inches thick. It is underlain by pinkish-gray very cobbly loam about 3 inches thick. Fractured quartzite bedrock is at a depth of about 19 inches. The profile is moderately alkaline to strongly alkaline.

Permeability is moderately rapid. Available water capacity is 1 to 2 inches. Water supplying capacity is 3 to 4 inches. Effective rooting depth is 14 to 19 inches.

These soils are used for range.

Representative profile of Checkett very cobbly loam, 20 to 40 percent slopes, in an area of Checkett-Rock land association, 2 miles south and one-half mile east of microwave tower, on west slope of ridge, SE¼ of sec. 31, T. 20 S., R. 9 W.:

A1—0 to 2 inches, pale-brown (10YR 6/3) very cobbly loam, dark grayish brown (10YR 4/2) when moist; very thin, platy structure; soft, friable, slightly sticky and slightly plastic; few fine roots; common fine vesicular pores; moderately calcareous; moderately alkaline; clear, smooth boundary.

B1—2 to 6 inches, brown (10YR 5/3) very cobbly light clay loam, brown (7.5YR 4/2) when moist; weak, fine, subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few fine and medium roots; few fine tubular pores; common thin clay films as bridges; moderately calcareous; lime is veined; moderately alkaline; gradual, smooth boundary.

B2t—6 to 16 inches, brown (7.5YR 5/3) very cobbly clay loam, reddish brown (5YR 4/4) when moist; moderate, fine, blocky structure; very hard, firm, sticky and plastic; few fine roots; few fine pores; common thin clay films; moderately calcareous; moderately alkaline; gradual, wavy boundary.

C—16 to 19 inches, pinkish-gray (7.5YR 7/2) very cobbly light loam, brown (7.5YR 5/3) when moist; weak, fine, subangular blocky structure; soft, friable, slightly sticky and slightly plastic; few fine and very fine roots; moderately calcareous; strongly alkaline.

R—19 inches, fractured quartzite bedrock.

The solum is 14 to 19 inches thick. The A1 horizon is 2 to 4 inches thick. It is 70 to 80 percent cobbles. The B2t horizon has value of 5 or 6 when dry and 4 or 5 when moist. It ranges from very cobbly light clay loam to very cobbly clay loam in texture. The B2t horizon is 50 to 60 percent cobbles. It is 8 to 10 inches thick.

CR—Checkett-Rock land association. This association is in the Cricket Mountain range in the southwest part of the survey area. It consists of about 50 percent Checkett very cobbly loam, 20 to 40 percent slopes, and 50 percent Rock land. Runoff is rapid. The hazard of erosion is severe.

Included with this association in mapping are small areas of Bluewing very cobbly loam, 3 to 10 percent slopes, and Hiko Springs sandy loam, 3 to 10 percent slopes.

This soil is used for range. Capability unit VIIs–S, nonirrigated; Semidesert Stony Hills range site.

Curdli Series

The Curdli series consists of well-drained soils. These soils formed in lake sediment on deltas. Slopes range from 0 to 1 percent. Native vegetation is shadscale, bud sagebrush, winter fat, seepweed, and halogeton. Elevation ranges from 4,550 to 4,700 feet. Average annual precipitation is 6 to 8 inches, and the average annual soil temperature is 49° to 52° F. The frost-free period is 115 to 120 days. These soils are associated with Goshute, Uvada, and Yenrab soils.

In a representative profile the surface layer is white loam about 4 inches thick. The underlying material extends to a depth of 60 inches or more. The upper 10 inches is very pale brown loam; the lower 46 inches is white silt loam. The profile is strongly alkaline.

Permeability is moderate. The soils are strongly saline. The available water capacity is 10 to 11 inches for a 5-foot profile. The amount of water available to plants is only about 1.5 to 3.0 inches because of the salt concentration. Effective rooting depth is 60 inches or more.

These soils are used for range.

Representative profile of Curdli loam, approximately 19 miles southwest of Hinkley and one-half mile south of U.S. Highway 50–6, NE¼ of sec. 4, T. 19 S., R. 10 W.:

A1—0 to 4 inches, white (10YR 8/2) loam, pale brown (10YR 6/3) when moist; weak, thin, platy structure that parts to weak, fine, granular structure; soft, friable, nonsticky and nonplastic; few fine roots; common fine vesicular pores; very strongly

calcareous; strongly alkaline; clear, smooth boundary.

C1ca—4 to 14 inches, very pale brown (10YR 8/3) loam; very pale brown (10YR 7/3) when moist; massive; slightly hard, friable, slightly sticky and slightly plastic; common fine and few medium roots; common fine and few medium tubular pores; very strongly calcareous; strongly alkaline; clear, smooth boundary.

C2ca—14 to 24 inches, white (10YR 8/1) heavy silt loam, very pale brown (10YR 7/3) when moist; moderate, thick, platy structure; very hard, friable, slightly sticky and plastic; few fine roots; few fine pores; very strongly calcareous; strongly alkaline; clear, smooth boundary.

C3ca—24 to 60 inches, white (10YR 8/1) heavy silt loam, white (10YR 8/2) when moist; massive; very hard, friable, slightly sticky and plastic; few fine roots; few fine pores; very strongly calcareous; strongly alkaline.

Hue throughout the profile is dominantly 10YR, but it ranges to 2.5Y. The A1 horizon has value of 7 or 8 when dry and 6 or 7 when moist, and chroma of 2 and 3. It is dominantly loam but ranges to silt loam and is 3 to 5 inches thick. The C horizon has value of 6 to 8 when dry and 5 to 8 when moist, and chroma of 1 to 3. It is dominantly silt loam but ranges to loam or sandy loam. The clay content averages 18 to 27 percent. The calcium carbonate content ranges from 40 to 55 percent.

CU—Curdli loam. This soil is in the southern half of the survey area. Slopes range from 0 to 1 percent. Runoff is slow. The hazard of erosion is slight.

Included with this soil in mapping are small areas of Goshute gravelly silt loam and Uvada silt loam.

This soil is used for range. Capability unit VIIe–D, nonirrigated; Desert Silt Flats range site.

Deseret Series

The Deseret series consists of somewhat poorly drained soils. These soils formed in lake sediment and alluvium on lake terraces and flood plains. Slopes range from 0 to 1 percent. Native vegetation is greasewood, saltgrass, smotherweed, rubber rabbitbrush, and western wheatgrass. Elevation ranges from 4,650 to 4,700 feet. Average annual precipitation is 8 to 10 inches, and the average annual air temperature is 49° to 52° F. The frost-free period is 115 to 120 days. These soils are associated with Kanosh and Kessler soils.

In a representative profile the surface layer is light brownish-gray silt loam about 4 inches thick. The underlying material extends to a depth of 60 inches or more. The upper 5 inches is light brownish-gray silty clay loam and the lower 51 inches is stratified very pale brown silty clay loam, silt loam, and loam. The profile is moderately alkaline to strongly alkaline. Gypsum is below a depth of about 10 to 15 inches.

Permeability is moderately slow. The soils are slightly saline to moderately saline. The available water capacity is 10 to 11 inches for a 5-foot profile. The water supplying capacity is about 5 to 6 inches. Effective rooting depth is 36 to 60 inches. In some years the depth to the water table is as little as 48 inches, but it is generally more than 60 inches.

These soils are used for range and irrigated crops. The main irrigated crops are alfalfa, small grain, and silage corn.

Representative profile of Deseret silt loam, 2 miles north of Pavant, 1,050 feet west and 600 feet north of the southwest corner of sec. 16, T. 20 S., R. 5 W.:

A1—0 to 4 inches, light brownish-gray (10YR 6/2) silt loam, dark grayish brown (10YR 4/2) when moist; weak, thin, platy structure; soft, friable, slightly sticky and slightly plastic; common fine and very fine roots; common fine and very fine vesicular pores; moderately calcareous; strongly alkaline; clear, smooth boundary.

C1—4 to 9 inches, light brownish-gray (10YR 6/2) light silty clay loam, grayish brown (10YR 5/2) when moist; weak, medium, subangular blocky structure; hard, firm, sticky and plastic; common fine and few medium roots; common fine and few medium pores; moderately calcareous; strongly alkaline; gradual wavy boundary.

C2—9 to 15 inches, very pale-brown (10YR 6/3) heavy silt loam, brown (10YR 5/3) when moist; weak, medium, subangular blocky structure; slightly hard, friable, sticky and plastic; common fine and few medium roots; few fine and very fine pores; few salt and gypsum flecks; strongly calcareous; strongly alkaline; gradual, smooth boundary.

C3cs—15 to 25 inches, white (10YR 8/2) light silty clay loam, brown (10YR 5/3) when moist; massive; hard, firm, sticky and plastic; few fine and medium roots; common fine and few medium pores; many gypsum flecks; strongly calcareous; moderately alkaline; gradual, wavy boundary.

C4cs—25 to 38 inches, very pale brown (10YR 8/3) light loam, pale brown (10YR 6/3) when moist, massive; very friable, nonsticky and nonplastic; few fine roots; common fine and few medium pores; many gypsum flecks; strongly calcareous; moderately alkaline; abrupt, wavy boundary.

C5—38 to 58 inches, very pale brown (10YR 8/3) light silty clay loam, pale brown (10YR 6/3) when moist; common, fine, distinct, strong-brown (7.5YR 5/6) mottles; massive; few fine and medium roots; few fine and very fine tubular pores; many gypsum flecks; strongly calcareous; moderately alkaline.

The A1 horizon has value of 3 or 4 when moist and chroma of 2 and 3. It is 3 to 6 inches thick. The C horizon has hue of 10YR and 7.5YR. It is light silty clay loam to sandy loam, but it averages 20 to 35 percent clay and less than 15 percent sand coarser than very fine sand. Horizons of gypsum accumulation are between depths of 10 and 40 inches. Mottles are above a depth of 40 inches.

De—Deseret silt loam. This soil is in the southeastern part of the survey area near Pavant. Slopes range from 0 to 1 percent. Runoff is slow. The hazard of erosion is slight.

Included with this soil in mapping are small areas of Kessler loam, 1 to 5 percent slopes.

This soil is used for irrigated crops and for range. Capability units IIc–2, irrigated, and VIIs–S8, nonirrigated; Semidesert Alkali Flats range site.

Drum Series

The Drum series consists of moderately well drained soils. These soils formed in lake sediment and alluvium on deltas and flood plains. Slopes range from 0 to 2 percent. Native vegetation is saltgrass, shadscale, greasewood, seepwood, alkali sacaton, and rubber rabbitbrush. Elevation ranges from 4,600 to 4,700 feet. Average annual precipitation is 6 to 8 inches, and the average annual air temperature 49° to 52° F. The frost-free period is 115 to 120 days. These soils are associated with Abbott, Yenrab, and Yuba soils.

In a representative profile the surface layer is light-gray loam about 6 inches thick. The underlying material extends to a depth of 60 inches or more. The upper

5 inches is very pale brown loam, and the lower 49 inches is very pale brown silty clay loam. The profile is moderately alkaline to strongly alkaline.

Permeability is moderately slow. The soils are strongly saline. The available water capacity is 10 to 11 inches for a 5-foot profile. The amount of water available to plants is only about 1.5 to 3.5 inches because of the salt concentration.

These soils are used for range.

Representative profile of Drum loam, 4 miles northwest of Pavant, SW¼NE¼ of sec. 1, T. 20 S., R. 6 W.:

A1—0 to 6 inches, light-gray (10YR 7/2) loam, dark brown (10YR 4/3) when moist; moderate, thick, platy structure; soft, friable, slightly sticky and slightly plastic; common fine and very fine and few large roots; many fine and very fine vesicular pores; moderately calcareous; strongly alkaline; abrupt, smooth boundary.

C1ca—6 to 11 inches, very pale brown (10YR 8/3) heavy loam, yellowish brown (10YR 4/4) when moist; weak, thin, platy structure; slightly hard, friable, slightly sticky and slightly plastic; common fine and very fine and few medium roots; many fine and very fine tubular pores and interstitial pores; strongly calcareous; moderately alkaline; abrupt, smooth boundary.

C2ca—11 to 20 inches, very pale brown (10YR 8/3) light silty clay loam, brown (10YR 5/3) when moist; massive; hard, friable, slightly sticky and slightly plastic; few fine and very fine roots; many fine and very fine tubular pores; very strongly calcareous; strongly alkaline; gradual, wavy boundary.

C3—20 to 29 inches, very pale brown (10YR 7/3) light silty clay loam, pale brown (10YR 6/3) when moist; massive; hard, firm, sticky and plastic; few fine and very fine roots; few fine tubular pores; strongly calcareous; strongly alkaline; clear, smooth boundary.

C4—29 to 60 inches, light-gray (10YR 7/2) silty clay loam, pale brown (10YR 6/2) when moist; few fine, distinct, yellowish-brown (10YR 5/6) mottles; massive; very hard, firm, sticky and plastic; few fine roots; few very fine tubular pores; strongly calcareous; strongly alkaline.

Depth to a horizon of strong lime accumulation ranges from 6 to 20 inches. The A1 horizon has hue of 10YR and 2.5Y, value of 6 or 7 when dry and 3 or 4 when moist, and chroma of 1 to 3. It is 4 to 6 inches thick. The Cca horizon has hue of 10YR and 2.5Y and value of 4 to 7 when moist. Chroma is 1 to 4 but is dominantly 2 and 3. This horizon is heavy loam or light silty clay loam. The clay content averages 27 to 35 percent above a depth of 40 inches.

DU—Drum loam. This soil is in the northwestern and southeastern parts of the survey area. Slopes range from 0 to 2 percent. Runoff is slow. The hazard of erosion is slight.

Included with this soil in mapping are small areas of Abbott silty clay, strongly saline; Saltair silt loam; and Yenrab fine sand, undulating.

The soil is used for range. Capability units IIw–27, irrigated, and VIIs–D8, nonirrigated; Desert Flats range site.

Duggins Series

The Duggins series consists of well-drained soils. These soils formed in lake sediment and alluvium on deltas and flood plains. Slopes range from 0 to 1 percent. Native vegetation is big sagebrush, rubber rabbitbrush, Indian ricegrass, squirreltail, and cheatgrass. Elevation ranges from 4,600 to 4,700 feet. Average annual precipitation is 9 to 11 inches, and the average annual air temperature is 51° to 54° F. The frost-free period is 120 to 125 days. These soils are associated with Musinia and Woodrow soils.

In a representative profile the surface layer is light-gray silty clay about 5 inches thick. The underlying material is light-gray light silty clay to a depth of 60 inches or more. The profile is strongly alkaline.

Permeability is slow. The available water capacity is 10 to 11 inches for a 5-foot profile. Effective rooting depth is 60 inches or more.

These soils are used for irrigated crops. The main irrigated crops include alfalfa and small grain.

Representative profile of Duggins silty clay, 2½ miles west and ½ mile north of the southeast corner of the survey area, sec. 31, T. 20 S., R. 5 W.:

A1—0 to 5 inches, light-gray (10YR 7/2) silty clay, light brownish gray (10YR 6/2) when moist; weak, fine, granular structure; hard, firm, sticky and plastic; common fine roots; few fine pores; strongly calcareous; strongly alkaline; clear, smooth boundary.

C—5 to 60 inches, light-gray (10YR 7/2) light silty clay; light brownish gray (10YR 6/2) when moist; massive; very hard, firm, sticky and plastic; few fine and medium roots; few fine pores; strongly calcareous; some lime flecks; strongly alkaline.

The A1 horizon has value of 6 or 7 when dry and 5 or 6 when moist, and chroma of 2 or 3. It is 4 to 9 inches thick. The C horizon has hue of 10YR or 2.5Y, value of 6 or 7 when dry and 5 or 6 when moist, and chroma of 2 or 3. It is light silty clay or heavy silty clay loam. Thin layers of sandy loam are in places.

Dv—Duggins silty clay. This soil is in the southeastern part of the survey area, west of Pavant. Runoff is low. The hazard of erosion is slight.

Included with this soil in mapping are small areas of Woodrow silty clay loam.

These soils are used for irrigated crops. Capability unit IIIs–25, irrigated; not assigned to a range site.

Dune Land

DW—Dune land. This miscellaneous land type consists mainly of dunes of clay and sandy clay. The dunes range from 1 to 10 feet in height. Blown-out areas are between the dunes. There is an extremely small amount of seepweed and greasewood vegetation. These dunes are partly active. They are along the northeastern shoreline of the Sevier Lake bed and near the mouth of the Sevier River channel.

This land type is not suitable for farming. Capability unit VIIIs–5, nonirrigated; not assigned to a range site.

Escalante Series

The Escalante series consists of well-drained soils. These soils formed in lake sediment and alluvium on lake terraces and alluvial fans. Slopes range from 1 to 5 percent. Native vegetation is big sagebrush, greasewood, yellowbrush, and halogeton. Elevation ranges from 4,650 to 4,800 feet. Average annual precipitation is 8 to 10 inches, and the average annual air temperature is 49° to 52° F. The frost-free period is 115 to 125 days. These soils are associated with Kessler and Yenrab soils.

In a representative profile the surface layer is light brownish-gray sandy loam about 4 inches thick. The

underlying material extends to a depth of 60 inches or more. The upper 25 inches is light brownish-gray sandy loam. The profile is moderately alkaline to a very strongly alkaline.

Permeability is moderately rapid. The available water capacity is 6.0 to 7.5 inches for a 5-foot profile. The water supplying capacity is 5.0 to 6.0 inches. Effective rooting depth is 48 to 60 inches.

These soils are used for range.

Representative profile of Escalante sandy loam, 1 to 5 percent slopes, 2 miles west of Pavant, SE¼ of the NE¼ of sec. 30, T. 20 S., R. 5 W.:

A1—0 to 4 inches, light brownish-gray (10YR 6/2) sandy loam, dark grayish brown (10YR 4/2) when moist; weak, thin, platy structure; soft, very friable, nonsticky and nonplastic; few fine roots; few fine tubular pores and vesicular pores; moderately calcareous; moderately alkaline; abrupt, smooth boundary.

C1—4 to 29 inches, light brownish-gray (10YR 6/2) sandy loam, dark brown (10YR 4/3) when moist; massive; soft, very friable, nonsticky and nonplastic; many fine and medium and few large roots; common fine and medium tubular pores; moderately calcareous; strongly alkaline; abrupt, wavy boundary.

C2ca—29 to 41 inches, white (10YR 8/1) light loam, light brownish gray (10YR 6/2) when moist; massive; weakly lime-cemented; hard, friable, slightly sticky and slightly plastic; few fine roots; few fine pores; strongly calcareous; very strongly alkaline: clear, wavy boundary.

C3—41 to 49 inches, white (10YR 8/2) sandy loam, grayish brown (10YR 5/2) when moist; massive; soft, very friable, nonsticky and nonplastic; few fine roots; few fine pores; strongly calcareous; strongly alkaline; clear, wavy boundary.

C4—49 to 60 inches, white (10YR 8/1) silt loam, light brownish gray (10YR 6/2) when moist; massive; weakly lime-cemented; friable, slightly sticky and slightly plastic; few fine roots; few fine pores; strongly calcareous; moderately alkaline.

The A1 horizon has value of 3 or 4 when moist and chroma of 2 or 3. It is 4 to 8 inches thick. In some places below a depth of 40 inches hue is 2.5Y, and texture ranges from sandy loam to light silty clay loam.

ESB—Escalante sandy loam, 1 to 5 percent slopes. This soil is in the southeastern part of the survey area, between Pavant and Sugarloaf Butte. It has the profile described as representative of the series. Runoff is slow. The hazard of water erosion is slight. The hazard of soil blowing is moderate.

Included with this soil in mapping are small areas of Kessler loam, 1 to 5 percent slopes, and Yenrab fine sand, undulating.

This soil is used for range. Capability unit VIIe–S, nonirrigated; Semidesert Limy Loam range site.

EYC—Escalante-Yenrab complex, undulating. This complex consists of about 60 percent Escalante sandy loam, 1 to 5 percent slopes, and about 40 percent Yenrab fine sand, high rainfall, undulating. These soils are intermingled, but the Escalante soil is generally on the more uniform slopes and the Yenrab soil is on the undulating slopes as dunes. Each soil has a profile similar to the one described as representative of its respective series, but the Yenrab soil is moderately alkaline. Runoff is slow. The hazard of water erosion is slight to moderate. The hazard of soil blowing is moderate to high.

These soils are used as range. Both soils in capability unit VIIs–S, nonirrigated. Escalante soil in Semidesert Limy Loam range site; Yenrab soil in Semidesert Sand range site.

Goshute Series

The Goshute series consists of well-drained soils. These soils formed in lake sediment on beach bars and lake terraces. Slope range from 0 to 2 percent. Native vegetation is shadscale, inkweed, kochia, bud sagebrush, greasewood, galleta, Indian ricegrass, and alkali sacaton. Elevation ranges from 4,550 to 4,750 feet. Average annual precipitation is 6 to 8 inches, and the average annual air temperature is 49° to 52° F. The frost-free period is 115 to 120 days. These soils are associated with Curdli, Toddler, and Uvada soils.

In a representative profile the surface layer is light-gray gravelly silt loam about 2 inches thick. The subsoil is pale-brown, very strongly alkaline silty clay loam about 8 inches thick. The underlying material extends to a depth of more than 60 inches. The upper 7 inches is pale-brown silty clay loam; and the lower 43 inches is fine gravel. The profile is moderately alkaline to very strongly alkaline.

Permeability is moderately slow. The soils are strongly saline to very moderately saline. The available water capacity is 3.0 to 4.0 inches for a 5-foot profile. The amount of water available to plants, however, is only about 1.5 to 3.0 inches because of the salt concentration. Effective rooting depth is about 18 to 36 inches.

These soils are used for range.

Representative profile of Goshute gravelly silt loam, approximately 20 miles southwest of Hinckley on U.S. Highway 50–6 and 5 miles south of the highway, SW¼ of sec. 32, T. 19 S., R. 10 W.:

A2—0 to 2 inches, light-gray (10YR 7/2) gravelly silt loam, brown (10YR 5/3) when moist; weak, thin, platy structure; soft, friable, slightly sticky and slightly plastic; few fine roots; common fine and medium vesicular pores; strongly calcareous; strongly alkaline; clear, smooth boundary.

B21t—2 to 4 inches, pale-brown (10YR 6/3) light silty clay loam, brown (10YR 5/3) when moist; weak, fine, granular structure; slightly hard, firm, sticky and plastic; few medium and fine roots; few fine tubular pores; moderate, continuous, clay films on ped faces; strongly calcareous; strongly alkaline; clear, smooth boundary.

B2t—4 to 10 inches, pale-brown (10YR 6/3) heavy silty clay loam, brown (10YR 5/3) when moist; moderate, medium, columnar structure that parts to moderate, medium, subangular blocky; hard, firm, sticky and plastic; few fine roots; few fine pores; moderate, continuous, clay films on ped faces; strongly calcareous; very strongly alkaline; clear, smooth boundary.

C1—10 to 17 inches, very pale-brown (10YR 7/3) light silty clay loam, pale brown (10YR 6/3) when moist; massive; hard, friable, sticky and plastic; few fine roots; few fine pores; many salt veins; strongly calcareous; moderately alkaline; clear, wavy boundary.

IIC2—17 to 60 inches, pale-brown (10YR 6/3) fine gravel, brown (10YR 5/3) when moist; single grained; loose, moderately calcareous; moderately alkaline.

The A2 horizon is dominantly gravelly silt loam but ranges to loam and silt loam. It is 2 to 3 inches thick. The Bt horizon has value of 6 or 7 when dry, and chroma of 2 to 4. It is silty clay to heavy silty clay loam that averages 35 to 50 percent clay and is 8 to 16 inches thick. The lower part of the C horizon is fine gravel; 60 to 80 percent of the

fragments are pebbles less than 1 inch in diameter or are sand.

GO—Goshute gravelly silt loam. This soil has slopes that range from 0 to 2 percent. Runoff is medium. The hazard of erosion is moderate.

Included with this soil in mapping are small areas of Uvada silt loam and Yenrab fine sand, undulating.

This soil is used for range. Capability unit VIIs–D8, nonirrigated; Desert Alkali Bench range site.

Hiko Springs Series

The Hiko Springs series consists of well-drained soils. These soils formed in lake sediment and alluvium on lake terraces and alluvial fans. Slopes range from 3 to 10 percent. Native vegetation is shadscale, bud sagebrush, galleta, squirreltail, Indian ricegrass, horsebrush, and alkali sacaton. Elevation ranges 4,550 to 5,000 feet. Average annual precipitation is 6 to 8 inches, and the average air temperature is 49° to 52° F. The frost-free period is 115 to 120 days. These soils are associated with Bluewing and Checkett soils.

In a representative profile the surface layer is pale-brown sandy loam about 14 inches thick. The underlying material extends to a depth of 60 inches or more. The upper 6 inches is pale-brown gravelly sandy loam, the next 5 inches is light yellowish-brown gravelly coarse sand, the next 8 inches is very pale brown sandy clay loam, and the lower 27 inches is reddish-yellow gravelly clay loam. This profile is strongly alkaline to very strongly alkaline.

Permeability is moderate. The available water capacity is 6.0 to 7.0 inches for a 5-foot profile. The water supplying capacity is 4 to 5 inches. Effective rooting depth is 36 to 60 inches.

These soils are used for range.

Representative profile of Hiko Springs sandy loam, 3 to 10 percent slopes, eroded, 4 miles south of Clear Lake rail station and 3.5 miles west of State Highway 257, NE¼ sec. 23, T. 20 S., R. 9 W.:

A1—0 to 4 inches, pale-brown (10YR 6/3) sandy loam, brown (10YR 5/3) when moist; weak, fine, granular structure; soft, friable, nonsticky and nonplastic; few fine roots; few fine tubular pores; moderately calcareous; strongly alkaline; clear, smooth boundary.

C1—4 to 14 inches, pale-brown (10YR 6/3) sandy loam, yellowish brown (10YR 5/4) when moist; weak, fine, subangular blocky structure; soft, very friable, nonsticky and nonplastic; few fine and very fine roots; few fine tubular pores; moderately calcareous; strongly alkaline; clear, smooth boundary.

C2ca—14 to 20 inches, very pale brown (10YR 7/3) gravelly sandy loam, pale brown (10YR 6/3) when moist; massive; soft, friable, nonsticky and nonplastic; few fine roots; common fine tubular pores; 30 percent gravel and cobbles; moderately calcareous, carbonate accumulation as thin coating on bottoms of rock fragments; strongly alkaline; clear, wavy boundary.

C3ca—20 to 25 inches, light yellowish-brown (10YR 6/4) gravelly coarse sand, yellowish-brown (10YR 5/4) when moist; single grained; loose; few fine roots; 35 percent gravel; moderately calcareous; lime coatings on gravel; strongly alkaline; gradual, wavy boundary.

C4ca—25 to 33 inches, very pale brown (10YR 8/3) sandy clay loam, pale brown (10YR 6/3) when moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots; few fine tubular pores; strongly calcareous; carbonate accumulation as veins and splotches; very strongly alkaline; gradual, wavy boundary.

C5—33 to 60 inches, reddish-yellow (7.5YR 6/6) gravelly light clay loam, brown (7.5YR 5/4) when moist; massive; slightly hard, firm, sticky and plastic; 30 percent gravel and cobbles; moderately calcareous; very strongly alkaline.

The profile is more than 60 inches thick. The A horizon has value of 6 or 7 when dry and 4 or 5 when moist, and chroma of 2 to 4. In places the A1 horizon is as much as 40 percent gravel. The C horizon has value of 6 to 8 when dry and 4 to 7 when moist, and chroma is 2 to 4 but ranges to 6. The average clay content is less than 18 percent. More than 15 percent of the sand is coarser than very fine sand. The average gravel and cobble content averages less than 35 percent.

HKC2—Hiko Springs sandy loam, 3 to 10 percent slopes, eroded. This soil is cut by shallow gullies every 50 to 200 feet and by deep gullies, 8 to 10 feet deep, every 200 to 400 feet. Runoff is medium. The hazard of erosion is moderate.

Included with this soil in mapping are small areas of Bluewing very cobbly loam, 3 to 10 percent slopes, eroded, and Uvada silt loam.

This soil is used for range. Capability unit VIIe–D, nonirrigated; Desert Gravelly Loam range site.

Hiko Springs Variant

The Hiko Springs variant consists of well-drained soils. These soils formed in alluvium on alluvial fans. Slopes range from 3 to 10 percent. Native vegetation is shadscale, horsebrush, winter fat, galleta, squirreltail, yellowbrush, and black sagebrush. Elevation ranges from 4,700 to 5,300 feet. Average annual precipitation is 6 to 8 inches, and the average annual air temperature is 49° to 52° F. The frost-free period is 115 to 125 days. These soils are associated with Checkett and Hiko Springs soils.

In a representative profile the surface layer is very pale brown very gravelly loam about 4 inches thick. The underlying material extends to a depth of 29 inches. The upper part is pale-brown very cobbly loam 11 inches thick, and the lower part is white cobbly sandy loam 14 inches thick. An indurated, lime-cemented hardpan is at a depth of 29 inches. The profile is strongly alkaline.

Permeability is moderately rapid above the hardpan. The soils are slightly saline to moderately saline. The available water capacity is 1.5 to 2.0 inches above the hardpan. The water supplying capacity is about 2 to 4 inches. Effective rooting depth is 22 to 30 inches.

These soils are used for range.

Representative profile of Hiko Springs very gravelly loam, hardpan variant, 3 to 10 percent slopes, 1 mile south of the microwave station in the Crickett Mountains, NE¼ of sec. 30, T. 20 S., R. 9 W.:

A1—0 to 4 inches, very pale brown (10YR 7/3) very gravelly loam, brown (10YR 5/3) when moist; weak, thin, platy structure; slightly hard, friable, nonsticky and slightly plastic; few fine roots; few fine pores; 50 to 60 percent gravel; strongly calcareous; strongly alkaline; clear, smooth boundary.

C1ca—4 to 15 inches, pale-brown (10YR 6/3) very cobbly loam, brown (10YR 5/3) when moist; weak, fine, subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few fine and medium roots; few fine pores; 50 to 60 percent cobbles; strongly calcareous; strongly alkaline; clear, wavy boundary.

C2ca—15 to 29 inches, white (10YR 8/2) cobbly sandy loam, very pale brown (10YR 7/3) when moist; massive; slightly cemented but softens when wet, friable, nonsticky and nonplastic; few fine roots; few fine pores; 20 to 50 percent cobbles; very strongly calcareous; strongly alkaline; clear, wavy boundary.

C3cam—29 inches, indurated, lime-cemented hardpan.

The A1 horizon has value of 6 or 7 when dry and 5 or 6 when moist, and chroma is 2 or 3. It is very gravelly loam or very gravelly sandy loam that is 50 to 70 percent gravel and is 2 to 5 inches thick. The C horizon has hue of 10YR or 7.5YR, and its value is 6 to 8 when dry and 4 to 7 when moist. It is very cobbly loam or cobbly sandy loam that is 20 to 70 percent gravel and cobbles. The average is about 50 percent. Depth to the Ccam horizon is 22 to 30 inches. In places the part of the C horizon above the hardpan is slightly cemented, but it softens when wetted.

HLC—Hiko Springs very gravelly loam, hardpan variant, 3 to 10 percent slopes. This soil is in the Crickett Mountain area in the southwestern part of the survey area. Runoff is rapid. The hazard of erosion is severe. Sheet erosion is slight, and a few shallow gullies have formed.

Included with this soil in mapping are small areas of Checkett very cobbly loam, Hiko Springs sandy loam, and Penoyer silt loam.

This soil is used for range. Capability unit VIIs–D, nonirrigated; Desert Gravelly Loam range site.

Kanosh Series

The Kanosh series consists of somewhat poorly drained gypsiferous soils. These soils formed in lake sediment and alluvium on deltas and flood plains. Slopes range from 0 to 1 percent. Native vegetation is alkali sacaton, saltgrass, pickleweed, and greasewood. Elevation ranges from 4,600 to 4,700 feet. Average annual precipitation is 9 to 11 inches, and the average annual temperature is 51° to 54° F. The frost-free period is 120 to 125 days. These soils are associated with Deseret and Yenrab soils.

In a representative profile the surface layer is light-gray very fine sandy loam about 4 inches thick. The underlying material extends to a depth of 54 inches or more. The upper part is very pale brown very fine sandy loam 18 inches thick. The lower part is pinkish-white very fine sandy loam and white sandy loam. The profile is moderately alkaline.

Permeability is moderately rapid. These soils are strongly saline. The available water capacity is 7 to 9 inches. The amount of water available to plants, however, is only 1.5 to 3.0 inches because of the high salt concentration. Effective rooting depth is 30 to 60 inches. Depth to the water table generally ranges from 20 to 40 inches, but in some wet years it is near the surface for short periods.

These soils are used for range.

Representative profile of Kanosh very fine sandy loam, 3½ miles south of the Holden-Meadow junction, sec. 4, T. 20 S., R. 5 W.:

A1—0 to 4 inches, light-gray (10YR 7/2) very fine sandy loam, dark grayish brown (10YR 4/2) when moist; massive; soft, friable, nonsticky and nonplastic; common fine and few medium roots; common very fine tubular pores; slightly calcareous; moderately alkaline; abrupt, smooth boundary.

C1cs—4 to 22 inches, very pale brown (10YR 8/3) very fine sandy loam; pale brown (10YR 6/3) when moist; massive; soft, friable, nonsticky and nonplastic; common fine and few medium roots; common very fine tubular pores; many gypsum flecks; strongly calcareous; moderately alkaline; abrupt, smooth boundary.

C2cs—22 to 27 inches, pinkish-white (7.5YR 8/2) very fine sandy loam, light yellowish brown (10YR 6/4) when moist; massive; soft, very friable, nonsticky and nonplastic; few very fine roots; few very fine pores; slightly calcareous; moderately alkaline; abrupt, smooth boundary.

C3cacs—27 to 34 inches, pinkish-white (7.5YR 8/2) very fine sandy loam; light brownish gray (10YR 6/2) when moist; common, fine, distinct, yellowish-brown (10YR 5/6) mottles; massive; slightly hard, very friable, nonsticky and nonplastic; few fine roots; common very fine pores; strongly calcareous, moderately alkaline; abrupt, smooth boundary.

C4—34 to 54 inches, white (10YR 8/2) sandy loam, brown (10YR 5/3) when moist; massive; loose, nonsticky and nonplastic; slightly calcareous; moderately alkaline.

Mottles are at a depth of 20 to 40 inches. Horizons with strong accumulations of gypsum are above a depth of 40 inches. The A1 horizon has value of 6 or 7 when dry and 4 or 5 when moist and chroma of 2 or 3. It is very fine sandy loam and sandy loam 3 to 6 inches thick. The C horizon has value of 7 or 8 when dry and 5 or 6 when moist, and chroma of 2 to 4. Some parts of the C horizon are weakly cemented.

Ka—Kanosh very fine sandy loam. This soil is in the southeastern part of the survey area about 3 to 4 miles north of Pavant. Slopes range from 0 to 1 percent. Runoff is slow. The hazard of erosion is slight.

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

This soil is used for range. Capability unit VIIw–28, nonirrigated; Salt Meadow range site.

Kessler Series

The Kessler series consists of well-drained soils. These soils formed in lake sediment and alluvium on deltas and alluvial fans. Slopes range from 1 to 5 percent. Native vegetation is big sagebrush, yellowbrush, squirreltail, greasewood, alkali sacaton, and halogeton. Elevation ranges from 4,600 to 4,700 feet. Average annual precipitation is 9 to 11 inches, and the average annual air temperature is 49° to 52° F. The frost-free period is 115 to 120 days. These soils are associated with Deseret and Escalante soils.

In a representative profile the surface layer is light-gray loam about 11 inches thick. The underlying material extends to a depth of 60 inches or more. The upper 8 inches is light-gray silt loam; the next 7 inches is very pale brown silty clay loam; the next 20 inches is white silt loam; and lower 14 inches is gray very fine sandy loam. The profile is moderately alkaline to very strongly alkaline.

Permeability is moderate. The soils are slightly saline to strongly saline. Effective rooting depth is 36 to 60 inches.

These soils are used for range and irrigated crops. The main irrigated crops are alfalfa, small grain, and silage corn.

Representative profile of Kessler loam, 1 to 5 percent slopes, 2 miles west of the scenic highway on south Bald Mountain road, SW¼ of sec. 17, T. 20 S., R. 5 W.:

A1—0 to 11 inches, light-gray (10YR 7/2) loam, brown (10YR 4/3) when moist; moderate, medium, platy structure; slightly hard, friable, slightly sticky

and slightly plastic; few fine roots; many fine vesicular pores; strongly calcareous; very strongly alkaline; abrupt, smooth boundary.

C1ca—11 to 19 inches, light-gray (10YR 7/2) silt loam, brown (10YR 5/3) when moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few fine roots; few fine tubular pores; strongly calcareous; very strongly alkaline; gradual, wavy boundary.

C2ca—19 to 26 inches, very pale brown (10YR 8/3) light silty clay loam, pale brown (10YR 6/3) when moist; common, fine, distinct, reddish-brown (5YR 4/3) mottles; weak, medium, subangular blocky structure; hard, friable, slightly sticky and plastic; few fine roots; few fine tubular pores; strongly calcareous; moderately alkaline; gradual, wavy boundary.

C3ca—26 to 42 inches, white (10YR 8/2) silt loam, pale brown (10YR 6/3) when moist; moderate, medium, angular blocky structure; extremely hard, friable, slightly sticky and slightly plastic; few fine roots; few fine tubular pores; strongly calcareous; moderately alkaline; abrupt, smooth boundary.

C4ca—42 to 46 inches, white (10YR 8/1) silt loam, light brownish gray (10YR 6/2) when moist; massive; extremely hard, friable, slightly sticky and slightly plastic; few fine pores; very strongly calcareous; strongly alkaline; gradual, smooth boundary.

IIC5—46 to 60 inches, gray (10YR 5/1) very fine sandy loam, black (10YR 2/1) when moist; massive; hard, very friable, nonsticky and nonplastic; noncalcareous; strongly alkaline.

The A horizon has value of 6 or 7 when dry. It is loam or silt loam 5 to 11 inches thick. The part of the C horizon between depths of 11 and 40 inches has value of 7 or 8 when dry and 4 to 6 when moist, and chroma of 1 to 3. It is loam, silt loam, or light silty clay loam. The clay content averages 18 to 27 percent. Depth to the Cca horizon is 10 to 19 inches.

KEB—Kessler loam, 1 to 5 percent slopes. This soil is in the southeastern part of the survey area. It has the profile described as representative of the series. Runoff is medium. The hazard of erosion is moderate. The available water capacity is 10 to 11 inches for a 5-foot profile. The water supplying capacity is 5 to 6 inches.

Included with this soil in mapping are small areas of Yenrab fine sand, high rainfall, undulating, and Uvada silt loam.

This soil is used for range. Native vegetation is big sagebrush, yellowbrush, and squirreltail grass. Capability unit VIIe–S, nonirrigated; Semidesert Limy Loam range site.

KLB—Kessler loam, strongly saline, 1 to 5 percent slopes. This soil is in the southeastern part of the survey area. It has a profile similar to the one described as representative of the series, but it is strongly saline. Runoff is medium. The hazard of erosion is moderate. The available water capacity is 10 to 11 inches for a 5-foot profile. The amount of water available to plants, however, is only 2 to 3 inches because of the salt concentration.

Included with this soil in mapping are small areas of Kessler loam, 1 to 5 percent slopes.

This soil is used for range. Native vegetation is alkali sacation, greasewood, and halogeton. Capability unit VIIs–S8, nonirrigated; Semidesert Alkali Flats range site.

KsA—Kessler silt loam, 1 to 2 percent slopes. This soil is in the southeastern part of the survey area. It has a profile similar to the one described as representative of the series, but the surface layer is silt loam. Runoff is slow. The hazard of erosion is slight. The available water capacity is 10 to 11 inches for a 5-foot profile.

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

This soil is used for irrigated crops of alfalfa, small grain, and silage corn. Capability unit, IIc–2, irrigated; not assigned to a range site.

Lahontan Series

The Lahontan series consists of somewhat poorly drained soils. These soils formed in lake sediment and alluvium on deltas and flood plains. Slopes range from 0 to 1 percent. Native vegetation is greasewood, shadscale, and inkweed. Elevation ranges from 4,500 to 4,700 feet. Average annual precipitation is 6 to 8 inches, and the average annual air temperature is 49° to 52° F. The frost-free season is 115 to 120 days. These soils are associated with Abbott, Anco, and Yuba soils.

In a representative profile the surface layer is white silty clay about 2 inches thick. The underlying material extends to a depth of 60 inches or more. The upper 6 inches is light-gray silty clay, and the lower 52 inches is heavy silty clay loam. The profile is strongly alkaline to very strongly alkaline.

Permeability is slow. The soils are strongly saline. The available water capacity is 10 to 11 inches for a 5-foot profile. The amount of water available to plants, however, is only about 1.5 to 3.5 inches because of high salt concentrations. Effective rooting depth is 48 to 60 inches.

These soils are used for range.

Representative profile of Lahontan silty clay, about 2 miles northeast of Topas Slough, SE¼ of sec. 29, T. 15 S., R. 8 W.:

A2—0 to 2 inches, white (2.5Y 8/1) silty clay, light brownish gray (2.5Y 6/2) when moist; weak, thick, platy structure that parts to weak, thin, platy; very hard, firm, sticky and plastic; few fine and many very fine tubular pores; strongly calcareous, lime is disseminated; strongly alkaline; clear, wavy boundary.

C1—2 to 8 inches, light-gray (2.5Y 7/1) silty clay, light brownish gray (2.5Y 6/2) when moist; moderate, thick, platy structure that parts to moderate, fine, subangular blocky structure; very hard, firm, sticky and plastic; few very fine roots; few fine and many very fine tubular pores; strongly calcareous, lime is disseminated; strongly alkaline; clear, wavy boundary.

C2—8 to 17 inches, white (5Y 8/2) heavy silty clay loam, light olive gray (5Y 6/2) when moist; moderate, very thin, platy structure; slightly hard, firm, sticky and plastic; few very fine, fine and medium roots; few fine and common very fine tubular pores; strongly calcareous, lime is disseminated; very strongly alkaline; clear, smooth boundary.

C3—17 to 32 inches, white (5Y 8/1) heavy silty clay loam, olive gray (5Y 5/2) when moist; few very fine, distinct, strong-brown (7.5YR 5/6) mottles; strong, fine and very fine, angular blocky structure; hard, firm, sticky and plastic; few fine and very fine roots; few fine and common very fine tubular pores; lens of sandy loam, 1 inch thick, in middle of the horizon; strongly calcareous, lime is disseminated; very strongly alkaline; abrupt, smooth boundary.

C4—32 to 39 inches, white (5Y 8/2) heavy silty clay loam, light gray (5Y 7/2) when moist; few, very fine, distinct, strong-brown (7.5YR 5/6) mottles; weak, fine, subangular blocky structure; slightly hard, firm, sticky and plastic; few very fine, fine, and

medium roots; few fine medium and common very fine tubular pores; few small shells throughout strongly calcareous, lime is disseminated; very strongly alkaline; clear, wavy boundary.

C5—39 to 60 inches, white (5Y 8/1) heavy silty clay loam, light gray (5Y 7/2) when moist; common, very fine distinct, yellowish-brown (10YR 5/6) mottles; strong, very fine and medium, angular blocky structure; hard, firm, sticky and plastic; few fine and very fine roots; few fine and very fine tubular pores; strongly calcareous, lime is disseminated; very strongly alkaline; abrupt, smooth boundary.

The A horizon has hue of 10YR or 2.5Y, value of 6 to 8 when dry and 4 to 6 when moist, and chroma of 1 and 2. It is silty clay or silty clay loam 2 to 6 inches thick. The C horizon between a depth of 10 and 40 inches has hue of 10YR to 5Y, value of 6 to 8 when dry and 5 to 7 when moist, and chroma of 1 and 2. Chroma of 1 or distinct or prominent mottles having chroma of 2 are at depths between 20 and 40 inches. The C horizon is silty clay loam and silty clay that averages 35 to 50 percent clay. Texture below a depth of 40 inches ranges from clay to loamy fine sand, but it is dominantly silty clay loam or silty clay.

LA—Lahontan silty clay. This soil has slopes that range from 0 to 1 percent. Runoff is slow. The hazard of erosion is slight.

Included with this soil in mapping are small areas of Anco silty clay loam, strongly saline; Drum loam; and Yuba silty clay loam.

This soil is used for range. Capability unit VIIs–D8, nonirrigated; Desert Alkali Flats range site.

Lahontan Variant

The Lahontan variant consists of well-drained soils. These soils formed in lake sediment and alluvium on deltas and flood plains. Slopes range from 0 to 2 percent. Native vegetation is pickleweed, seepweed, halogeton, and greasewood. Elevation ranges from 4,500 to 4,600 feet. Average annual precipitation is 6 to 8 inches, and the average annual air temperature is 49° to 52° F. The frost-free period is 115 to 120 days. These soils are associated with Toddler, Uffens, and Uvada soils.

In a representative profile the surface layer is light-gray and light brownish-gray silty clay loam about 4 inches thick. The underlying material extends to a depth of 60 inches or more. The upper 30 inches is light brownish-gray silty clay, and the lower 26 inches is light brownish-gray sand. The profile is moderately alkaline to strongly alkaline.

Permeability is slow. The soils are very strongly saline. The available water capacity is 6 to 7 inches in a 5-foot profile. The amount of water available to plants is 0 to 1.5 inches because of the very high salt concentration. Some roots of salt-tolerant plants extend as deep as 60 inches.

These soils are mostly in wasteland. Growth of useful vegetation is very slow.

Representative profile of Lahontan silty clay loam, sandy subsoil variant, 7 miles southwest of Deseret, NE¼ of sec. 1, T. 19 S., R. 8 W.:

A11—0 to 1 inch, light-gray (2.5Y 7/2) silty clay loam, grayish brown (2.5Y 5/2) when moist; weak, thin, platy structure; slightly hard, friable, slightly sticky and plastic; few fine roots; common fine and medium vesicular pores; strongly calcareous; strongly alkaline; abrupt, smooth boundary.

A12—1 to 4 inches, light brownish-gray (2.5Y 6/2) heavy silty clay loam, grayish brown (2.5Y 5/2) when moist; moderate, very fine granular structure; soft, firm, sticky and plastic; common fine roots; few very fine pores; strongly calcareous; strongly alkaline; clear, smooth boundary.

C1—4 to 11 inches, light brownish-gray (10YR 6/2) silty clay, brown (10YR 5/3) when moist; few, fine, faint, olive-brown (10YR 4/4) mottles; weak, thin, platy structure; hard, firm, sticky and plastic; few fine roots; few very fine pores; strongly calcareous; moderately alkaline; clear, smooth boundary.

C2—11 to 16 inches, light-gray (10YR 7/2) sandy loam, grayish brown (10YR 5/2) when moist; massive; soft, very friable, nonsticky and nonplastic; few fine roots; few fine tubular pores; strata of material similar to that in C1 horizon; strongly calcareous; moderately alkaline; clear, wavy boundary.

C3sa—16 to 34 inches, light brownish-gray (10YR 6/2) silty clay, brown (10YR 5/3) when moist; common, medium, distinct, yellowish-brown (10YR 5/5) and gray (5Y 5/1) mottles; moderate, medium, blocky structure; very hard, firm, sticky and plastic; few fine roots; common fine and few medium pores; strongly calcareous; moderately alkaline; clear, wavy boundary.

IIC4—34 to 60 inches, light brownish-gray (10YR 6/2) sand, grayish brown (10YR 5/2) when moist; few medium, prominent, light olive-brown (2.5Y 5/6) mottles; single grained; soft, very friable, nonsticky and nonplastic; few fine roots; few fine interstitial pores; moderately calcareous; moderately alkaline.

Distinct or prominent mottles are in the profile. The total soluble salt content is as much as 3.5 percent in some horizons. The A1 horizon has hue of 2.5Y or 10YR, value of 6 or 7 when dry and 5 or 6 when moist, and chroma of 2 or 3. It is silty clay loam or silty clay 2 to 5 inches thick. The C horizon has hue of 10YR or 2.5Y and value of 5 or 6 when moist. The texture below a depth of about 30 to 36 inches is sand or loamy sand. The clay content between depths of 10 and 30 inches averages 35 to 50 percent.

LC—Lahontan silty clay loam, sandy subsoil variant. This soil is in areas 6 to 7 miles southwest of Deseret. Slopes range from 0 to 1 percent. Runoff is slow. The hazard of erosion is slight.

Included with this soil in mapping are small areas of Toddler sandy clay loam and Uffens silt loam.

This soil is mostly wasteland. Capability unit VIIIs–8, nonirrigated; not assigned to a range site.

Lava Flows

LF—Lava flows. This miscellaneous land type consists dominantly of basalt rocks that are mostly exposed. In places the rocks are covered by a thin layer of soil. The flows are commonly 1 to 6 feet above the valley plain. This land type is within a 4- to 5-mile radius of Pavant Butte. A small amount of shadscale and Indian ricegrass grow where the thin layers of soil occur. This land type has no value for farming. Capability unit VIIIs–X; not assigned to a range site.

Mellor Series

The Mellor series consists of well-drained soils. These soils formed in lake sediment and alluvium on deltas and flood plains. Slopes range from 0 to 1 percent. Native vegetation is greasewood, big sagebrush, rubber rabbitbrush, shadscale, yellowbrush, and squirreltail. Elevation ranges from 4,600 to 4,700 feet. Average annual precipitation is 8 to 11 inches, and the average annual air temperature is 49° to 52° F. The

frost-free period is 115 to 120 days. These soils are associated with Yenrab and Yuba soils.

In a representative profile the surface layer is light-gray silt loam about 6 inches thick. The subsoil is pale-brown silty clay loam about 7 inches thick. The underlying material is light-gray silty clay loam that extends to a depth of 60 inches or more. The profile is moderately alkaline to very strongly alkaline.

Permeability is moderately slow. The soils are moderately saline to strongly saline. The available water capacity is about 10 to 11 inches for a 5-foot profile. The amount of water available to plants, however, is only about 1.5 to 4.0 inches because of the moderate to high salt concentration. Effective rooting depth is 30 to 60 inches or more.

These soils are used for range.

Representative profile of Mellor silt loam, 7 miles north and 3 miles west of Pavant, NW¼SE¼ of sec. 19, T. 19 S., R. 5 W.:

A2—0 to 6 inches, light-gray (10YR 7/2) silt loam, brown (10YR 5/3) when moist; weak, very thin, platy structure; slightly hard, very friable, slightly sticky and slightly plastic; few fine roots; many vesicular pores; strongly calcareous; strongly alkaline; abrupt, wavy boundary.

B2t—6 to 13 inches, pale-brown (10YR 6/3) light silty clay loam, dark brown (10YR 4/3) when moist; moderate, medium and coarse, blocky structure; very hard, firm, sticky and plastic; few fine roots; few fine and medium tubular pores; thin occasional clay films on peds, strongly calcareous; very strongly alkaline; clear, wavy boundary.

C1—13 to 22 inches, light-gray (10YR 7/2) silty clay loam, pale brown (10YR 6/3) when moist; massive; very hard, firm, sticky and plastic; few fine roots; common fine pores; strongly calcareous; strongly alkaline; clear, wavy boundary.

C2—22 to 65 inches, light-gray (10YR 7/2) silty clay loam, pale brown (10YR 6/3) when moist; massive; very hard, firm, very sticky and plastic; few fine roots in upper part; common very fine pores; strongly calcareous; moderately alkaline.

The A2 horizon is 4 to 6 inches thick. The B2t horizon has value of 6 or 7 when dry and 4 or 5 when moist. It is light silty clay loam 6 to 8 inches thick. The C horizon has value of 7 or 8 when dry and chroma of 2 or 3. It ranges from light silty clay loam to heavy silty clay loam. Above a depth of 40 inches, the clay content averages 27 to 35 percent.

ME—Mellor silt loam. This soil is in the southeastern part of the survey area. Slopes range from 0 to 1 percent. Runoff is slow. The hazard of erosion is slight.

Included with this soil in mapping are small areas of Uvada silt loam; Yenrab fine sand, high rainfall, undulating; and Yuba silty clay loam.

This soil is used for range. Capability unit VIIs–S8, nonirrigated; Semidesert Alkali Flats range site.

Modena Series

The Modena series consists of well-drained soils. These soils formed in alluvium on flood plains. Slopes range from 0 to 1 percent. Native vegetation is big sagebrush, Indian ricegrass, rubber rabbitbrush, and western wheatgrass. Elevation ranges from 4,600 to 4,700 feet. Average annual precipitation is 9 to 11 inches, and the average annual air temperature is 51° to 54° F. The frost-free period is 120 to 125 days. These soils are associated with Escalante, Kessler, and Woodrow soils.

In a representative profile the surface layer is light reddish-brown sandy loam about 7 inches thick. The underlying material, to a depth of 41 inches, is stratified light reddish-brown, light-brown, and reddish-brown sandy loam, sand, and silt loam. Below this, it is grayish-brown sandy clay loam and light brownish-gray silty clay loam to a depth of 60 inches or more. The profile is strongly alkaline.

Permeability is moderately slow. The available water capacity is 6.5 to 7.5 inches for a 5-foot profile. Effective rooting depth is 60 inches or more.

These soils are used for irrigated crops. The main crops are alfalfa, small grains, and silage corn.

Representative profile of Modena sandy loam, 2⅛ miles north and 1¼ miles west of the southeastern corner of the survey area, SE¼ of sec. 20, T. 20 S., R. 5 W.:

A1—0 to 7 inches, light reddish-brown (5YR 6/3) sandy loam, reddish brown (5YR 4/3) when moist; massive; soft, very friable, nonsticky and nonplastic; few fine roots; few fine pores; strongly calcareous; strongly alkaline; clear, smooth boundary.

C1—7 to 17 inches, light reddish-brown (5YR 6/3) sandy loam, reddish brown (5YR 4/3) when moist; weak, thick, platy structure; soft, very friable, nonsticky and nonplastic; few fine roots; few fine pores; strongly calcareous; strongly alkaline; abrupt, smooth boundary.

C2—17 to 21 inches, light-brown (7.5YR 6/4) sand, brown (7.5YR 5/4) when moist; single grained; loose; few fine roots; interstitial pores; strongly calcareous; strongly alkaline; abrupt, wavy boundary.

C3—21 to 30 inches, light-brown (7.5YR 6/4) sandy loam, dark brown (7.5YR 4/2) when moist; few, fine, faint, dark reddish-brown (2.5YR 3/4) mottles; massive; slightly hard, friable, slightly sticky and slightly plastic; few fine roots; few fine pores; strongly calcareous; strongly alkaline; abrupt, wavy boundary.

C4—30 to 37 inches, reddish-brown (5YR 5/3) sandy loam, dark reddish brown (5YR 3/3) when moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few fine roots; few fine pores; moderately calcareous; strongly alkaline; gradual, wavy boundary.

C5—37 to 41 inches, light-brown (7.5YR 6/4) light silt loam, brown (7.5YR 4/2) when moist; few, fine, reddish-brown (5YR 4/3) mottles; massive; slightly hard, very friable, slightly sticky and slightly plastic; few fine roots; few fine pores; strongly calcareous; strongly alkaline; clear, smooth boundary.

Ab—41 to 45 inches, grayish-brown (10YR 5/2) sandy clay loam, very dark grayish brown (10YR 3/2) when moist; weak, medium, subangular blocky structure; hard, firm, sticky and plastic; few fine roots; few fine pores; strongly calcareous; strongly alkaline; clear, wavy boundary.

C6—45 to 52 inches, light brownish-gray (10YR 6/2) silty clay loam; dark grayish brown (10YR 4/2) when moist; massive; very hard, firm, sticky and plastic; few fine roots; many fine pores; strongly calcareous; strongly alkaline; clear, wavy boundary.

C7—52 to 60 inches, light brownish-gray (10YR 6/2) heavy silty clay loam, brown (10YR 4/3) when moist; moderate, medium, prismatic structure; very hard, firm, sticky and plastic; few fine roots; few fine and medium pores; strongly calcareous; strongly alkaline.

There is little or no evidence of reduction or segregation of iron in the profile. The A1 horizon has hue of 5YR and 7.5YR, value of 4 or 5 when moist, and chroma of 2 to 4. It is 4 to 9 inches thick. The part of the C horizon above a depth of 40 inches ranges from sand to silt loam, but it is dominantly sandy loam. The part of the C horizon below a depth of 40 inches has hue of 10YR to 5YR, value of 3 to 5

when moist, and chroma of 2 to 4. The C horizon ranges from sandy loam to silty clay loam. Buried horizons are common but are not present in all places.

Mo—Modena sandy loam. This soil has slopes that range from 0 to 1 percent. Runoff is slow. The hazard of erosion is slight.

Included with this soil in mapping are small areas of Kessler loam and Woodrow silt loam.

This soil is used for irrigated crops, or it is idle. Capability unit IIc–2, irrigated; not assigned to a range site.

Musinia Series

The Musinia series consists of well-drained soils. These soils formed in alluvium on flood plains. Slopes range from 0 to 1 percent. Native vegetation is big sagebrush, rubber rabbitbrush, Indian ricegrass, and western wheatgrass. Elevation ranges from 4,600 to 4,700 feet. Average annual precipitation is 9 to 11 inches, and the average annual air temperature is 51° to 54° F. The frost-free period is 120 to 125 days. These soils are associated with Kessler and Woodrow soils.

In a representative profile the surface layer is grayish-brown silt loam about 17 inches thick. The underlying material extends to a depth of 60 inches or more. The upper 35 inches is light brownish-gray and pinkish-gray silty clay loam, and the lower 8 inches is light-gray loam and sandy loam. The profile is moderately alkaline to strongly alkaline.

Permeability is moderately slow. The available water capacity is 10 to 11 inches for a 5-foot profile. Effective rooting depth is 60 inches or more.

Most of the acreage of these soils is used for irrigated crops or is idle; however, a small acreage is used for range. The main irrigated crops are alfalfa, small grain, and silage corn.

Representative profile of Musinia silt loam, 2½ miles north and 200 feet west of the southeastern corner of the survey area, SE¼ of sec 21, T. 20 S., R. 5 W.:

A11—0 to 6 inches, grayish-brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) when moist; moderate, thin, platy structure that parts to moderate, fine, granular; slightly hard, friable, slightly sticky and slightly plastic; common fine roots; common fine and medium pores; strongly calcareous; strongly alkaline; clear, smooth boundary.

A12—6 to 17 inches, grayish-brown (10YR 5/2) heavy silt loam; very dark grayish brown (10YR 3/2) when moist; weak, medium, granular structure; hard, friable, sticky and plastic; common fine and few medium pores; common fine roots; strongly calcareous; strongly alkaline; clear, smooth boundary.

C1—17 to 39 inches, light brownish-gray (10YR 6/2) light silty clay loam, very dark grayish brown (10YR 3/2) when moist; moderate, medium, subangular blocky structure; very hard, firm, sticky and plastic; common fine roots; few fine pores; weak secondary lime flecks; strongly calcareous; moderately alkaline; gradual, wavy boundary.

C2—39 to 52 inches, pinkish-gray (7.5YR 6/2) silty clay loam, brown (7.5YR 4/4) when moist; massive; very hard, firm, sticky and plastic; few fine roots; many fine and few medium pores; strongly calcareous; moderately alkaline; gradual, wavy boundary.

C3—52 to 60 inches, light-gray (10YR 7/2) loam, brown (10YR 5/3) when moist; massive; hard, friable, slightly sticky and slightly plastic; common fine and medium pores; strongly calcareous; strongly alkaline; clear, smooth boundary.

C4—60 to 65 inches, light-gray (10YR 7/2) sandy loam, brown (10YR 5/3) when moist; massive; slightly hard, very friable, nonsticky and nonplastic; common fine pores; strongly calcareous; strongly alkaline.

The A1 horizon has chroma of 2 or 3. It is silt loam and silty clay loam 12 to 17 inches thick. The part of the C horizon above a depth of 40 inches has hue of 10YR and 7.5YR, value of 5 to 7 when dry and 4 to 6 when moist, and chroma of 2 to 4. It is silt loam or silty clay loam. Below a depth of 40 inches texture ranges from sandy loam to silty clay loam.

Mu—Musinia silt loam. This soil is in the southeastern part of the survey area near Pavant. Slopes range from 0 to 1 percent. Runoff is slow. The hazard of erosion is slight.

Included with this soil in mapping are small areas of soils that are strongly saline and small areas of Woodrow silt loam.

This soil is used principally for irrigated crops. Capability unit IIc–2, irrigated; not assigned to a range site.

Pahranagat Series

The Pahranagat series consists of very poorly drained soils. These soils formed in lake sediment and alluvium on deltas and flood plains. Slopes range from 0 to 2 percent. Native vegetation is saltgrass, alkali sacaton, wiregrass, sedges, and pickleweed. Elevation ranges from 4,600 to 4,650 feet. Average annual precipitation is 6 to 8 inches, and the average annual air temperature is 49° to 52° F. The frost-free period is 115 to 120 days. These soils are associated with Saltair soils.

In a representative profile the surface layer is dark-gray loam about 10 inches thick. The underlying material extends to a depth of 60 inches or more. The upper 22 inches is gray and light-gray silt loam, and the lower 28 inches is white loam and silty clay loam. The profile is moderately alkaline.

Permeability is moderately slow. The soils are very strongly saline. The available water capacity is 10 to 11 inches for a 5-foot profile. Effective rooting depth is 48 to 60 inches or more. Depth to the water table ranges from near the surface to a depth of about 50 inches, but it is near the surface most of the year.

These soils are used for range and wildlife, principally for waterfowl.

Representative profile of Pahranagat loam, in the Clear Lake Refuge, sec. 22, T. 19 S., R 7 W.:

O2—2 inches to 0, peatlike organic layer.

A1g—0 to 10 inches, dark-gray (10YR 4/1) loam, black (10YR 2/1) when moist; weak, medium, blocky structure; slightly hard, friable, nonsticky and nonplastic; common fine, very fine, and medium roots; common fine and medium pores; slightly calcareous; moderately alkaline; gradual, wavy boundary.

C1g—10 to 15 inches, gray (10YR 6/1) silt loam; gray (2.5Y 5/1) when moist; weak, fine, blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many fine and very fine roots; many very fine and common fine tubular pores; strongly calcareous; moderately alkaline; clear, wavy boundary.

C2g—15 to 23 inches, gray (10YR 6/1) heavy silt loam; dark gray (10YR 4/1) when moist; weak, medium, blocky structure; slightly hard, friable, slightly

sticky and plastic; common fine and very fine, and few medium roots; common very fine and fine tubular pores; strongly calcareous; moderately alkaline; clear, smooth boundary.

A1b—23 to 27 inches, gray (10YR 5/1) heavy silt loam; very dark gray (10YR 3/1) when moist; weak, coarse, blocky structure; slightly hard, friable, sticky and plastic; common fine and very fine roots; many very fine pores; strongly calcareous; moderately alkaline; clear, smooth boundary.

C3g—27 to 32 inches, light-gray (10YR 7/1) silt loam; grayish brown (2.5YR 5/2) when moist; weak, coarse, angular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common fine roots; many very fine and few fine tubular pores; strongly calcareous; moderately alkaline; gradual wavy boundary.

C4g—32 to 42 inches, white (10YR 8/1) loam, light grayish brown (2.5Y 6/2) when moist; moderate, medium, subangular blocky structure; weakly cemented, friable, nonsticky and nonplastic; common fine and very fine roots; many very fine and common fine tubular pores; very strongly calcareous; moderately alkaline; clear, smooth boundary.

C5g—42 to 60 inches, white (8/0) silty clay loam; white (5Y 8/2) when moist; weak, coarse, subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few fine roots; common very fine pores; very strongly calcareous; moderately alkaline.

In most profiles an organic layer 2 to 3 inches thick overlies the A horizon. The A1 horizon has hue of 10YR and 2.5Y, and it has value of 4 or 5 when dry and 2 or 3 when moist. It is 7 to 11 inches thick. The C horizon has hue of 10YR to 5Y, value of 3 to 8 when moist, and chroma of 0 to 2. The white color in the lower part of the C horizon is associated with high lime content as well as gleying. The C horizon is silt loam, loam, and clay loam. Texture is mainly silt loam above a depth of 40 inches. The C horizon is 50 inches or more thick.

PA—Pahranagat loam. This soil is in the low-lying areas of the Clear Lake waterfowl management area. In these areas, the overall slope gradient is dominantly near 0 percent, but slopes range to 2 percent because of the uneven surface. Runoff is ponded to slow. The hazard of erosion is slight.

Included with this soil in mapping are small areas of Saltair silt loam, deep water table.

This soil is used for range and for wildlife, mainly waterfowl. Capability unit VIIw–28, nonirrigated; Salt Meadow range site.

Penoyer Series

The Penoyer series consists of well-drained soils. These soils formed in lake sediment and alluvium on deltas and flood plains. Slopes range from 0 to 2 percent. Native vegetation is shadscale, winter fat, yellowbrush, bud sagebrush, greasewood, Indian ricegrass and squirreltail. Elevation ranges from 4,500 to 4,800 feet. Average annual precipitation is 6 to 8 inches, and the average annual air temperature is 49° to 52° F. The frost-free period is 115 to 120 days. These soils are associated with Abraham and Anco soils.

In a representative profile the surface layer is very pale brown silt loam about 5 inches thick. The underlying material is light-gray and white silt loam that extends to a depth of 60 inches or more. The profile is moderately alkaline to very strongly alkaline.

Permeability is moderate. The soils are slightly saline to strongly saline. Effective rooting depth is 60 inches or more.

These soils are used mainly for range, but a small acreage is used for irrigated crops of alfalfa, alfalfa seed, barley, and silage corn.

Representative profile of Penoyer silt loam, 7 miles southeast of Deseret, sec. 35, T. 18 S., R 8 W.:

A1—0 to 5 inches, very pale brown (10YR 7/3) silt loam, brown (10YR 5/3) when moist; weak, thin, platy structure; slightly hard, friable, slightly sticky and slightly plastic; common fine and very fine and few medium roots; few fine pores; moderately calcareous; strongly alkaline; clear, wavy boundary.

C1—5 to 15 inches, light-gray (10YR 7/2) heavy silt loam, brown (10YR 5/3) when moist; weak, medium, subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common fine and very fine and few medium roots; few fine and very fine pores; strongly calcareous; very strongly alkaline; clear, smooth boundary.

C2—15 to 43 inches, light-gray (10YR 7/2) light silt loam, light brownish gray (10YR 6/2) when moist; weak, fine, subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; few fine and very fine roots; common fine pores; strongly calcareous; moderately alkaline; gradual, wavy boundary.

C3—43 to 67 inches, white (2.5Y 8/2) silt loam, light gray (2.5Y 7/2) when moist; massive; very hard, friable, slightly sticky and slightly plastic; few fine roots; many very fine pores; strongly calcareous; moderately alkaline.

The A1 horizon has hue that is dominantly 10YR but ranges to 7.5YR, value of 6 or 7 when dry and 4 or 5 when moist, and chroma of 2 or 3. It is dominantly silt loam but ranges to very fine sandy loam and loam. It is 3 to 9 inches thick. The part of the C horizon above a depth of 40 inches has hue that is dominantly 10YR but ranges to 7.5YR, value of 6 or 7 when dry and 4 to 6 when moist, and chroma of 2 to 4. It is dominantly light silt loam but ranges from fine sandy loam to loam. The part of the C horizon below a depth of 40 inches has hue of 7.5YR to 2.5Y, value of 6 to 8 when dry and 4 to 7 when moist, and chroma of 2 to 4. It ranges from fine sand to silty clay loam, but it is dominantly silt loam or very fine sandy loam. In some places faint or distinct mottles are below a depth of 40 inches.

Pe—Penoyer silt loam. This soil has the profile described as representative of the series. Slopes range from 0 to 2 percent. This soil is slightly saline to moderately saline. Irrigated cropland has been artificially drained. The water table is usually below a depth of 5 feet. Runoff is slow. The hazard of erosion is slight. The available water capacity is 8 to 11 inches for a 5-foot profile. The amount of water available to plants, however, is only 6 to 8 inches because of the salt concentration.

Included with this soil in mapping are small areas of Anco silty clay loam, in irrigated areas, and areas of an eroded soil that is cut by shallow gullies, 4 miles south of the microwave station. Also included are areas of Hiko Springs very gravelly loam, hardpan variant, 3 to 10 percent slopes, and Uffens silt loam in nonirrigated areas.

This soil is used for range and irrigated crops. Native vegetation is winter fat, bud sagebrush, yellowbrush, Indian ricegrass, and squirreltail. Areas used for irrigated crops are artificially drained. The main irrigated crops are alfalfa, alfalfa seed, barley, and silage corn. Capability units IIw–27, irrigated, and VIIe–D, nonirrigated; Desert Silt Flats range site.

Ph—Penoyer silt loam, strongly saline. This soil has

a profile similar to the one described as representative of the series, but it is strongly saline. Slopes range from 0 to 1 percent. Runoff is slow. The hazard of erosion is slight. The available water capacity is 8 to 11 inches for a 5-foot profile. The amount of water available to plants, however, is only 1.5 to 3.5 inches because of the salt concentration. This soil must be leached of salt before it can be cropped.

Included with this soil in mapping are small areas of Abraham loam, strongly saline; Anco silty clay loam, strongly saline; and Yuba silty clay loam.

This soil is used for range, or it is idle. Native vegetation is shadscale and greasewood. Capability units IIw–27, irrigated, and VIIs–D8, nonirrigated; Desert Alkali Flats range site.

Playas

PM—Playas. This miscellaneous land type consists of level depressions of mixed alluvial sediment, generally silty clay loam or silty clay. The content of salt is generally so high that usually no vegetation grows on them. The Playas are commonly dry on the surface, but at times they are under water. They are throughout the survey area.

Included with this unit in mapping are small areas of soil that support some vegetation. The Playas have no value for farming. Capability unit VIIIw–8; not assigned to a range site.

PN—Playas-Abbott association. This association consists of about 60 percent Playas and 40 percent Abbott silty clay, strongly saline. The areas of Playas and Abbott soils are intermingled. They are in the western part of the survey area. Slopes range from 0 to 1 percent.

This association is mostly wasteland, but a few areas are used for range. Playas in capability group VIIIs–8; not assigned to a range site. Abbott soil in capability group VIIs–D8; Desert Alkali Flats range site.

Poganeab Series

The Poganeab series consists of poorly drained soils. These soils formed in lake sediment and alluvium on deltas and flood plains. Slopes range from 0 to 1 percent. Native vegetation is greasewood, shadscale, inkweed, and halogeton. Elevation ranges from 4,550 to 4,650 feet. Average annual precipitation is 6 to 8 inches, and the average annual air temperature is 49° to 52° F. The frost-free period is 115 to 120 days. These soils are associated with Abbott, Abraham, Anco, and Yuba soils.

In a representative profile the surface layer is gray silty clay loam about 11 inches thick. The underlying material extends to a depth of 60 inches or more. The upper 36 inches is light-gray silty clay loam and heavy silt loam that has distinct mottles, and the lower 13 inches is light brownish-gray silty clay. The profile is moderately alkaline to strongly alkaline.

Permeability is moderately slow. The soils are slightly saline to strongly saline. Effective rooting depth is 60 inches or more.

These soils are used for irrigated crops and range. The main irrigated crops include alfalfa, alfalfa seed, barley, and silage corn.

Representative profile of Poganeab silty clay loam, 2 miles northwest of Sutherland, 600 feet north of the southeastern corner of sec. 19, T. 16 S., R. 7 W.:

Ap—0 to 11 inches, gray (10YR 6/1) silty clay loam, dark gray (10YR 4/1) when moist; moderate, medium, angular blocky structure; very hard, firm, sticky and plastic; few medium and fine roots; few fine and very fine tubular pores; strongly calcareous; strongly alkaline; clear, smooth boundary.

C1—11 to 36 inches, light-gray (10YR 7/2) light silty clay loam, grayish brown (10YR 5/2) when moist; common, fine, distinct, yellowish-brown (10YR 5/6) mottles; weak, medium, subangular blocky structure; very hard, firm, sticky and plastic; few fine and very fine roots; few fine and very fine tubular pores; strongly calcareous; strongly alkaline; clear, smooth boundary.

C2—36 to 47 inches, light-gray (10YR 7/2) heavy silt loam, grayish brown (10YR 5/2) when moist; common, fine, distinct, olive-yellow (2.5Y 6/6) mottles; massive; hard, friable, slightly sticky and plastic; few very fine roots; few very fine tubular pores; strongly calcareous; strongly alkaline; gradual, wavy boundary.

C3—47 to 56 inches, light brownish-gray (10YR 6/2) silty clay, dark grayish brown (10YR 4/2) when moist; common, fine, distinct, reddish-brown (5YR 5/4) and yellowish-brown (10YR 5/6) mottles; massive; very hard, very firm, very sticky and plastic; strongly calcareous; moderately alkaline; clear, wavy boundary.

C4—56 to 60 inches, gray (10YR 6/1) silty clay, gray (10YR 5/1) when moist; massive; very hard, very firm, very sticky and plastic; strongly calcareous; moderately alkaline.

The part of the profile above a depth of 20 inches has chroma of 1 or less, or it has distinct or prominent mottles and chroma of 2 or less. The A horizon has value of 6 or 7 when dry and 4 or 5 when moist, and chroma of 1 or 2. It is dominantly silty clay loam but ranges to silty clay, and it is 6 to 11 inches thick. The part of the C horizon above a depth of 40 inches has hue of 10YR and 2.5Y, value of 6 or 7 when dry and 4 to 6 when moist, and chroma of 1 or 2. It has few to common, fine to medium, distinct mottles. It ranges from heavy silt loam to light silty clay loam and averages 27 to 35 percent clay. The part of the C horizon below a depth of 40 inches has hue of 10YR and 2.5Y, value of 6 or 7 when dry and 4 or 5 when moist, and chroma of 1 or 2. It has few to common, fine to medium, faint and distinct mottles. It is stratified and ranges from silty clay to sand, but it is dominantly silty clay loam or silt loam.

Po—Poganeab silty clay loam. This soil has the profile described as representative of the series. Slopes range from 0 to 1 percent. This soil is slightly saline to moderately saline. It has been artificially drained, and the water table is usually below a depth of 5 feet. Runoff is slow. The hazard of erosion is slight. The available water capacity is 10 to 11 inches for a 5-foot profile. The amount of water available to plants, however, is only 4.5 to 8.5 inches because of the salt concentration.

Included with this soil in mapping are small areas of Abbott silty clay, Abraham silty clay loam, Anco silty clay loam, and a Poganeab soil that has a silty clay surface texture.

This soil is used mainly for irrigated crops of alfalfa, alfalfa seed, barley, and silage corn. Capability unit IIw–27, irrigated; not assigned to a range site.

Pr—Poganeab silty clay loam, strongly saline. This soil has a profile similar to the one described as representative of the series, but it is strongly saline.

Slopes are 0 to 1 percent. Salt concentrations are too high for irrigated crops. This soil must be leached of salt before it can be cropped. Runoff is slow. The hazard of erosion is slight. The available water capacity is 10 to 11 inches for a 5-foot profile. The amount of water available to plants, however, is only 1.5 to 3.5 inches because of the salt concentration. This soil has been artificially drained, and the water table is usually below a depth of 5 feet.

Included with this soil in mapping are small areas of Abbott silty clay, strongly saline; Abraham loam, strongly saline; Poganeab silty clay loam, sandy substratum; and Yuba silty clay loam.

This soil is used for range, or it is idle. Native vegetation is greasewood, shadscale, inkweed, and halogeton. Capability units IIw–27, irrigated, and VIIs–D8, nonirrigated; Desert Alkali Flats range site.

Pt—Poganeab silty clay loam, sandy substratum. This soil has a profile similar to the one described as representative of the series, but the material below a depth of 36 to 40 inches is dominantly loamy sand or sand. Slopes are 0 to 1 percent. This soil is slightly saline to moderately saline. It has been artificially drained, and the water table is usually below a depth of 6 feet. The coarse-textured material below a depth of 40 inches improves the drainage of the soil. Runoff is slow. The hazard of erosion is slight. The available water capacity of the soil is 8.0 to 9.0 inches for a 5-foot profile. The amount of water available to plants, however, is only 2.0 to 7.5 inches because of the salt concentration.

Included with this soil in mapping are small areas of Abbott silty clay, sandy substratum, and Poganeab silty clay loam.

This soil is used principally for irrigated crops of alfalfa, alfalfa seed, barley, and silage corn. Capability unit IIw–27, irrigated; not assigned to a range site.

PU—Poganeab-Uffens association. This association consists of about 40 percent Poganeab silty clay loam, strongly saline; 30 percent Uffens silt loam; and 30 percent Uvada silt loam. Slopes are 0 to 2 percent. Runoff is slow. The hazard of erosion is slight. The available water capacity is 10 to 11 inches for a 5-foot profile. The water supplying capacity, however, is only 1.5 to 3.5 inches because of salt concentrations.

Included with this association in mapping are small areas of Shear silty clay, 1 to 5 percent slopes, and Yenrab fine sand, undulating.

The Poganeab soil is in depressions. It has a profile similar to the soil described as representative of the Poganeab series; but it is strongly saline.

The Uffens and Uvada soils are in the slightly elevated areas.

This association is used for range. All soils in capability unit VIIs–D8, nonirrigated; Poganeab soil in Desert Alkali Flats range site; Uffens soil in Desert Alkali Bench range site; Uvada soil in Desert Flats range site.

Rock Land

This miscellaneous land type consists of rock outcrops and very shallow soils over bedrock. It has steep and very steep slopes. It is about 30 percent bare rock outcrop and 70 percent dominantly very shallow, very cobbly soils and intermittent rock outcrop. Rock land supports only a very small amount of vegetation. In this survey area, this miscellaneous land type is mapped in association with Sugarloaf soils on the slopes of Pavant Butte and with Checkett soils in the Crickett Mountain range.

This land type has little or no value for farming. Capability unit VIIIs-X; not assigned to a range site.

Saltair Series

The Saltair series consists of poorly drained and very poorly drained soils. These soils formed in lake sediment and alluvium on deltas and flood plains. Slopes are 0 to 3 percent. Native vegetation is alkali sacaton, saltgrass, pickleweed, salicornia, and greasewood. Elevation is 4,550 to 4,650 feet. Average annual precipitation is 6 to 8 inches, and the average annual air temperature is 49° to 52° F. The frost-free period is 115 to 120 days. These soils are associated with Drum and Pahranagat soils.

In a representative profile the surface layer is gray silt loam about 14 inches thick. The underlying material extends to a depth of 65 inches or more. The upper 31 inches is gray and light-gray silt loam. The lower 20 inches is white silty clay loam. The profile is moderately alkaline to strongly alkaline.

Permeability is moderate. The soils are very strongly saline. Available water capacity is 10 to 11 inches in a 5-foot profile. Effective rooting depth is 60 inches or more. The water table is commonly near the surface but it ranges from 0 to 60 inches in depth.

These soils are used for range and wildlife, mainly waterfowl.

Representative profile of Saltair silt loam, 3¾ miles north of main Clear Lake road, east end of fenced cow lane, NE¼ of sec. 22, T. 19 S., R. 7 W.:

A11sa—0 to 7 inches, gray (10YR 6/1) silt loam, very dark grayish brown (10YR 3/2) when moist; weak, thick, platy structure parting to moderate, thin, platy; slightly hard, friable, slightly sticky and plastic; common very fine and few fine roots; few fine and medium tubular pores; moderately calcareous; moderately alkaline; clear, smooth boundary.

A12—7 to 12 inches, gray (10YR 6/1) silt loam, dark gray (2.5Y 4/1) when moist; weak, medium, subangular blocky structure parting to moderate, fine, subangular blocky; slightly hard, friable, slightly sticky and plastic; few fine and very fine roots; few fine and common very fine pores; strongly calcareous; moderately alkaline; abrupt, smooth boundary.

A13—12 to 14 inches, gray (10YR 6/1) silt loam, very dark grayish brown (10YR 3/2) when moist; massive; slightly hard, friable, slightly sticky and plastic; few fine roots; common fine tubular pores; strongly calcareous; moderately alkaline; abrupt, smooth boundary.

C1—14 to 19 inches, light-gray (10YR 7/1) silt loam, gray (10YR 6/1) when moist; weak, fine, subangular blocky structure; slightly hard, friable, slightly sticky and plastic; few fine and very fine roots; many very fine and few fine and medium tubular pores; strongly calcareous; moderately alkaline; clear, smooth boundary.

A1b—19 to 22 inches, gray (10YR 6/1) silt loam, very dark grayish brown (10YR 3/2) when moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few fine roots; common fine tubular pores; strongly calcareous; moderately alkaline; abrupt, smooth boundary.

C2b—22 to 24 inches, gray (10YR 6/1) silt loam, dark gray (10YR 4/1) when moist; weak, coarse, subangular blocky structure; slightly hard, friable, slightly sticky and plastic; few very fine roots; many very fine and few fine and medium tubular pores; strongly calcareous; moderately alkaline; clear, smooth boundary.

C3b—24 to 28 inches, gray (10YR 6/1) silt loam, very dark gray (10YR 3/1) when moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few fine roots; common fine tubular pores; strongly calcareous; moderately alkaline; clear, smooth boundary.

C4b—28 to 45 inches, light-gray (10YR 7/1) heavy silt loam, gray (10YR 5/1) when moist; weak, medium, subangular blocky structure; weakly cemented, friable, slightly sticky and plastic; few very fine roots; many very fine and few fine and medium tubular pores; strongly calcareous; strongly alkaline; abrupt, smooth boundary.

C5b—45 to 65 inches, white (2.5YR 8/1) heavy silty clay loam, light gray (2.5Y 7/2) when moist; few, fine, faint, pale-yellow (2.5Y 8/4) mottles; weak, coarse, blocky structure; slightly hard, firm, sticky and plastic; few very fine roots; many very fine and few fine and medium tubular pores; strongly calcareous; moderately alkaline.

Throughout the profile chroma of 1 or less is dominant, but in places the chroma is 2. The A1 horizon has value of 6 to 8 when dry and 3 to 6 when moist. It is loam and silt loam 3 to 14 inches thick. The C horizon has value of 4 to 7 when moist. It is silt loam and silty clay loam.

SA—Saltair silt loam. This soil is in the Clear Lake area. It has the profile described as representative of the series. Overall gradient is dominantly 0 to 1 percent, but because of the uneven surface, slopes range from 0 to 3 percent. The water table is at or near the surface most of the year. Runoff is very slow or is ponded. The hazard of erosion is slight.

Included with this soil in mapping are small areas of Pahranagat loam and Playas.

This soil is used for range or wildlife, mainly waterfowl. Native vegetation is alkali sacaton, saltgrass, and pickleweed. Capability unit VIIw–28, nonirrigated; Salt Meadow range site.

SD—Saltair silt loam, deep water table. This soil has a profile similar to the one described as representative of the series, but the water table is generally between depths of 40 to 60 inches. Slopes are 0 to 2 percent. Runoff is very slow. The hazard of erosion is slight.

Included with this soil in mapping are small areas of Drum loam and Yenrab fine sand, undulating.

This soil is used for range. Native vegetation is saltgrass, salicornia, and greasewood. Capability unit VIIw–28, nonirrigated; Alkali Bottom range site.

Saltair Variant

The Saltair variant consists of somewhat poorly drained soils. These soils formed in lake sediment and alluvium on deltas and flood plains. Slopes are 0 to 2 percent. Native vegetation is alkali sacaton, saltgrass, pickleweed, and Nuttalls saltbush. Elevation ranges from 4,600 to 4,700 feet. Average annual precipitation is 8 to 10 inches, and the average annual air temperature is 49° to 52° F. The frost-free period is 115 to 120 days. These soils are associated with Uvada and Yuba soils.

In a representative profile the surface layer is very pale brown silty clay loam about 3 inches thick. The underlying material extends to a depth of 60 inches or more. The upper 46 inches is light-gray, very pale brown, and white silty clay loam. The lower 11 inches is very dark grayish-brown loamy sand. The profile is very strongly alkaline to strongly alkaline above the loamy sand and moderately alkaline in the loamy sand.

Permeability is moderately slow. The soils are very strongly saline. Available water capacity is 8.0 to 10 inches for a 5-foot profile. Effective rooting depth is 40 to 60 inches. Depth to water table is 40 to 60 inches.

These soils are used for range.

Representative profile of Saltair silty clay loam, very strongly calcareous variant, 15 feet west of the northeastern corner of sec. 35, T. 18 S., R. 6 W.:

A1—0 to 3 inches, very pale brown (10YR 7/3) silty clay loam, yellowish brown (10YR 5/4) when moist; weak, thick, platy structure that parts to moderate, very fine, granular; slightly hard, firm, sticky and plastic; few medium fine and very fine roots; few fine and very fine pores; strongly calcareous; very strongly alkaline; clear, smooth boundary.

C1—3 to 11 inches, light-gray (10YR 7/2) heavy silty clay loam, yellowish brown (10YR 5/4) when moist; weak, medium, subangular blocky structure; hard, firm, sticky and plastic; few fine, medium, and very fine roots; few medium and common fine tubular pores; very strongly calcareous; strongly alkaline; clear, wavy boundary.

C2—11 to 27 inches, very pale brown (10YR 7/3) silty clay loam, pale brown (10YR 6/3) when moist; moderate, fine, subangular blocky structure; hard, firm, sticky and plastic; few fine and very fine roots; common fine and very fine pores; very strongly calcareous; strongly alkaline; clear, wavy boundary.

C3—27 to 49 inches, white (10YR 8/2) silty clay loam, diatomaceous earth, pale brown (10YR 6/3) when moist; common, fine, distinct, brownish-yellow (10YR 6/6) mottles; massive; very hard, firm, sticky and plastic; few fine and very fine roots; common fine and very fine pores; very strongly calcareous; strongly alkaline; clear, smooth boundary.

IIC4—49 to 60 inches, very dark grayish-brown (10YR 3/2) loamy sand, black (10YR 2/1) when moist; massive; hard, very friable, nonsticky and nonplastic; slightly calcareous; moderately alkaline.

The A1 horizon has hue of 10YR and 2.5Y, value of 6 or 7 when dry and 4 or 5 when moist, and chroma of 2 to 4. It is fine sandy loam and silty clay loam. The part of the C horizon between depths of 10 and 40 inches has hue of 10YR and 2.5Y, value of 6 and 7 when moist, and chroma of 1 to 3. It is heavy silt loam and silty clay loam and is 20 to 35 percent clay. The IIC horizon has hue of 10YR and 2.5Y; value is 3 to 5 when dry and 2 to 4 when moist. It is loamy sand or sand. The calcium carbonate content below a depth of 20 inches is 50 to 60 percent.

SE—Saltair silty clay loam, very strongly calcareous variant. This soil is in the southeastern part of the survey area. Slopes are 0 to 2 percent. Runoff is slow. The hazard of erosion is slight.

Included with this soil in mapping are small areas of Yuba silty clay loam.

This soil is used for range. Capability unit VIIw–28, nonirrigated; Alkali Bottom range site.

Shear Series

The Shear series consists of moderately well drained soils. These soils formed in wind-deposited dunes. Slopes are 1 to 5 percent. Native vegetation is greasewood, shadscale, seepweed, and halogeton. Elevation ranges from 4,550 to 4,600 feet. Average annual precipitation is 6 to 8 inches, and the average annual air

temperature is 49° to 52° F. The frost-free period is 115 to 120 days. These soils are associated with Abbott and Anco soils.

In a representative profile the surface layer is light brownish-gray silty clay about 3 inches thick. The underlying material extends to a depth of 60 inches or more. The upper 50 inches is light brownish-gray silty clay, and the lower 7 inches is light-gray heavy silty clay loam. The profile is moderately alkaline to strongly alkaline.

Permeability is moderately slow. The soils are strongly saline. The available water capacity is 10 to 11 inches for a 5-foot profile. The amount of water available to plants, however, is only 1.5 to 3.5 inches because of the high salt concentration. Effective rooting depth is 60 inches or more. These soils are artificially drained, and the water table is commonly below a depth of 5 feet.

The areas of these soils are used for range.

Representative profile of Shear silty clay, 1 to 5 percent slopes, 3⅛ miles northwest of Hinckley, 415 feet south and 1,100 feet east of the northwestern corner of sec. 13, T. 17 S., R. 8 W.:

A1—0 to 3 inches, light brownish-gray (10YR 6/2) silty clay, grayish brown (2.5Y 5/2) when moist; weak, medium, blocky structure parting to moderate, very fine, granular; individual granular peds are about the size of medium sand; consistence of peds is loose; peds are hard, firm, sticky and plastic; few very fine roots; few very fine tubular pores; strongly calcareous; strongly alkaline; clear, smooth boundary.

C1—3 to 20 inches, light brownish-gray (10YR 6/2) light silty clay, grayish brown (2.5Y 5/2) when moist; weak, fine, angular blocky structure parting to moderate, very fine, granular; consistence of individual peds is loose; peds are very hard, firm, sticky and plastic; few medium and fine roots; common very fine tubular pores; strongly calcareous; strongly alkaline; gradual, wavy boundary.

C2—20 to 53 inches, light brownish-gray (10YR 6/2) light silty clay, grayish brown (10YR 5/2) when moist; moderate, very fine, granular structure; consistence of individual granular peds is loose; peds are hard, firm, sticky and plastic; few large and fine roots; few fine tubular pores; few salt or gypsum flecks, or both, in upper half of horizon; strongly calcareous; moderately alkaline; abrupt, smooth boundary.

C3—53 to 60 inches, light-gray (10YR 7/2) heavy silty clay loam, grayish brown (10YR 5/2) when moist; common, fine, distinct, yellowish-brown (10YR 5/6) mottles; moderate, fine, angular blocky structure; very hard, firm, sticky and plastic; few large and fine roots; common very fine tubular pores; strongly calcareous; moderately alkaline.

The A horizon has hue of 10YR or 2.5Y and value of 4 or 5 when moist. It is dominantly silty clay but ranges to sandy clay loam. It is 2 to 3 inches thick. The part of the C horizon above a depth of 40 inches has hue of 10YR or 2.5Y and value of 6 when dry. Below a depth of 40 inches it has value of 6 or 7 when dry and 4 or 5 when moist and chroma of 1 or 2. The C horizon ranges from light silty clay to heavy silty clay loam. Average clay content between depths of 10 and 40 inches is 40 to 60 percent.

ShB—Shear silty clay, 1 to 5 percent slopes. This soil is on dunes that are 3 to 10 feet high. Runoff is medium. The hazard of erosion is moderate.

Included with this soil in mapping are small areas of Abbott silty clay, strongly saline; Abraham loam, strongly saline; Anco silty clay loam, strongly saline; and Playas.

This soil is used as range. Capability units IIIe–27, irrigated, and VIIs–D8, nonirrigated; Desert Alkali Flats range site.

Stony Colluvial Land

ST—Stony colluvial land. This miscellaneous land type consists dominantly of cobbles, stones, and boulders intermingled with a small amount of soil material. A few rock outcrops are in places. This land type is on very steep and steep toe slopes of a plateau that is elevated 200 to 400 feet above the valley plain. It is in an area 5 to 6 miles south and 6 to 8 miles west of Deseret. A small amount of vegetation is in some areas.

This land type is not suitable for farming. Capability unit VIIIs–X, nonirrigated; not assigned to a range site.

Sugarloaf Series

The Sugarloaf series consists of somewhat excessively drained soils. These soils formed in lake sediment over colluvium or alluvium from volcanic sand and gravel on lake terraces and benches. Slopes are 0 to 30 percent. Native vegetation is shadscale, big sagebrush, horsebrush, bud sagebrush, range ratney, Brigham tea, galleta, and Indian ricegrass. Elevation ranges from 4,650 to 4,950 feet. Average annual precipitation is 8 to 10 inches, and the average annual air temperature is 49° to 52° F. The frost-free period is 115 to 120 days. These soils are associated with Yenrab soils.

In a representative profile the surface layer is pale-brown sandy loam about 10 inches thick. The underlying material extends to a depth of 60 inches or more. The upper 9 inches is light-gray sandy loam, the middle 32 inches is light brownish-gray and grayish-brown loamy fine sand, and the lower 9 inches is volcanic cinders and black gravelly sand. The profile is moderately alkaline to strongly alkaline.

Permeability is moderately rapid. The soils are slightly saline. The available water capacity is 3 to 4 inches for a 5-foot profile. The water supplying capacity is 4 to 6 inches. Effective rooting depth is 36 to 48 inches.

These soils are used for range.

Representative profile of Sugarloaf sandy loam, 0 to 10 percent slopes, approximately 2 miles east of Clear Lake waterfowl management area and 700 feet north of Pavant Butte, sec. 30, T. 19 S., R. 6 W.:

A11—0 to 2 inches, pale-brown (10YR 6/3) light sandy loam, dark grayish brown (10YR 4/2) when moist; weak, thin, platy structure; soft, very friable, nonsticky and nonplastic; common fine and very fine and few medium roots; many fine and very fine vesicular pores; moderately calcareous; strongly alkaline; clear, smooth boundary.

A12—2 to 10 inches, pale-brown (10YR 6/3) sandy loam, dark grayish brown (10YR 4/2) when moist; massive; hard, friable, nonsticky and nonplastic; many very fine and fine and few medium roots; few very fine pores; slightly calcareous; moderately alkaline; gradual, wavy boundary.

C1ca—10 to 19 inches, light-gray (10YR 7/2) sandy loam, brown (10YR 5/3) when moist; massive; soft, friable, slightly sticky and slightly plastic; few fine and very fine roots; few fine pores; strongly calcareous; strongly alkaline; clear, smooth boundary.

C2—19 to 31 inches, light brownish-gray (10YR 6/2) loamy fine sand, very dark grayish brown (10YR 3/2) when moist; massive; loose, very friable; few very fine and fine roots; moderately calcareous; moderately alkaline; gradual, wavy boundary.

C3—31 to 51 inches, grayish-brown (10YR 5/2) loamy fine sand, very dark grayish brown (10YR 3/2) when moist; single grained; loose, very friable; few very fine roots; moderately calcareous; moderately alkaline; clear, smooth boundary.

IIC4—51 to 58 inches, volcanic cinders, mostly gravel size, single grained; loose; moderately calcareous; lime occurs as coating on cinders, moderately alkaline; clear, smooth boundary.

IIIC5—58 to 84 inches, black (10YR 2/1) gravelly sand, black (10YR 2/1) when moist; single grained; loose; 20 percent gravel; noncalcareous; moderately alkaline.

A thin mantle of basalt gravel or cinders covers the surface in most places. The A horizon has value of 3 or 4 when moist. It is 5 to 14 inches thick. The C horizon generally has hue of 10YR or 2.5Y, value of 5 to 7 when dry and 3 to 5 when moist, and chroma of 1 to 3. In the lower part of the horizon, mainly below a depth of 40 inches, however, value is 2 and chroma is 0 or 1. Between depths of 10 and 40 inches, texture is dominantly sand, loamy sand, loamy fine sand, or sandy loam. The sandy loam texture does not extend below a depth of 20 inches. Depth to the Cca horizon is 5 to 14 inches. It is 6 to 13 inches thick. Below a depth of 40 inches, volcanic cinders, gravel, and sand occur.

SU—Sugarloaf sandy loam, 0 to 10 percent slopes. This soil has the profile described as representative of the series. Slopes are dominantly 2 to 10 percent but range from 0 to 10 percent. Runoff is slow to medium. The hazards of water erosion and soil blowing are moderate.

Included with this soil in mapping are small areas of a soil that has about 10 inches of white silty clay loam over very dark grayish-brown or black volcanic sand that extends to 60 inches or more.

This soil is used for range. Capability unit VIIe–S, nonirrigated; Semidesert Limy Loam range site.

SV—Sugarloaf-Rock land association. This association consists of about 60 percent Sugarloaf sandy loam, 10 to 30 percent slopes, and 40 percent Rock land. Runoff is medium to rapid. The hazard of erosion is moderate or high.

The Sugarloaf soil is mostly on the lower slopes of Pavant Butte. The areas of Rock land occur intermittently throughout the unit, but they are mostly near the top and on the northern and western sides of the Pavant Butte.

This soil is used for range. Sugarloaf soil in capability unit VIIe–S, nonirrigated; Rock land in capability unit VIIIs–X, nonirrigated; Sugarloaf soil in Semidesert Limy Loam range site; Rock land not assigned to a range site.

Swasey Series

The Swasey series consists of well-drained soils. These soils formed in residuum and lake sediment mainly derived from basic igneous rocks. They are on small plateaus that are 200 to 300 feet above the valley bottom. Slopes are 3 to 10 percent. Native vegetation is shadscale, bud sagebrush, alkali sacaton, and cheatgrass. Elevation ranges from 4,600 to 4,900 feet. Average annual precipitation is 6 to 8 inches, and the average annual air temperature is 49° to 52° F. The frost-free period is 115 to 120 days. These soils are associated with Penoyer and Uffens soils.

In a representative profile the surface layer is light-gray very cobbly loam about 4 inches thick. The subsoil is pale-brown clay loam about 6 inches thick. The underlying material is pale-brown loam and sandy clay loam and very pale brown silty clay loam that is underlain by basalt bedrock at about 27 inches. The profile is moderately alkaline to very strongly alkaline.

Permeability is moderately slow above the bedrock. The soils are moderately saline. The available water capacity is 3.5 to 4.5 inches. The amount of water available to plants, however, is only 2.0 to 3.5 inches because of the moderate salt concentration. Effective rooting depth is 20 to 40 inches.

These soils are used for range.

Representative profile of Swasey very cobbly loam, 3 to 10 percent slopes, 5 miles south and 6 miles west of Deseret, sec. 28, T. 18 S., R. 8 W.:

A2—0 to 4 inches, light-gray (10YR 7/2) very cobbly heavy loam, grayish brown (10YR 5/2) when moist; moderate, thick, platy structure parting to weak, thin, platy; slightly hard, friable, slightly sticky and slightly plastic; few fine roots; common fine vesicular pores; strongly calcareous; strongly alkaline; clear, smooth boundary.

B2t—4 to 10 inches, pale-brown (10YR 6/3) clay loam; brown (10YR 4/3) when moist; weak, prismatic structure parting to moderate, very fine, subangular blocky; hard, firm, very sticky and plastic; common fine and medium roots; common fine tubular pores; thin, patchy, clay films on some ped faces and in pores and root channels; strongly calcareous; very strongly alkaline; clear, smooth boundary.

C1—10 to 14 inches, pale-brown (10YR 6/3) light silt loam, brown (10YR 4/3) when moist; weak, medium, angular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common fine tubular pores; many fine roots; strongly calcareous; lime is disseminated; strongly alkaline; clear, smooth boundary.

C2—14 to 24 inches, pale-brown (10YR 6/3) light sandy clay loam, brown (10YR 4/3) when moist; weak, medium, angular blocky structure; hard, friable, slightly sticky and slightly plastic; few fine roots; common fine and few medium tubular pores; strongly calcareous; lime is disseminated; moderately alkaline; clear, wavy boundary.

C3—24 to 27 inches, very pale brown (10YR 7/3) light silty clay loam, pale brown (10YR 6/3) when moist; massive; hard, friable, sticky and plastic; few fine roots; few fine tubular pores; very strongly calcareous; lime is disseminated; moderately alkaline; abrupt, irregular boundary.

R—27 inches, basalt bedrock.

The depth to bedrock ranges from 20 to 40 inches. The combined thickness of the A2 and B2t horizons ranges from 8 to 12 inches. The A2 horizon has value of 6 or 7 when dry and 5 or 6 when moist. The B2t horizon has value of 4 or 5 when moist and chroma of 2 or 3. Reaction is strongly alkaline and very strongly alkaline. The B2t horizon is clay loam that is 27 to 35 percent clay. The C horizon has value of 4 to 6 when moist and chroma of 2 and 3. It is light sandy clay loam, loam, and light silty clay loam. Reaction is moderately alkaline to strongly alkaline.

SWC—Swasey very cobbly loam, 3 to 10 percent slopes. This soil is in areas 6 to 7 miles southwest of Deseret. Runoff is slow to medium. The hazard of erosion is slight to moderate.

Included with this soil in mapping are small areas of Penoyer silt loam. Also included and making up about 15 percent of the mapping unit is a soil similar

to this Swasey soil, but bedrock is at a depth of less than 20 inches.

This soil is used for range. Capability unit VIIs–D8, nonirrigated; Desert Alkali Bench range site.

Toddler Series

The Toddler series consists of well-drained soils. These soils formed in lake sediment reworked by winds, mainly on beach bars and lake plains. Slopes are 1 to 5 percent. Native vegetation is shadscale, greasewood, winterfat, halogeton, and inkweed. Elevation ranges from 4,550 to 4,800 feet. Average annual precipitation is 6 to 8 inches, and the average annual air temperature is 49° to 52° F. The frost-free period is 115 to 120 days. These soils are associated with Uffens and Uvada soils.

In a representative profile the soil is dominantly very pale brown sandy clay loam to a depth of 60 inches or more. It is moderately alkaline to strongly alkaline.

Permeability is moderate. These soils are strongly saline. The available water capacity is 9 to 11 inches for a 5-foot profile. The amount of water available to plants, however, is only about 2.0 to 3.5 inches because of the high salt concentration. Effective rooting depth is 60 inches or more.

These soils are used for range.

Representative profile of Toddler sandy clay loam, 3 miles north of Clear Lake Station, 0.6 mile west of the quarter corner marker between sec. 10 and 11, 3,500 feet south and 2,500 feet east of the northwestern corner of sec. 10, T. 10 S., R. 8 W.:

A1—0 to 5 inches, very pale brown (10YR 8/3) sandy clay loam, pale brown (10YR 6/3) when moist; single grained; loose, friable, sticky and plastic; few fine roots; strongly calcareous; moderately alkaline; clear, smooth boundary.

C1—5 to 13 inches, very pale brown (10YR 8/3) sandy clay loam, pale brown (10YR 6/3) when moist; moderate, thin, platy structure; soft, friable, slightly sticky and slightly plastic; common fine roots; few fine tubular pores; strongly calcareous; moderately alkaline; abrupt, wavy boundary.

C2—13 to 18 inches, very pale brown (10YR 7/3) light silty clay loam, pale brown (10YR 6/3) when moist; massive; slightly hard, friable, sticky and plastic; few medium and fine roots; few fine tubular pores; strongly calcareous; strongly alkaline; clear, wavy boundary.

C3—18 to 25 inches, very pale brown (10YR 7/3) sandy clay loam, pale brown (10YR 6/3) when moist; weak, medium, platy structure; slightly hard, friable, slightly sticky and slightly plastic; few fine roots; common fine vescular pores; strongly calcareous; strongly alkaline; clear, wavy boundary.

C4—25 to 34 inches, very pale brown (10YR 7/3) heavy sandy clay loam, pale brown (10YR 6/3) when moist; massive; slightly hard, friable, sticky and plastic; few fine roots; few fine tubular pores; strongly calcareous; strongly alkaline; diffuse, smooth boundary.

C5—34 to 65 inches, pale-brown (10YR 6/3) sandy clay loam, brown (10YR 5/3) when moist; massive; slightly hard, friable, sticky and slightly plastic; few fine roots; few fine tubular pores; strongly calcareous; strongly alkaline.

The A horizon has value of 7 or 8 when dry and 5 or 6 when moist, and chroma of 2 and 3. It ranges from sandy clay loam to sandy loam and loam and is 2 to 5 inches thick. The C horizon has hue of 10YR and 2.5Y, and chroma of 2 or 3. It ranges from sandy clay loam to clay loam and light silty clay loam. The average clay content between depths of 10 and 40 inches is 20 to 35 percent, and more than 15 percent of the sand is coarser than very fine sand.

TO—Toddler sandy clay loam. This soil has slopes that range from 1 to 3 percent. Runoff is slow. The hazard of erosion is slight.

Included with this soil in mapping are small areas of Abbott silty clay, strongly saline; Abraham loam, strongly saline; Uffens silt loam; and Uvada silt loam.

This soil is used for range. Capability unit VIIs–D8, nonirrigated; Desert Flats range site.

Uffens Series

The Uffens series consists of well-drained soils. These soils formed in lake sediment on shorelines and beach bars. Slopes are 0 to 2 percent. Native vegetation is shadscale, kochia, bud sagebrush, greasewood, galleta, Indian ricegrass, alkali sacaton, and pickleweed. Elevation ranges from 4,500 to 4,700 feet. Average annual precipitation is 6 to 8 inches, the average annual air temperature is 49° to 52° F. The frost-free period is 115 to 120 days. These soils are associated with Toddler and Uvada soils.

In a representative profile the surface layer is light gray silt loam about ½ inch thick. The subsoil is light brownish-gray and very pale brown, alkaline heavy sandy clay loam about 9 inches thick. The underlying material is stratified. It is a very pale brown and light-gray sandy clay loam to a depth of 57 inches. Below this, to a depth of 70 inches, it is light brownish-gray sand. The profile is strongly alkaline to very strongly alkaline.

Permeability is moderately slow. The soils are moderately saline to strongly saline. The available water capacity is 10 to 11 inches for a 5-foot profile. The amount of water available to plants, however, is only about 2.0 to 3.5 inches because of the high salt concentration. Effective rooting depth is 60 inches or more.

These soils are used for range.

Representative profile of Uffens silt loam, 3 miles south of Deseret and 6 miles west of highway, NE¼ of sec. 20, T. 18 S., R. 8 W.:

A2—0 to ½ inch, light-gray (10YR 7/2) silt loam, grayish brown (10YR 5/2) when moist; weak, fine, platy structure; slightly hard, friable, slightly sticky and slightly plastic; few fine roots; common fine pores; strongly calcareous; strongly alkaline; abrupt, smooth boundary.

B21t—½ to 3 inches, light brownish-gray (2.5Y 6/2) heavy sandy clay loam, dark grayish brown (2.5Y 4/2) when moist; moderate, fine, columnar structure that parts to weak, fine, blocky structure; very hard, firm, slightly sticky and plastic; few fine roots; many fine vesicular pores; thin, patchy clay films on ped faces; strongly calcareous; very strongly alkaline; clear, smooth boundary.

B22t—3 to 10 inches, very pale brown (10YR 7/3) heavy sandy clay loam, brown (10YR 5/3) when moist; weak, medium, prismatic structure that parts to weak, medium, blocky; very hard, firm, sticky and plastic; few fine roots; few fine tubular pores; thin, continuous clay films on peds; strongly calcareous; very strongly alkaline; clear, smooth, boundary.

C1—10 to 27 inches, very pale brown (10YR 7/3) heavy sandy clay loam, brown (10YR 5/3) when moist; weak, coarse, blocky structure; very hard, firm, sticky and plastic; common fine roots; many fine tubular pores; strongly calcareous; strongly alkaline; gradual, smooth boundary.

C2—27 to 54 inches, light-gray (10YR 7/2) sandy clay

loam, grayish brown (10YR 5/2) when moist; massive; very hard, firm, sticky and plastic; few fine roots; common fine and medium tubular pores; strongly calcareous; strongly alkaline; clear, smooth boundary.

C3—54 to 57 inches, light-gray (2.5Y 7/2) light silty clay; grayish brown (2.5Y 5/2) when moist; weak, medium, prismatic structure; extremely hard, firm, sticky and plastic; few fine roots; few fine vesicular pores; moderately calcareous; moderately alkaline; clear, smooth boundary.

IIC4—57 to 70 inches, light brownish-gray (10YR 6/2) sand, light brownish gray (10YR 6/2) when moist; single grained, loose; few fine roots; few fine pores; moderately calcareous; strongly alkaline.

The A horizon has hue of 10YR or 2.5Y. It ranges from sandy loam to silt loam ½ inch to 3 inches thick. The B2t horizon has hue of 10YR and 2.5Y, but hue is dominantly 10YR; value is 4 to 6 when moist. It is heavy sandy clay loam or clay loam 7 to 13 inches thick. The C horizon has hue of dominantly 10YR and value of 6 to 8 when dry. The C horizon is stratified; it ranges from sand to silty clay. The strata of sand are below a depth of 50 inches.

UE—Uffens silt loam. This soil has the profile described as representative of the series. Slopes are 0 to 2 percent. Runoff is slow. The hazard of erosion is slight. This soil is strongly saline.

Included with this soil in mapping are small areas of Toddler sandy clay loam and Uvada silt loam.

This soil is used for range. Capability unit VIIs–D8, nonirrigated; Desert Alkali Bench range site.

UFC—Uffens-Swasey complex, 0 to 10 percent slopes. This complex consists of about 60 percent Uffens silt loam and 40 percent Swasey very cobbly loam. These soils are on a small plateau 200 to 300 feet above the valley bottom. Runoff is slow to medium. The hazard of erosion is slight to moderate. These soils are moderately saline.

The Uffens soil has slopes of 0 to 2 percent and is within the steeper areas of the Swasey soil.

Included with this complex in mapping are small areas of Penoyer silt loam.

This complex is used for range. Native vegetation is shadscale, bud sagebrush, winter fat, and alkali sacaton. Capability unit VIIs–D8, nonirrigated; Desert Alkali Bench range site.

UH2—Uffens-Uvada silt loams, eroded. This complex consists of about 60 percent Uffens silt loam, 0 to 5 percent slopes, eroded, and 40 percent Uvada silt loam, 0 to 5 percent slopes, eroded. These soils are intermingled on the landscape. They do not occur in a definite pattern. They have a profile similar to the one described as representative of their respective series, but they are eroded. In some places the entire surface layer has been lost through erosion, and the areas have been cut by gullies 2 to 10 feet deep and 300 to 600 feet apart. Runoff is medium. The hazard of erosion is moderate. These soils are strongly saline.

Included with these soils in mapping are small areas of Yenrab fine sand, undulating.

This complex is used for range. Native vegetation is shadscale, greasewood, kochia, and bud sagebrush. Both soils in capability unit VIIs–D8; Uffens soil in Desert Alkali Bench range site; Uvada soil in Desert Flats range site.

Uvada Series

The Uvada series consists of well-drained soils. These soils formed in lake sediment on deltas. Slopes are 10 to 12 percent. Native vegetation is shadscale, kochia, seepweed, pickleweed, halogeton, and greasewood. Elevation ranges from 4,500 to 4,800 feet. Average annual precipitation is 6 to 8 inches, and the average annual air temperature is 49° to 52° F. The frost-free period is 115 to 120 days. These soils are associated with Goshute, Uffens, Toddler, and Yenrab soils.

In a representative profile the surface layer is light-gray silt loam and silty clay loam about 4 inches thick. The subsoil is brown and light-brown silty clay and heavy silty clay loam about 13 inches thick. The underlying material extends to a depth of 65 inches. The upper 30 inches is light-brown and pale-brown silty clay loam. The lower 18 inches is very pale brown silt loam. The profile is strongly alkaline and very strongly alkaline.

Permeability is very slow. The soils are strongly saline to very strongly saline.

These soils are used for range.

Representative profile of Uvada silt loam, 9 miles west and 3 miles south of Deseret, NE¼ of sec. 23, T. 18 S., R. 9 W.:

A2—0 to 2 inches, light-gray (10YR 7/2) silt loam, brown (10YR 5/3) when moist; weak, medium and weak, thin, platy structure; hard, friable, slightly sticky and slightly plastic; few fine roots; common medium and fine pores; strongly calcareous; very strongly alkaline; clear, smooth boundary.

A&B—2 to 4 inches, light-gray (10YR 7/2) silty clay loam, brown (7.5YR 5/4) when moist; weak, medium blocky structure parting to moderate, very fine, blocky structure; hard, firm, slightly sticky and plastic; strongly calcareous, very strongly alkaline; clear, smooth boundary.

B21t—4 to 7 inches, brown (7.5YR 5/4) silty clay, brown (7.5YR 4/4) when moist; moderate, medium, prismatic structure parting to strong, fine, blocky structure; very hard, very firm, very sticky and very plastic; few fine roots; few very fine pores; moderate, continuous, clay films on peds; strongly calcareous; lime is segregated in soft nodules; very strongly alkaline; gradual, smooth boundary.

B22t—7 to 12 inches, light-brown (7.5YR 6/4) light silty clay, brown (7.5YR 5/4) when moist; moderate, medium, blocky structure; hard, firm, sticky and very plastic; common fine and few medium roots; common fine pores; thin, continuous, clay films on peds; strongly calcareous; strongly alkaline; gradual, smooth boundary.

B3t—12 to 17 inches, light-brown (7.5YR 6/4) heavy silty clay loam, brown (7.5YR 5/4) when moist; weak, medium, blocky structure; hard, firm, sticky and plastic; few fine roots; few fine pores; moderate, continuous, clay films on ped faces; strongly calcareous; lime is segregated in soft nodules; strongly alkaline; clear, smooth boundary.

C1—17 to 25 inches, light-brown (7.5YR 6/4) silty clay loam, brown (7.5YR 5/4) when moist; massive; hard, firm, sticky and plastic; few fine roots; few fine pores; strongly calcareous; strongly alkaline; diffuse, smooth boundary.

C2—25 to 47 inches, pale-brown (10YR 6/3) silty clay loam, brown (10YR 5/3) when moist; massive; hard, firm, sticky and plastic; common fine pores; strongly alkaline; gradual, wavy boundary.

C3sa—47 to 65 inches, very pale brown (10YR 7/3) silt loam, brown (10YR 5/3) when moist; massive; hard, firm, slightly sticky and plastic; common fine pores; strongly calcareous; strongly alkaline.

Combined thickness of the A and B horizons ranges from 11 to 29 inches. The A horizon has hue of 10YR and 7.5YR, value of 6 to 8 when dry and 4 to 6 when moist, and chroma

of 2 or 3. It is loam or silt loam 2 to 6 inches thick. The B2t horizon has hue of 10YR and 7.5YR, value to 5 to 7 when dry and 4 to 6 when moist, and chroma of 2 to 4. It ranges from heavy silty clay loam to silty clay that is 35 to 60 percent clay, and it is 8 to 16 inches thick. The C horizon has hue that is dominantly 10YR but ranges from 7.5YR to 2.5Y; value of 3 to 6 when dry and 5 to 7 when moist; and chroma of 2 to 4. It is dominantly silty clay loam but ranges to silt loam. In some places sand and gravel are present below a depth of 40 inches.

UL—Uvada silt loam. This soil has the profile described as representative of the series. Slopes are 0 to 2 percent. This soil is strongly saline. Salt content is about 0.65 to 2.0 percent. Runoff is slow. The hazard of erosion is slight. The available water capacity is 10 to 11 inches for a 5-foot profile. The amount of water available to plants, however, is only about 1.5 to 3.5 inches because of the high salt concentrations.

Included with this soil in mapping are small areas of Goshute gravelly silt loam; Hiko Springs sandy loam, 3 to 10 percent slopes; and Toddler sandy clay loam.

This soil is used for range. Native vegetation is shadscale and a small amount of greasewood and halogeton. Capability unit VIIs–D8, nonirrigated; Desert Flats range site.

UM—Uvada silt loam, strongly saline. This soil has a profile similar to the one described as representative of the series, but it is very strongly saline. The salt content is more that 2 percent. Slopes are 0 to 2 percent. Runoff is slow. The hazard of erosion is slight. The available water capacity is about 10 to 11 inches. The amount of water available to plants, however, is only about 0 to 2.0 inches because of the very high salt concentrations.

Included with this soil in mapping are small areas of Playas and Uvada silt loam.

This soil is used for range of very low value. Native vegetation is mostly pickleweed and a small amount of seepweed and kochia. Capability unit VIIs–D8, nonirrigated; Desert Salt Flats range site.

UN2—Uvada-Toddler complex, eroded. This complex consists of about 40 percent Uvada silt loam; 35 percent Toddler sandy loam, 1 to 5 percent slopes, eroded; and 25 percent Anco silty clay loam, strongly saline, eroded. Slopes range from 0 to 5 percent. Runoff is slow to medium. The hazard of erosion is slight to moderate. The available water capacity is 9 to 11 inches. The amount of water available to plants, however, is only about 1.5 to 3.5 inches because of the high salt concentration.

The Uvada soil is generally in depressions.

The Toddler soil has a profile similar to the one described as representative of the Toddler series, but the surface layer is sandy loam and the soil is moderately eroded. It commonly occurs in slightly elevated areas.

The Anco soil has a profile similar to the one described as representative of the Anco series, but it is strongly saline and moderately eroded.

Included with this complex in mapping are small areas of playas.

This complex is used for range. Native vegetation is shadscale, greasewood, inkweed, and halogeton. Capability unit VIIs–D8, nonirrigated; Uvada and Toddler soils in Desert Flats range site; Anco soil in Desert Alkali Flats range site.

UYC—Uvada-Yenrab complex, undulating. This complex consists of about 60 percent Uvada silt loam, strongly saline, and 40 percent Yenrab fine sand, undulating.

The Uvada soil is on nearly level lake deltas. Slopes are 0 to 2 percent. This soil has a profile similar to the soil described as representative of the Uvada series, but it is very strongly saline. The content of salt is more than 2 percent. Runoff is slow. The hazard of erosion is slight.

The Yenrab soil is on dunes on lake terraces. Slopes are 1 to 10 percent. The hazard of water erosion is moderate, and the hazard of soil blowing is high.

This complex is used for range. Native vegetation is pickleweed, shadscale, greasewood, and seepweed. Uvada soil in capability unit VIIs–D7, nonirrigated; Desert Salt Flats range site. Yenrab soil in capability unit VIIs–D8, nonirrigated; Desert Alkali Sand range site.

Woodrow Series

The Woodrow series consists of well-drained soils. These soils formed in lake sediment and alluvium on deltas and flood plains. Slopes are 0 to 1 percent. Native vegetation is big sagebrush, greasewood, Indian ricegrass, and cheatgrass. Elevation ranges from 4,600 to 4,700 feet. Average annual precipitation is 9 to 11 inches, and the average annual air temperature is 51° to 54° F. The frost-free period is 120 to 125 days. These soils are associated with Modena and Musinia soils.

In a representative profile the surface layer is light brownish-gray silt loam about 9 inches thick. The underlying material is dominantly pale-brown and pinkish-gray silty clay loam that extends to a depth of 60 inches or more. The profile is moderately alkaline to very strongly alkaline.

Permeability is moderately slow. The available water capacity is 10 to 11 inches for a 5-foot profile. Effective rooting depth is 60 inches or more.

These soils are used mainly for irrigated crops of alfalfa, small grain, and silage corn.

Representative profile of Woodrow silt loam, 1½ miles northwest of the southeastern corner of the survey area, SE¼ of sec. 29, T. 20 S., R. 5 W.:

A11—0 to 2 inches, light brownish-gray (10YR 6/2) silt loam, very dark grayish brown (10YR 3/2) when moist; weak, thick, platy structure; slightly hard, friable, slightly sticky and slightly plastic; few fine roots; few fine pores; strongly calcareous; moderately alkaline; clear, smooth boundary.

A12—2 to 9 inches, light brownish-gray (10YR 6/2) silt loam; very dark grayish brown (10YR 2/2) when moist; weak, medium, subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common fine and few medium roots; few fine pores; strongly calcareous; moderately alkaline; gradual, smooth boundary.

C1—9 to 16 inches, light gray (10YR 7/2) silt loam, very dark grayish brown (10YR 3/2) when moist; weak, fine, granular structure; slightly hard, friable, slightly sticky and slightly plastic; common fine and few medium roots; common fine pores; strongly calcareous; strongly alkaline; clear, wavy boundary.

C2—16 to 26 inches, pale-brown (10YR 6/3) light silty clay loam, brown (10YR 5/3) when moist; weak, medium, subangular blocky structure; hard, firm,

sticky and plastic; common fine and few medium roots; common fine pores; strongly calcareous; very strongly alkaline; clear, wavy boundary.

C3—26 to 46 inches, pinkish-gray (7.5YR 6/2) silty clay loam, brown (7.5YR 4/3) when moist; weak, medium, subangular blocky structure; hard, firm, sticky and plastic; few fine roots; common, fine and few medium pores; strongly calcareous; moderately alkaline; gradual, smooth boundary.

C4—46 to 62 inches, light-brown (7.5YR 6/4) loam, brown (7.5YR 4/4) when moist; massive; hard, friable, slightly sticky and plastic; few fine roots; common fine and few medium pores; strongly calcareous; moderately alkaline.

The A1 horizon is silt loam or sandy clay loam. The C horizon is light silty clay loam, silt loam, and loam. The clay content between depths of 10 to 40 inches averages 27 to 35 percent.

Wo—Woodrow silt loam. This soil has slopes of 0 to 1 percent. Runoff is slow. The hazard of erosion is slight.

Included with this soil in mapping are small areas of Modena sandy loam and Musinia silt loam.

This soil is used for irrigated crops. Capability unit IIc–2, irrigated; not assigned to a range site.

Yenrab Series

The Yenrab series consists of somewhat excessively drained soils. These soils formed in eolian material and lake sediment on beach bars and lake terraces. Slopes are 1 to 10 percent. Native vegetation is horsebrush, yellowbrush, scurfpea, rubber rabbitbrush, greasewood, shadscale, big sagebrush, bud sagebrush, Russian thistle, and Indian ricegrass. Elevation is 4,600 to 4,800 feet. Average annual precipitation is 6 to 10 inches, and the average annual air temperature is 49° to 52° F. The frost-free period is 115 to 125 days. These soils are associated with Sugarloaf, Uffens, and Uvada soils.

In a representative profile the surface layer is pale-brown fine sand about 12 inches thick. The underlying material is light brownish-gray sand that extends to a depth of 60 inches or more. The profile is strongly alkaline.

Permeability is rapid. The soils are moderately saline to strongly saline. The available water capacity is about 3.0 to 4.0 inches for a 5-foot profile. Effective rooting depth is 60 inches or more.

The areas of these soils are used for range.

Representative profile of Yenrab fine sand, undulating 4½ miles east of Woodrow, sec. 17, T. 16 S., R. 6 W.:

C1—0 to 12 inches, pale-brown (10YR 6/3) fine sand, brown (10YR 5/3) when moist; single grained; loose, few fine and medium roots; strongly calcareous; strongly alkaline; gradual, wavy boundary.

C2—12 to 60 inches, light brownish-gray (10YR 6/2) sand, grayish brown (10YR 5/2) when moist; single grained; loose; few fine roots; strongly calcareous; strongly alkaline.

A thin scattering of fine gravel is on the surface in some places. The surface layer is sandy loam in places. The C horizon has value of 6 or 7 when dry and 5 or 6 when moist, and chroma of 2 or 3. It is most commonly sand, fine sand, or loamy sand, but it is sandy loam in places.

YBC—Yenrab fine sand, undulating. This soil has the profile described as representative of the series. Slopes are 1 to 10 percent. Dunes and hummocks are common and range from a few inches to 25 feet in height. Runoff is slow. The hazard of water erosion is moderate, and the hazard of soil blowing is high. The water supplying capacity is 4 to 5 inches. Average annual precipitation is 6 to 8 inches.

Included with this soil in mapping are small areas of Uvada silt loam and Yenrab sandy loam, 1 to 10 percent slopes. Also included is a soil that is similar to this Yenrab soil, but it has a strong lime layer and in places it contains a little gravel.

This soil is used for range. Native vegetation is scurfpea, horsebrush, yellowbrush, and Russian thistle. Capability unit VIIs–D8, nonirrigated; Desert Alkali Sand range site.

YDC—Yenrab fine sand, high rainfall, undulating. This soil has a profile similar to the one described as representative of the series, but it is moderately alkaline. The water supplying capacity is 5 to 6 inches. The average annual precipitation is 8 to 10 inches. Slopes are 1 to 10 percent. Dunes and hummocks are common and range from a few inches to 25 feet in height. Runoff is slow. The hazard of water erosion is moderate, and the hazard of soil blowing is high.

Included with this soil in mapping are small areas of Ecalante sandy loam, 1 to 5 percent slopes.

This soil is used for range. The main native vegetation is big sagebrush, rubber rabbitbrush, Russian thistle, and Indian ricegrass. Capability unit VIIs–S, nonirrigated; Semidesert Sand range site.

YeC—Yenrab sandy loam, 1 to 10 percent slopes. This soil has a profile similar to the one described as representative of the series, but the surface layer is sandy loam 8 to 10 inches thick, and there are very few dunes. Runoff is slow. The hazards of water erosion and soil blowing are moderate. The water supplying capacity is 4 to 5 inches. Average annual precipitation is 6 to 8 inches.

This soil is used for range. Native vegetation is mainly shadscale, bud sagebrush, greasewood, and Indian ricegrass. Capability unit VIIs–D8, nonirrigated; Desert Alkali Bench range site.

YL—Yenrab-Lava flows association. This association consists of about 55 percent Yenrab fine sand, undulating, and 45 percent Lava flows. Slopes are 1 to 10 percent.

Included with this association in mapping are small areas of Curdli loam. Runoff is slow to medium. The hazard of water erosion is slight to moderate, and the hazard of soil blowing is high. The water supplying capacity of the Yenrab soil is 4 to 5 inches. Average annual precipitation is 6 to 8 inches.

Lava flows occur intermittently throughout the association. In places a thin mantle of sand covers them.

The Yenrab soil is used for range. The Lava flows are wasteland. Native vegetation is scurfpea, horsebrush, yellowbrush, and Russian thistle. Yenrab soil in capability unit VIIs–D8, nonirrigated; Desert Alkali Sand range site. Lava flows in capability unit VIIIs–X, nonirrigated; not assigned to a range site.

YUC—Yenrab-Uffens complex, 0 to 10 percent slopes. This complex consists of about 50 percent Yenrab sandy loam, 1 to 10 percent slopes, and 50 percent Uffens silt loam, which has slopes of 0 to 2 percent. These soils are intermingled on the landscape. Average

annual precipitation is 6 to 8 inches. Runoff is slow.

Included with this complex in mapping are small areas of Uvada silt loam and Yenrab fine sand, undulating.

The Yenrab soil has a profile similar to that described as representative of the Yenrab series, but the surface layer is sandy loam 8 to 10 inches thick and there are a few dunes and hummocks. The hazard of water erosion is moderate. The hazard of soil blowing is severe. The water supplying capacity is 4 to 5 inches.

The Uffens soil has a water supplying capacity of 1½ to 3½ inches. The hazard of water erosion is slight.

This complex is used for range. Native vegetation is shadscale, bud sagebrush, greasewood, and Indian ricegrass. Capability unit VIIs–D8, nonirrigated; Desert Alkali Bench range site.

Yuba Series

The Yuba series consists of moderately well drained soils. These soils formed in lake sediment and alluvium on deltas and flood plains. Slopes are 0 to 2 percent. Native vegetation is pickleweed, Nuttalls saltbush, greasewood, halogeton, and seepweed. Elevation ranges from 4,500 to 4,700 feet. Average annual precipitation is 6 to 8 inches, and the average annual air temperature is 49° to 52° F. The frost-free period is 115 to 120 days. These soils are associated with Uffens and Uvada soils.

In a representative profile the surface layer is light-gray silty clay loam about 4 inches thick. The underlying material is white and light-gray heavy silty clay loam that extends to a depth of 60 inches or more. The profile is moderately to strongly alkaline.

Permeability is slow. The soils are very strongly saline; the salt concentration is about 2.0 to 3.5 percent. The available water capacity is 10 to 11 inches for a 5-foot profile. The amount of water available to plants, however, is only about 0 to 2.0 inches because of the high salt concentration. Effective rooting depth is 60 inches or more.

These soils are used for range.

Representative profile of Yuba silty clay loam, 2¾ miles south of Millard-Juab County line and Sugarville-Hot Springs Road, SE¼ of sec. 17, T. 15 S., R. 8 W.:

A1—0 to 4 inches, light-gray (2.5Y 7/2) heavy silty clay loam, pale brown (10YR 6/3) when moist; moderate, coarse, subangular blocky structure; hard, firm, sticky and plastic; few fine and medium roots; common fine and very fine tubular pores; strongly calcareous; strongly alkaline; clear, smooth boundary.

C1—4 to 12 inches, light-gray (2.5Y 7/2) heavy silty clay loam, light brownish gray (2.5Y 6/2) when moist; weak, fine, subangular blocky structure; hard, firm, sticky and plastic; common fine and very fine roots; common fine and very fine tubular pores; strongly calcareous; moderately alkaline; clear, smooth boundary.

C2sa—12 to 25 inches, white (2.5Y 8/2) heavy silty clay loam, light olive gray (5Y 6/2) when moist; few, fine, distinct, yellowish-brown (10YR 5/6) mottles; weak, medium, subangular blocky structure; hard, firm, sticky and plastic; few fine, very fine, and medium roots; common fine and very fine tubular pores; strongly calcareous; moderately alkaline; clear, wavy boundary.

C3—25 to 46 inches, light-gray (2.5Y 7/2) heavy silty clay loam, light brownish gray (2.5Y 6/2) when moist; few, fine, distinct, yellowish-brown (10YR 5/6) mottles; moderate, medium, subangular blocky structure; hard, firm, sticky and plastic; few, fine roots; few fine tubular pores; strongly calcareous; moderately alkaline; gradual, wavy boundary.

C4—46 to 60 inches, white (2.5Y 8/2) silty clay loam, light gray (5Y 7/2) when moist; massive; hard, firm, sticky and plastic; few very fine roots; common fine tubular pores; strongly calcareous; moderately alkaline.

Very strong salt concentrations are between depths of 0 and 40 inches. Mottles are above a depth of 20 inches in some profiles. The A horizon has hue of 10YR to 5Y, value of 7 or 8 when dry and 5 or 6 when moist, and chroma of 2 or 3. It is 2 to 5 inches thick. The C horizon has hue of 10YR to 5Y, value of 6 to 8 when dry and 5 to 7 when moist, and chroma of 1 to 3. It is dominantly heavy silty clay loam but ranges to silty clay. Above a depth of 40 inches, the average clay content ranges from 35 to 50 percent.

YV—Yuba silty clay loam. This soil has slopes of 0 to 2 percent. Runoff is very slow. The hazard of erosion is slight.

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

This soil is used for range, or it is wasteland. Capability unit VIIs–D7, nonirrigated; Desert Salt Flats range site.

Use and Management of the Soils

This section describes the use of the soils for crops, and then it explains the system of capability classification used by the Soil Conservation Service and describes management of the soils by capability units. In addition, predicted average acre yields of the principal crops grown in the survey area are given, and management of the soils for range and engineering purposes is discussed.

Data relative to the management of the soils for crops and to crop yields are based on farm records and on observations made by the district conservationist and soil scientists who helped to prepare the survey. Where little or no information is available for a particular soil, yield estimates are based on those of similar soils.

Crops

All the soils in this survey area that are used for irrigated crops require the same management practices. The practices differ mainly in the degree to which they are applied.

The chief irrigated crops grown in this survey are alfalfa for hay, alfalfa seed, barley, corn silage, pasture, and, to a very limited extent, sugar beets. Important management practices include land leveling, proper tillage, irrigation water management, drainage, salt reduction, fertilization, pest control, and weed control.

The soils in this survey area can be plowed in spring or in fall, but preferably in fall. Organic matter and barnyard manure plowed under tend to increase water intake rate and workability of the soil. Crops respond to nitrogen and phosphate fertilizers. Alfalfa is particularly responsive to phosphate.

Salt and alkali

Many soils in arid regions contain soluble salts, and in places these salts are highly concentrated. The origin, and, to some extent, the direct source of salts are the primary minerals found in soils and in exposed rocks. The salts set free by weathering of minerals in arid regions generally remain in the soil. The combination of low precipitation and high evapotranspiration prevents deep penetration of water and the consequent leaching of salts. Another source of salts is surface and ground water. In this survey area, surface and ground water contain large quantities of dissolved salts. The salt concentration depends on the salt content of the soil or rocks that have contact with the water. Water adds salt to the soil under natural conditions, such as when lowlands flood or when the ground water rises to the surface and evaporates. Surface water used for irrigation also acts as a source of salt.

Soils in the survey area range from nonsaline or slightly saline to very strongly saline. Some of the soils are moderately alkali or strongly alkali. A few soils have concentrations of both soluble salts and alkali. These soils are identified as saline-alkali soils.

The removal of soluble salts and alkali from soils requires individual treatment. Adequate drainage and large quantities of irrigation water are needed for the removal of soluble salts and alkali, but a sodium-reducing amendment is needed for removal of alkali (*4*). The appearance and properties of saline-alkali soils are generally similar to those of saline soils. The soil particles remain flocculated in both types of soils. If the excess soluble salts are leached out, however, the soil properties are likely to change markedly. Some of the exchangeable sodium hydrolyzes and forms sodium hydroxide, and eventually sodium carbonate forms. Thus, after leaching, a saline-alkali soil may become alkali, the individual soil particles may disperse, and the soil becomes unsuitable for tillage.

Irrigation water supply

In this survey area the water supply for irrigation is derived from the Sevier River; from the watersheds of the Pavant Plateau, Gunnison Plateau, Canyon Mountains, and East Tintic Mountains to the east; occasionally from overflow from the Chicken Creek drainage out of Juab County; and from wells, either privately owned or owned by irrigation companies.

During the winter irrigation water from the Sevier River and the surrounding watersheds is stored in the Sevier Bridge Reservoir, the DMAD Reservoir, and the Gunnison Bend Reservoir. These reservoirs have capacity to store a 1-year supply. Irrigation water is available on call and can usually be delivered within 1 or 2 days, because of the size and location of these reservoirs.

The available water supply for the 10 years prior to 1969 was considerably less than the preceding 30 to 40 years because of, in part, the prolonged drought. Over the years many acres formerly used for irrigation have been abandoned because of the drought. During the 20 years preceding 1970, one share of irrigation company stock delivered as little as 0.33 acre-foot and as much as 2.20 acre-feet of irrigation water.

In general, the tributaries of the Sevier River have good-quality water. A considerable amount of the irrigation water that goes to Delta via the Sevier River is return flow to the river and becomes increasingly laden with calcium, magnesium, and sodium salts with increased distance down the river. Content of sodium salts increases rapidly from Redmond to Sevier Bridge Reservoir and then changes only slightly at Gunnison Bend Reservoir, but the total salt content increases from the Sevier Bridge Reservoir to Gunnison Bend Reservoir.

The quality of the water from wells is usually good. To reduce excessive soil dispersion caused by the sodium in the soils, the well water is usually mixed with river water.

The supply of irrigation water is limited, and the water contains salt. Therefore, irrigation methods and practices that insure efficient use of the water are necessary. Installing drains and maintaining a safe level of salt concentration in the soil are very important. An annual irrigation leaching helps to maintain salt concentrations at a satisfactory level if adequate drainage is provided to remove the salt.

Border and furrow irrigation methods are commonly used. The sprinkler method is used to a limited extent.

Border irrigation is a good system for close-growing crops. This system requires flat slopes that are level between borders. An adequate volume of water is needed to fill the border width and to extend through its length in a reasonable period. This system also aids in reducing salt accumulations in the soil. One leaching irrigation each year helps to keep the saline salts moving down through the soil profile.

Drainage is accomplished mostly with use of deep open drains. Some tile drains are used. The tile drains must be installed after careful investigation and be constructed so that sediment will not enter the system. Drainage is necessary to keep the water table at a reasonable depth and to remove the salts that otherwise will accumulate. If the soils are not drained, salt accumulates and crop yields are reduced. In extreme cases, the salt accumulation may become so high that certain crops will not grow and other more tolerant crops will not respond well.

Because of the beneficial effect of organic matter on soil structure, the return of crop residue, barnyard manure, and sod crops to the soil helps to maintain good soil tilth. The formation of traffic pans can be reduced if the soils are not tilled or trampled when wet. Varying the depth of tillage and limiting the number of trips over the field also help in maintaining favorable soil structure.

Information about land leveling, tillage, water management, drainage, and salt reduction can be obtained from the field office of the Soil Conservation Service.

Most soils in this survey area are well supplied with potassium, calcium, iron, and magnesium. Crops usually respond to fertilizers containing nitrogen or phosphorus, or both. The response depends on the crop, the cropping history, the previous use of fertilizer, and the management practices of irrigation, tillage, drainage, and pest control. Specific information can be obtained from the Utah State University Experiment Station and from the Extension Service.

Capability groups of soils

Capability classification is a grouping of soils to show, in a general way, their suitability for most kinds of farming. It is a practical classification based on limitations of soils, the risk of damage when they are used, and the way they respond to treatment. The soils are classified according to degree and kind of permanent limitations, but without consideration of major and generally expensive landforming that would change the slope, depth, or other characteristics of the soils, and without consideration of possible but unlikely major reclamation projects.

In the capability system, all kinds of soil are grouped at three levels: the capability class, subclass, and unit. These are discussed in the following paragraphs.

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

Class I soils have few limitations that restrict their use (None in this survey area).

Class II soils have some limitations that reduce the choice of plants, require very careful management, or both.

Class III soils have severe limitations that reduce the choice of plants, require very careful management, or both.

Class IV soils have very severe limitations that restrict the choice of plants, require very careful management, or both (None in this survey area).

Class V soils are subject to little or no erosion but have other limitations, impractical to remove, that limit their use largely to pasture, range, woodland, and wildlife food and cover. (None in this survey area).

Class VI soils have severe limitations that generally make them unsuited to cultivation and limit their use largely to pasture or range, woodland, or wildlife food and cover. (None in this survery area).

Class VII soils have very severe limitations that make them unsuited to cultivation and that restrict their use largely to grazing, woodland, or wildlife.

Class VIII soils and landforms have limitations that preclude their use for commercial plant production and restrict their use to recreation, wildlife, or water supplying, or to esthetic purposes.

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

CAPABILITY UNITS are soil groups within the subclasses. The soils in one capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity and other responses to management. Thus, the capability unit is a convenient grouping for making many statements about the management of soils. Capability units are generally designated by adding numbers assigned locally, for example, IIc–2. Thus, in one symbol, the Roman numeral designates the capability class or degree of limitation, and the small letter immediately following the numeral designates the subclass or kind of limitation as defined in the foregoing paragraph. The Arabic numeral following the subclass designation specifically identifies the capability unit of the Utah State system; the numerals are not numbered consecutively.

In the Utah system of classification, a number or a capital letter following the subclass letter suggests the nature of the soil limitation. Numbers are used for irrigated capability units and capital letters for nonirrigated capability units. The number *2* used for irrigated units in the first position indicates that the capability unit is made up of soils that are in areas where the frost-free period is 100 to 150 days.

The letters *D* and *S* are for nonirrigated capability units and show the average annual precipitation. The letter *D* indicates that the average annual precipitation is 6 to 8 inches, and the letter *S* indicates that it is 8 to 12 inches. Additional numbers or letters indicate the following limitations: *4*, low available water capacity (gravelly or cobbly material); *5*, slow permeability; *7*, salinity; *8*, salinity and alkali; and *X*, low available water capacity (stony or rocky material).

Management by capability units

Soils in this survey area are grouped into capability units. Those grouped together have similar characteristics and qualities. Soils used for irrigated crops are grouped on the assumption that irrigation water is available and that drainage and salt reduction are feasible.

In the following pages each capability unit represented in the survey area is described. The units are not numbered consecutively, because not all units in the statewide system are represented in this survey area. The capability classification for each soil is given in the "Guide to Mapping Units."

CAPABILITY UNIT IIw–27, IRRIGATED

This capability unit consists of deep, somewhat poorly drained soils. The soils formed in mixed alluvium and lake sediment on terraces, flood plains, and alluvial fans. Slopes are 0 to 2 percent. The average annual precipitation is 6 to 8 inches. The frost-free period is 115 to 120 days.

The surface layer is loam, silt loam, or silty clay loam. The underlying material to a depth of about 40 inches is very fine sandy loam, silt loam, or clay loam. Below this depth the underlying material is mostly silt loam or silty clay loam, but in places it is sandy loam or sand.

Permeability is moderate to moderately slow. Runoff is slow. The hazard of erosion is slight. These soils have an available water capacity of 7.5 to 11 inches to a depth of 5 feet. They are slightly saline to strongly saline. The soils used for irrigated crops are slightly saline to moderately saline. Water available for plant use is 2.5 to 9 inches. Effective rooting depth is 5 feet or more.

Irrigated crops include alfalfa hay, alfalfa seed, barley, and corn silage. The strongly saline soils

must be leached to lower the salt content before crop production is feasible.

CAPABILITY UNIT IIc–2, IRRIGATED

This capability unit consists of deep, well-drained soils. These soils formed in mixed alluvium and lake sediment on lake terraces, flood plains, and alluvial fans.

The surface layer is sandy loam or silt loam. The underlying material is sandy loam, silt loam, or silty clay loam. Slopes are 0 to 1 percent. The average annual precipitation is 8 to 11 inches. The frost-free period is 115 to 125 days.

Permeability is moderately rapid to moderately slow. Runoff is slow. The hazard of erosion is slight. Most of these soils hold 10 to 11 inches of available water to a depth of 5 feet, but some soils hold 6.5 to 7.5 inches. Effective rooting depth is 5 feet or more.

Irrigated crops include alfalfa hay, barley, corn silage, and some wheat. During years when the irrigation water supply is short, some areas are idle.

CAPABILITY UNIT IIIe–27, IRRIGATED

This capability unit consists only of Shear silty clay, 1 to 5 percent slopes. It is deep and well drained. It formed in mixed alluvium and lake sediment modified by wind into dunes 3 to 10 feet high. The average annual precipitation is 6 to 8 inches. The frost-free period is 115 to 120 days.

Permeability is moderately slow. Runoff is medium. The hazard of erosion is moderate. This soil has an available water capacity of 10 to 11 inches to a depth of 5 feet. It is strongly saline. Effective rooting depth is 5 feet or more.

The soil must be leveled and leached to lower the salt content before crops can be grown.

CAPABILITY UNIT IIIw–275, IRRIGATED

This capability unit consists of deep, somewhat poorly drained and poorly drained soils. These soils formed in mixed alluvium and lake sediment on flood plains and lake terraces. Slopes range from 0 to 1 percent. The average annual precipitation is 6 to 8 inches. The frost-free period is 115 to 120 days.

The surface layer is silty clay. The underlying material to a depth of 40 inches is clay, silty clay, and silty clay loam. Below this it is generally silty clay and silty clay loam, but in some places it is sand and sandy loam.

Permeability is slow. Runoff is slow to ponded. The hazard of erosion is slight. These soils have an available water capacity of 8½ to 11 inches to a depth of 5 feet. They are slightly saline to strongly saline. The soils used for irrigated crops are slightly saline to moderately saline. Water available for plant use is only 2½ to 9 inches because of the salt content in the soil. Effective rooting depth is 5 feet or more.

Irrigated crops include alfalfa hay, alfalfa seed, barley, and some corn silage. The strongly saline soils must be leached to lower the salt content before crops can be grown.

CAPABILITY UNIT IIIs–25, IRRIGATED

This capability unit consists only of Duggins silty clay. It is deep and well drained. It formed in mixed alluvium and lake sediment on flood plains and lake plains. Slopes are 0 to 1 percent. The average annual precipitation is 9 to 11 inches. The frost-free period is 120 to 125 days.

This soil has a silty clay texture to a depth of 5 feet or more.

Permeability is slow. Runoff is slow. The hazard of erosion is slight. This soil has an available water capacity of 9 to 11 inches to a depth of 5 feet. Effective rooting depth is 5 feet or more.

The soil in this capability unit is used mostly for alfalfa hay and barley. During years when the irrigation water supply is short, some areas are idle.

CAPABILITY UNIT VIIe–D, NONIRRIGATED

This capability unit consists of deep, well-drained soils. These soils formed in mixed alluvium and lake sediment on lake terraces and alluvial fans. Slopes are 3 to 10 percent.

The surface layer is silt loam, loam, very cobbly loam, or sandy loam. The underlying material is silt loam or gravelly sandy loam that extends to a depth of 5 feet or more. The average annual precipitation is 6 to 8 inches. The frost-free period is 115 to 120 days.

Permeability is moderate or moderately rapid. Runoff is slow to medium. The hazard of erosion is slight to moderate. These soils have an available water capacity of 4 to 10 inches to a depth of 5 feet. The water supplying capacity is 3 to 5 inches. The effective rooting depth is 3 to 5 feet or more. These soils are used for range. Native vegetation is Indian ricegrass, needleandthread, squirreltail, galleta, winterfat, and black sagebrush. In most years precipitation is too low for successful range seeding.

CAPABILITY UNIT VIIe–S, NONIRRIGATED

This capability unit consists of deep, well-drained and somewhat excessively drained soils. They formed in mixed alluvium and lake sediments on alluvial fans, benches, and lake terraces. Slopes are mostly 0 to 10 percent but range to 30 percent. The average annual precipitation is 8 to 11 inches. The frost-free period is 115 to 125 days.

The surface layer is sandy loam or loam. The underlying material is stratified loamy fine sand to silty clay loam and contains high lime accumulations to a depth of 5 feet or more.

Permeability is moderately rapid to moderately slow. Runoff is slow or medium. The hazard of erosion is slight to moderate. These soils have an available water capacity of 4 to 10 inches to a depth of 5 feet. The water supplying capacity is 4 to 6 inches. The effective rooting depth is 2.5 to 5 feet or more.

These soils are used for range. Native vegetation is Indian ricegrass, needleandthread, black sagebrush, big sagebrush, yellowbrush, and associated forbs. In most years precipitation is too low for successful range seeding.

CAPABILITY UNIT VIIw–28, NONIRRIGATED

This capability unit consists of deep, somewhat poorly drained to very poorly drained soils. They formed in mixed alluvium and lake sediment on lake plains, deltas, and flood plains. Slopes are mostly 0 but they range to 3 percent. The average annual

precipitation is 6 to 11 inches. The frost-free period is 115 to 120 days.

The soils have a texture of silt loam, silty clay, or very fine sandy loam to a depth of 5 feet or more.

Permeability is moderately rapid to slow. Runoff is slow to ponded. The hazard of erosion is slight. These soils have an available water capacity of 7 to 11 inches to a depth of 5 feet. The water supplying capacity is reduced depending on the salt content of the soil. The soils are strongly saline or very strongly saline. Effective rooting depth is 3 to 5 feet.

These soils are used for range and unimproved pasture. Native vegetation is alkali bluegrass, alkali sacaton, saltgrass, sedges, pickleweed, greasewood, and Nuttalls saltbush.

CAPABILITY UNIT VIIs–D, NONIRRIGATED

This capability unit consists only of Hiko Springs very gravelly loam, hardpan variant, 3 to 10 percent slopes. It is a moderately deep, well-drained soil that formed in mixed alluvium on alluvial fans and lake terraces. The average annual precipitation is 6 to 8 inches. The frost-free period is 115 to 120 days.

The surface layer is a very gravelly loam. The underlying material is very gravelly or very cobbly sandy loam. An indurated lime-cemented hardpan is at a depth of about 30 inches.

Permeability is moderately rapid above the hardpan. Runoff is rapid. The hazard of erosion is moderate. This soil has an available water capacity of 1.5 to 2 inches. The water supplying capacity is 2 to 3 inches. Effective rooting depth is to the hardpan.

This soil is used for range. Native vegetation is Indian ricegrass, needleandthread, squirreltail, galleta, black sagebrush, and associated forbs. The precipitation is too low for range seeding.

CAPABILITY UNIT VIIs–D7, NONIRRIGATED

This capability unit consists of deep, well-drained soils. These soils formed in mixed alluvium and lake sediments on lake deltas, lake plains, and flood plains. Slopes are 0 to 2 percent. The average annual precipitation is 6 to 8 inches. The frost-free period is 115 to 120 days.

The surface layer is silt loam or silty clay loam. The underlying material is silty clay loam or silty clay to a depth of 60 inches or more.

Permeability is slow or very slow. Runoff is slow or very slow. The hazard of erosion is slight. These soils have an available water capacity of 10 to 11 inches. The water supplying capacity is 2 to 3 inches, depending on the salt content in the soils. Effective rooting depth is 5 feet or more.

These soils are used for range. Native vegetation is salt-tolerant species, such as Nuttalls saltbush greasewood, and pickleweed. These soils are not suited to range seeding, because the salt concentration is high and precipitation is low.

CAPABILITY UNIT VIIs–D8, NONIRRIGATED

This capability unit consists of deep, somewhat excessively drained to poorly drained soils. They formed in mixed alluvium, lake sediment, and eolian sediment on lake plains, deltas, beach bars, and flood plains. Slopes are generally 0 to 10 percent; the sandy areas are undulating. The average annual precipitation is 6 to 8 inches. The frost-free period is 115 to 120 days.

The surface layer ranges from fine sand to silty clay. Some areas are gravelly silt loam or very cobbly loam. The underlying material is sand to clay and is gravelly or cobbly in places.

Permeability is very slow to rapid. Runoff is slow or medium. The hazard of erosion is high on the sandy soils and slight or moderate on the finer textured soils. These soils have an available water capacity of 3.5 to 11 inches. The water supplying capacity is 2 to 5 inches, depending on the salt content of the soil. The effective rooting depth is 5 feet or more.

These soils are used for range. Native vegetation is Indian ricegrass, galleta, bud sagebrush, and salt-tolerant species such as shadscale, seepweed, Nuttalls saltbush, and greasewood. These soils are not suited to range seeding, because the salt concentration is high and precipitation is low.

CAPABILITY UNIT VIIs–S, NONIRRIGATED

This capability unit consists of shallow and deep, somewhat excessively drained soils. They formed in mixed residuum and eolian deposits on lake terraces and mountainsides. Slopes are generally 0 to 40 percent, but the sandy areas are undulating. The average annual precipitation is 7 to 10 inches. The frost-free period is 115 to 125 days.

The surface layer is fine sand or very cobbly loam. The underlying material is sand, very cobbly loam, or very cobbly clay loam.

Permeability is moderate to rapid. Runoff is slow to rapid. The hazard of water erosion is moderate or high, and the hazard of soil blowing is high on the sandy soils. These soils have an available water capacity of 1.5 to 3.5 inches. The water supplying capacity is 2 to 5 inches, depending on soil depth. The effective rooting depth is 1.5 feet in the shallow soils to 5 feet or more in the deep soils

These soils are used for range. Native vegetation is bluebunch wheatgrass, needleandthread, Indian ricegrass, black sagebrush, bud sagebrush, big sagebrush, shadscale, yellowbrush, and four-wing saltbush. These soils are not suited to range seeding, because precipitation is too low in most years. Additional limitations are shallow depth, cobbly surface, and sandy texture.

CAPABILITY UNIT VIIs–S8, NONIRRIGATED

This capability unit consists of deep, well-drained and somewhat poorly drained soils. They formed in mixed alluvium and lake sediment on lake terraces and flood plains. Slopes are mostly 0 to 1 percent but range to 5 percent. The average annual precipitation is 8 to 11 inches. The frost-free period is 115 to 120 days.

The soils are silt loam and loam to a depth of 5 feet or more.

Permeability is moderate or moderately slow. Runoff is medium or slow. The hazard of erosion is slight or moderate to a depth of 5 feet. These soils have an available water capacity of 10 to 11 inches. Some run-in water adds to the amount of water otherwise available for plants. These soils are moderately saline or strongly saline. Some of the soils are strongly alkali.

TABLE 2.—*Estimated average yields per acre of principal irrigated soils under two levels of management*

[Yields in columns A can be expected under an average or common level of management; those in columns B can be expected under a moderately high level of management. Absence of data indicates that the crop is seldom grown on the soil specified]

Soil	Alfalfa hay		Alfalfa seed		Barley		Silage corn	
	A	B	A	B	A	B	A	B
	Tons	*Tons*	*Lbs*	*Lbs*	*Bu*	*Bu*	*Tons*	*Tons*
Abbott silty clay	3.0	4.5	170	350	50	75		
Abbott silty clay, sandy substratum	3.0	4.5	270	365	55	70		
Abraham loam	3.8	5.1	140	250	75	100	17	25
Abraham silty clay loam	4.5	5.8	150	280	75	100	18	28
Anco silty clay loam	4.4	5.1	160	300	70	85	15	23
Anco silty clay loam, sandy substratum	4.0	5.0	150	280	70	85	15	23
Deseret silt loam	3.5	5.0			55	70	15	23
Duggins silty clay	4.0	5.5			70	90		
Kessler silt loam, 1 to 2 percent slopes	4.0	5.5			70	90	17	25
Modena sandy loam	4.0	5.0			60	75	15	23
Musinia silt loam	4.5	6.0			75	100	18	28
Penoyer silt loam	3.8	5.1	140	250	75	100	17	25
Poganeab silty clay loam	4.4	5.1	160	300	70	85	15	23
Poganeab silty clay loam, sandy substratum	4.0	5.0	150	280	70	85	15	23
Woodrow silt loam	4.5	6.0			75	100	18	28

The water supplying capacity of these soils is 3 to 6 inches.

These soils are used for range. Native vegetation is Great Basin wildrye, squirreltail, bud sagebrush, fourwing saltbush, shadscale, and greasewood. These soils are not suited to range seeding, because precipitation is too low in most years and the salt content is high.

CAPABILITY UNIT VIIIw–8, NONIRRIGATED

This capability unit consists only of level areas of Playas. They formed in mixed alluvium, mostly silty clay loam or silty clay. They are very strongly saline. They are generally dry on the surface but at times are under water.

Playas have no value for farming. Little or no vegetation grows in these areas, because the salt content is high.

CAPABILITY UNIT VIIIs–5, NONIRRIGATED

This capability unit consists of areas of Dune land, which is dominantly clay and sandy clay. The dunes range from 1 to 10 feet in height. Blown out areas are between the dunes. These dunes are partly active. The average annual precipitation is 6 to 8 inches.

The hazard of erosion is moderate.

This land type is not suitable for farming.

CAPABILITY UNIT VIIIs–8, NONIRRIGATED

This capability unit consists of a deep, well-drained soils. These soils formed in mixed alluvium and lake sediment on flood plains and lake plains. Slopes are 0 to 2 percent. The average annual precipitation is 6 to 8 inches. The frost-free period is 115 to 120 days.

The surface layer is silty clay loam and silty clay that extends to a depth of about 34 inches. The material from a depth of 34 inches to 60 inches or more is sand.

Permeability is slow. Runoff is slow. The hazard of erosion is slight. These soils have an available water capacity of 6 to 8 inches. The water supplying capacity for plants is only 0 to 1.5 inches because the salt concentration is high. These soils are strongly saline and very strongly saline.

The soils have no value for farming.

CAPABILITY UNIT VIIIs–X, NONIRRIGATED

This capability unit consists of areas of Lava flows, Stony colluvial land, and Rock land. Lava flows are dominantly exposed basalt rocks. In places the rocks are covered with a thin layer of sand. The flows are 1 foot to 6 feet above the valley plains. Stony colluvial land consists mostly of stones, cobbles, and boulders intermingled with a small amount of soil material.

This capability unit has no value for crops or range.

Estimated yields

Table 2 gives the estimated average yield per acre of the main irrigated crops grown under two levels of management. Yields are averages for a period of years. In any given year, yields may be higher or lower than the average. These yields are estimated on the basis of information and records obtained from farmers and on field observations of soil conservationists. The collected information was reviewed by the local County Agricultural Agent. If no information is available for a particular soil, the estimates are based on the yields for a similar soil. Only soils that are suitable for the crops specified are listed in Table 2.

Under both levels of management, yields are based on a generalized cropping system consisting of legumes, small grain, row crops, and alfalfa. This cropping system, or a variation of it, is used in most of the survey area.

In table 2 the yields in columns A are those obtained under average, or common, management. Under common management, phosphorus fertilizer is applied sparingly or not at all; nitrogen is seldom used or is used in insufficient quantities. Most of the available animal

manure is spread, but it is not properly stored or incorporated into the soil.

The yields in columns B are those expected under a moderately high level of management. Under this management, phosphorus fertilizer is applied when alfalfa is seeded and again after 2 or 3 years. Nitrogen fertilizer is used on row crops and on small grain after the first year out of alfalfa, unless adequate animal manure is applied. Animal manure is properly stored and is spread and incorporated into the soil within a short time. Tillage is reduced to essential and timely operations to avoid forming traffic pans or otherwise compacting the soil. Control structures are used for handling irrigation water. Length of runs is selected as required by soil conditions, and water is applied according to crop requirements. Drainage is adequate to control the depth of the water table and to maintain low toxic salt content. Crop rotation generally is consistent, and weeds are controlled.

Range [2]

About 75 percent of the soils in Delta Area are used as range. Most of the soils are affected by excess salt or alkali, or both. They are mostly nearly level to gently sloping soils, but some have very steep slopes.

Range sites and condition classes

Soils that have the capacity to produce the same kinds, amounts, and proportions of range plants are grouped into range sites. A range site is the product of all environmental factors responsible for its development.

A plant community existing within a range site that has not undergone abnormal disturbance is the potential, or climax, plant community for that site. Climax plant communities are not precise or fixed in their composition but vary, within reasonable limits, from year to year and from place to place.

Abnormal disturbances such as overuse by livestock, excessive burning, erosion, or plowing result in changes in the climax plant community or even complete destruction if disturbance is drastic enough. If the range site has not deteriorated significantly under such disturbances, secondary plant succession progresses back to the climax plant community for the site.

Four range condition classes are used to indicate the degree of departure from the potential, or climax, vegetation brought about by grazing or other uses. The classes show the current condition of the native vegetation on a range site in relation to the potential native vegetation.

A range is in *excellent condition* if 76 to 100 percent of the vegetation is of the same kind as that in the climax stand. It is in *good condition* if the percentage is 51 to 75; in *fair condition* if the percentage is 26 to 50; and in *poor condition* if the percentage is less than 25.

When changes occur in the climax plant community because of excessive use by livestock or other disturbances, some plant species will increase and others will decrease. By comparing the composition of the present plant community with the climax plant community, it is possible to see how individual species have increased while others decreased. Plants not in the climax community that show up in the present plant community are invaders for the site.

The composition of climax and current plant communities, together with other range site information, provides the basis for selecting range management systems.

Management programs on range sites are generally aimed at increasing desirable plants and restoring the range to as near climax condition as possible. Some programs are designed to create or maintain plant communities somewhat removed from the climax to fit specific needs in the grazing program, to provide for wildlife habitat, or for other benefits. Any management objective should be compatible with conservation objectives.

In the following pages the range sites of Delta Area are described and the climax plants and principal invaders on the sites are named. Also given is an estimate of the potential annual yield of air-dry vegetation for each site when it is in excellent condition. The soils in each site can be determined by referring to the "Guide to Mapping Units."

ALKALI BOTTOM RANGE SITE

This site consists of deep, somewhat poorly drained to very poorly drained soils on flood plains and lake plains. These soils formed in alluvium and lake sediment from igneous and sedimentary rocks. Slopes range from 0 to 3 percent.

The soils have a surface layer dominantly of silt loam or silty clay loam. Elevation ranges from 4,550 to 4,700 feet. The average annual precipitation is 6 to 8 inches. The average frost-free period is 115 to 120 days.

Permeability is moderate or moderately slow. Runoff is very slow or slow. The hazard of erosion is slight. The available water capacity is 9 to 11 inches to a depth of 5 feet. Effective rooting depth is 4 to 5 feet. The soils are strongly saline to very strongly saline. Water available to plants is greatly reduced by the concentration of salt.

The vegetation on this range site is salt and alkali tolerant. The potential plant community, based on total air-dry weight, consists of 80 to 90 percent grasses, as much as 20 percent shrubs, and 0 to 1 percent forbs.

The approximate composition, by weight, of the potential plant community is 15 percent alkali bluegrass; 15 percent alkali sacaton; 10 percent Great Basin wildrye; 20 percent saltgrass; 10 percent sedges; 8 percent other grasses and grasslike plants; 7 percent pickleweed, which is seldom grazed by livestock; 5 percent greasewood; 5 percent Nuttalls saltbush; and 5 percent four-wing saltbush.

If this site is in excellent condition, the total annual yield of air-dry herbage is about 2,500 pounds per acre in favorable years and 1,000 pound per acre in unfavorable years. Approximately 90 percent of this production is from plants that furnish forage for livestock and big game.

Continued overgrazing of this site results in an increase in foxtail, saltgrass, sedges, rushes, and greasewood and in a decrease in alkali bluegrass,

[2] HORACE ANDREWS and LAMAR R. MASON, range conservationists, Soil Conservation Service, helped to prepare this section.

alkali cordgrass, alkali sacaton, tufted hairgrass, squirreltail, and Great Basin wildrye. If overgrazing is excessive, saltgrass, smotherweed, snakeweed, halogeton, greasewood, and saltcedar take over.

This site is not suitable for seeding, unless irrigation water is available and drainage is adequate.

SALT MEADOW RANGE SITE

This range site consists of deep, poorly drained or very poorly drained soils on lake plains, lake deltas, and flood plains. These soils formed in alluvium and lake sediment from sedimentary and igneous rocks. Slopes range from 0 to 3 percent. Elevation ranges from 4,500 to 4,700 feet. The average annual precipitation is 6 to 11 inches. The average frost-free period is 115 to 125 days.

The soils have a surface layer of silt loam, silty clay loam, silty clay, loam, or very gravelly fine sandy loam.

Permeability ranges from slow to moderately rapid. Runoff is slow to ponded. The hazard of erosion is slight. The available water capacity is about 7 to 11 inches to a depth of 5 feet. The soils are strongly saline or very strongly saline. Water available for plants is greatly reduced by the concentration of salt. Effective rooting depth is 2½ to 5 feet. The water table ranges from the surface to a depth of 4 feet.

The vegetation on this range site is mostly salt and water tolerant. The potential plant community, based on total air-dry weight, consists of 90 to 95 percent grasses and grasslike plants, a trace to 1 percent forbs, and 1 to 5 percent shrubs.

The approximate composition, by weight, of the potential plant community is 25 percent alkali bluegrass; 15 percent alkali sacaton; 5 percent saltgrass; 5 percent foxtail; 5 percent rushes; 15 percent sedges and spiked sedges, which are seldom grazed by livestock; 5 percent broadleaf sedge; 20 percent other grasses; 1 percent forbs, which are seldom grazed by livestock; and 4 percent shrubs.

If this site is in excellent condition, the total annual yield of air-dry herbage is about 4,000 pounds per acre in favorable years and 2,000 pounds per acre in unfavorable years. About 80 percent of this production is from plants that furnish forage for livestock and big game.

Continued excessive grazing of this site results in a decrease in alkali bluegrass, alkali sacaton, western wheatgrass, Great Basin wildrye, and four-wing saltbush and in an increase in saltgrass, foxtail, rushes, sedges and spiked sedges, greasewood, and rubber rabbitbrush. If use of the forage plants is excessive, smotherweed, beeflower, povertyweed, curlycup, gumweed, Russian thistle, and greasewood take over.

Under certain conditions this site can be mechanically treated and seeded. Generally, it should be left in its native condition, assuming proper range practices are followed.

DESERT ALKALI BENCH RANGE SITE

This range site consists of deep and moderately deep, somewhat excessively drained and well drained soils on lake plains, lake terraces, bench bars, outwash fans, and plateaus. These soils formed in alluvium, colluvium, and lake sediment from sedimentary and igneous rocks. Slopes are dominantly 0 to 3 percent but range to 10 percent. Elevation ranges from 4,500 to 5,050 feet. The average annual precipitation is 6 to 8 inches. The average frost-free period is 115 to 120 days.

The soils have a surface layer of silt loam, loam, and sandy loam. Some soils are gravelly or very cobbly in the surface layer. At a depth of 4 to 10 inches and extending to a depth of more than 60 inches or more, texture ranges from very gravelly sand to silty clay.

Permeability is moderately rapid to moderately slow. Runoff is slow or medium. The hazard of erosion is slight to high. The water supplying capacity is 1.5 to 5 inches. The soils range from slightly saline to strongly saline and from moderately alkali to very strongly alkali. Water available for plants is reduced according to the amount of salt in the soils. Effective rooting depth is 2 to 5 feet.

The vegetation of this range site is mostly salt and alkali tolerant. The potential plant community, based on total air-dry weight, consists of 55 to 65 percent grass, 30 to 40 percent shrubs, and 1 to 5 percent forbs.

The approximate composition, by weight, of the potential plant community is 20 percent Indian ricegrass; 5 percent needleandthread; 25 percent galleta; 10 percent other grasses; 3 percent globemallow; 5 percent other forbs; 16 percent bud sagebrush; 10 percent shadscale; 5 percent yellowbrush, which is seldom grazed by livestock; and 1 percent other shrubs, which are seldom grazed by livestock.

If this site is in excellent condition, the total annual yield of air-dry herbage is about 600 pounds per acre in favorable years and 250 pounds per acre in unfavorable years. Approximately 95 percent of this production is from plants that furnish forage for livestock and wildlife.

Continued excessive grazing of this site, especially during the growing season, results in an increase in yellowbrush, shadscale, snakeweed, woody phlox, annual buckwheat, Russian thistle, halogeton, saltgrass, galleta, fluffgrass, threeawn, cheatgrass, western wheatgrass, globemallow, and bud sagebrush and in a decrease in Indian ricegrass, needleandthread, Mormon tea, and four-wing saltbush.

In advanced stages of excessive use, this site may produce only shadscale, unpalatable weeds, and unpalatable grasses.

This site is not suitable for mechanical treatment or seeding.

DESERT ALKALI FLATS RANGE SITE

This range site consists of deep, poorly drained to well drained soils on lake deltas, lake plains, and flood plains. These soils formed in alluvium and lake sediment from sedimentary and igneous rocks. Slopes are dominantly 0 to 1 percent but range to 5 percent. Elevation ranges from 4,500 to 4,800 feet. The average annual precipitation is 6 to 8 inches. The average frost-free period is 115 to 120 days.

The soils have a surface layer dominantly of silty clay, silty clay loam, silt loam, or loam.

Runoff is slow or medium. The hazard of erosion is slight or moderate. The water supplying capacity is only 2.0 to 5.0 inches, because of the salt concentration. All of these soils are strongly saline, and some are strongly affected by alkali. Effective rooting depth is

4 to 5 feet. The poorly drained and somewhat poorly drained soils have been artificially drained, and the water table is below a depth of 5 feet.

The vegetation on this range site is very tolerant of salt and alkali. The potential plant community, based on total air-dry weight, consists of 65 to 75 percent shrubs, 0 to 25 percent forbs, and 0 to 10 percent grasses.

The approximate composition, by weight, of the potential plant community is 3 percent alkali sacaton; 3 percent Indian ricegrass; 4 percent squirreltail; 10 percent seepweed, which is seldom grazed by livestock; 5 percent pickleweed, which is seldom grazed by livestock; 5 percent smotherweed; 5 percent mustard, which is seldom grazed by livestock; 5 percent shadscale; 10 percent Nuttalls saltbush; and 50 percent greasewood.

If this site is in excellent condition, the total annual yield of air-dry herbage is about 750 pounds per acre in favorable years and 350 pounds per acre in unfavorable years. Approximately 80 percent of this production is from plants that furnish forage for livestock and wildlife.

Continued excessive grazing of this site results in a decrease of alkali sacaton, Indian ricegrass, and squirreltail and in an increase in greasewood, shadscale, seepweed, mustards, pickleweed, and smotherweed. If overgrazing is prolonged, this site may become a pure stand of greasewood and annual weeds, including the poisonous plant halogeton.

This range site is not suitable for mechanical improvement or seeding.

DESERT FLATS RANGE SITE

This range site consists of deep, moderately well drained and well drained soils on lake plains, beach bars, and flood plains. These soils formed in alluvium and lake sediment from sedimentary and igneous rocks. Slopes are dominantly 0 to 1 percent but range to 5 percent. Elevation ranges from 4,500 to 4,800 feet. The average precipitation is 6 to 8 inches. The average frost-free period is 115 to 120 days.

The soils have a surface layer of loam, sandy loam, sandy clay loam, and silt loam. At a depth of 4 to 8 inches and extending to a depth of 60 inches or more, texture is silty clay loam, silty clay, and sandy clay loam.

Permeability is moderate or moderately slow. Runoff is slow or medium. The hazard of erosion is slight or moderate. The water supplying capacity is 2 to 4 inches. These soils receive additional water from runin. These soils are strongly saline, and some are strongly affected by alkali. Effective rooting depth is 2 to 5 feet.

The vegetation on this range site is salt and alkali tolerant. The potential plant community, based on total air-dry weight, consists of about 60 to 70 percent shrubs, 25 to 30 percent grasses, and 5 to 10 percent forbs.

The approximate composition, by weight, of the potential plant community is 5 percent galleta; 15 percent Indian ricegrass; 5 percent squirreltail; 3 percent globemallow; 35 percent winterfat; 15 percent shadscale; 10 percent greasewood; 2 percent yellowbrush, which is seldom grazed by livestock; and 10 percent other shrubs.

If this site is in excellent condition, the total annual yield of air-dry herbage is about 1,300 pounds per acre in favorable years and 600 pounds per acre in unfavorable years. Approximately 98 percent of this production is from plants that furnish forage for livestock and wildlife.

Continued excessive grazing of this site, especially during the growing season, results in a decrease in Indian ricegrass, squirreltail, globemallow, bud sagebrush, and winterfat and in an increase in galleta, saltgrass, shadscale, gray molly, yellowbrush, and greasewood. If excessive grazing is prolonged, shadscale, yellowbrush, greasewood, and annual weeds take over.

This site is not suitable for mechanical treatment or seeding.

DESERT GRAVELLY LOAM RANGE SITE

This range site consists of deep and moderately deep, well-drained soils on lake terraces and outwash fans. These soils formed in alluvium and lake sediment from igneous and sedimentary rocks. Slopes range from 3 to 10 percent. Elevation ranges from 4,550 to 5,300 feet. The average annual precipitation is 6 to 8 inches. The average frost-free period is 115 to 120 days.

The soils have a surface layer of sandy loam, very cobbly loam, and very gravelly loam. In most of the soils, below a depth of about 12 to 15 inches and extending to a depth of 60 inches or more, is gravelly or cobbly sandy loam, but in places an indurated limecemented hardpan is at a depth of about 30 inches.

Permeability is moderate or moderately rapid. Runoff is medium or rapid. The hazard of erosion is moderate. The water supplying capacity is 2.0 to 5.0 inches. Effective rooting depth is 2 to 5 feet or more.

The potential plant community, based on total air-dry weight, consists of 65 to 80 percent grass, 5 to 10 percent forbs, and 15 to 30 percent shrubs.

The approximate composition, by weight, of the potential plant community is 20 percent Indian ricegrass; 18 percent needleandthread; 15 percent squirreltail; 10 percent galleta; 10 percent other grasses; 3 percent globemallow; 3 percent other forbs, which are not usually grazed by livestock; 10 percent black sagebrush; 5 percent bud sagebrush; and 6 percent other shrubs.

If this site is in excellent condition, the total annual yield of air-dry herbage is about 800 pounds per acre in favorable years and 400 pounds per acre in unfavorable years. About 95 percent of this production is from plants that furnish forage for livestock and big game.

Continued excessive grazing, especially during the growing season, results in a decrease in Indian ricegrass, needleandthread, western wheatgrass, squirreltail, globemallow, winterfat, bud sagebrush, and four-wing saltbush and in an increase in galleta, blue grama, sand dropseed, Sandberg bluegrass, locoweed, death camas, aster, black sagebrush, yellowbrush, and Mormon tea. If excessive grazing is prolonged, cheatgrass snakeweed, rubber rabbitbrush, shadscale, and cactus take over.

This site is not suitable for mechanical treatment or seeding.

DESERT ALKALI SAND RANGE SITE

This range site consists of deep, somewhat excessively drained soils on lake terraces and beach bars. These soils formed in wind-deposited material and in lake sediment of sedimentary and igneous rocks. Slopes are undulating and range from 1 to 10 percent. Elevation ranges from 4,600 to 4,800 feet. The average annual precipitation is 6 to 8 inches. The average frost-free period is 115 to 120 days.

This soil is fine sand or loamy sand that extends to a depth of 60 inches or more.

Runoff is slow. The hazard of water erosion is moderate, and the hazard of soil blowing is high. The water supplying capacity is 3.5 to 4.5 inches. The soils are strongly affected by alkali. Effective rooting depth is 4 to 5 feet.

The vegetation of this range site is moderately alkali and salt tolerant. The potential plant community, based on total air-dry weight, consists of 30 to 45 percent shrubs, 40 to 50 percent grasses, and 5 to 10 percent forbs.

The approximate composition, by weight, of the potential plant community is 30 percent Indian ricegrass; 10 percent sand dropseed; 5 percent other grasses; 5 percent globemallow; 3 percent scurfpea, generally not grazed by livestock; 2 percent other forbs; 25 percent four-wing saltbush; 3 percent Mormon tea; 3 percent yellowbrush, which is generally not grazed by livestock; and 14 percent other shrubs.

If this site is in excellent condition, the total annual yield of air-dry herbage is about 900 pounds per acre in favorable years and 500 pounds per acre in unfavorable years. About 95 percent of this production is from plants that furnish forage for livestock and big game.

Continued heavy grazing results in a decrease in Indian ricegrass, squirreltail, sand dropseed, alkali sacaton, globemallow, and four-wing saltbush. If excessive grazing is prolonged, yellowbrush, snakeweed, scurfpea, shadscale, Russian thistle, cheatgrass, and halogeton take over.

This site is not suitable for mechanical treatment or seeding.

DESERT SALT FLATS RANGE SITE

This range site consists of deep, well-drained soils on lake deltas, lake plains, and flood plains. These soils formed in alluvium and lake sediment from sedimentary and igneous rocks. Slopes are 0 to 2 percent. Elevation ranges from 4,500 to 4,800 feet. The average annual precipitation is 6 to 8 inches. The average frost-free period is 115 to 120 days.

The soils are dominantly silt loam, silty clay loam, or silty clay to a depth of 60 inches or more.

Permeability is slow. Runoff is very slow or slow. The hazard of erosion is slight. The water supplying capacity is 2 to 3 inches. These soils receive additional water from run-in. These soils are strongly saline or very strongly saline, and some are strongly affected by alkali. Effective rooting depth is 3 to 5 feet.

The vegetation of this range site is salt and alkali tolerant. The potential plant community, based on total air-dry weight, consists of 80 to 90 percent shrubs, 10 to 20 percent forbs, and from traces to 1 percent grasses.

The approximate composition, by weight, of the potential plant community is 65 percent Nuttalls saltbush; 5 percent greasewood; 10 percent other shrubs; 9 percent seepweed, which is seldom grazed by livestock; 10 percent pickleweed, which is seldom grazed by livestock; and 1 percent annual weeds.

If this site is in excellent condition, the total annual yield of air-dry herbage is about 1,200 pounds per acre in favorable years and 300 pounds per acre in unfavorable years. About 80 percent of this production is from plants that furnish forage for livestock and big game.

Continued excessive grazing, especially during the growing season, results in a decrease in Nuttalls saltbush and in an increase in seepweed, gray molly, greasewood, and pickleweed. Also, halogeton and annual weeds are likely to invade. If overgrazing is prolonged, this site can become barren or heavily infested with halogeton.

This site is not suitable for mechanical improvement or seeding.

DESERT SILT FLATS RANGE SITE

This range site consists of deep, well-drained soils on lake plains, lake deltas, and flood plains. These soils formed in alluvium and lake sediment from sedimentary and igneous rocks. Slopes are 0 to 2 percent. Elevation ranges from 4,500 to 4,800 feet. The average annual precipitation is 6 to 8 inches. The average frost-free season is 115 to 120 days.

The soils are dominantly silt loam to a depth of 60 inches or more.

Permeability is moderate. Runoff is slow. The hazard of erosion is slight. The water supplying capacity is 3 to 4.5 inches. These soils are slightly saline to strongly saline. Effective rooting depth is 3 to 5 feet.

The potential plant community, based on total air-dry weight, consists of about 85 to 95 percent shrubs, 5 to 10 percent grasses, and 1 to 2 percent forbs.

The approximate composition, by weight, of the potential plant community is 5 percent Indian ricegrass; 1 percent western wheatgrass; 2 percent squirreltail; 2 percent globemallow; 80 percent winterfat; 5 percent shadscale; 1 percent yellowbrush, which is seldom grazed by livestock; 4 percent other shrubs.

If this site is in excellent condition, the total annual yield of air-dry herbage is about 800 pounds per acre in favorable years and 200 pounds per acre in unfavorable years. About 99 percent of this production is from plants that furnish forage for livestock and big game.

Continued excessive grazing, especially during the growing season, results in a decrease in Indian ricegrass, squirreltail, western wheatgrass, globemallow, winterfat, and bud sagebrush and in an increase in shadscale and yellowbrush. Also, cheatgrass, Russian thistle, and halogeton invade. If excessive grazing is prolonged, yellowbrush, cheatgrass, and Russian thistle dominate, but in the latter stages of deterioration halogeton dominates.

This site is not suitable for mechanical treatment or seeding.

SEMIDESERT ALKALI FLATS RANGE SITE

This range site consists of deep, well-drained and somewhat poorly drained soils on flood plains and lake terraces. These soils formed in alluvium and lake sediment from sedimentary and igneous rocks. Slopes are dominantly 0 to 1 percent but range to 5 percent. Elevation ranges from 4,640 to 4,700 feet. The average annual precipitation is 8 to 11 inches. The average frost-free period is 120 to 125 days.

The soils are dominantly silty clay loam and silt loam that extends to a depth of 60 inches or more.

Permeability is moderate or moderately slow. Runoff is slow or medium. The hazard of erosion is slight or moderate. The water supplying capacity is 3 to 6 inches. These soils receive additional water from run-in. These soils are moderately saline or strongly saline, and some of them are strongly affected by alkali. Effective rooting depth is 3 to 5 feet. Deseret soils have a seasonal water table at a depth of about 40 to 60 inches.

The vegetation of this range site is drought, salt, and alkali tolerant. The potential plant community, based on total air-dry weight, consists of 35 to 45 percent grasses, 45 to 55 percent shrubs, and 1 to 5 percent forbs.

The approximate composition, by weight, of the potential plant community is 10 percent Great Basin wildrye; 20 percent squirreltail; 15 percent other grasses; 3 percent globemallow; 10 percent bud sagebrush; 5 percent four-wing saltbush; 10 percent shadscale; 5 percent gray molly; 15 percent greasewood; and 7 percent other shrubs.

If this site is in excellent condition, the total annual yield of air-dry herbage is about 1,500 pounds per acre in favorable years and 500 pounds per acre in unfavorable years. All of this production is from plants that furnish forage for livestock and big game.

Continued excessive grazing, especially during the growing season, results in a decrease in Great Basin wildrye, Indian ricegrass, squirreltail, western wheatgrass, globemallow, four-wing saltbush, bud sagebrush, Nuttalls saltbush, and winterfat and in an increase in saltgrass, sand dropseed, pickleweed, smotherweed, shadscale, greasewood, and gray molly. If excessive grazing is prolonged, annual mustards, povertyweed, Russian thistle, halogeton, prickly pear, and snakeweed invade.

This site is not suitable for seeding or mechnical treatment.

SEMIDESERT LIMY LOAM RANGE SITE

This range site consists of deep, well-drained and somewhat excessivley drained soils on lake terraces, benches, and alluvial fans. These soils formed in alluvium and lake sediment from sedimentary and igneous rocks. Slopes are dominantly 1 to 10 percent but range to 30 percent. Elevation ranges from 4,600 to 4,950 feet. The average annual precipitation is 8 to 11 inches. The average frost-free period is 120 to 125 days.

The soils have a surface layer of sandy loam or loam. Below a depth of 8 to 10 inches and extending to a depth of 60 inches or more, the soils range from loamy fine sand to silt clay loam.

Permeability is moderate or moderately rapid. Runoff is slow or medium. The hazard of erosion is slight or moderate. The water supplying capacity is 5.0 to 7.0 inches. Effective rooting depth is 2.5 to 5 feet.

The potential plant community, based on total air-dry weight, is 60 to 75 percent grasses, 15 to 25 percent shrubs, and 1 to 5 percent forbs.

The approximate composition, by weight, of the potential plant community is 15 percent bluebunch wheatgrass; 15 percent needleandthread; 25 percent Indian ricegrass; 15 percent other grasses; 2 percent globemallow; 3 percent other forbs; 10 percent black sagebrush; 3 percent big sagebrush; 2 percent rock goldenrod, which seldom is grazed by livestock; 5 percent yellowbrush; and 5 percent other shrubs.

If this site is in excellent condition, the total annual yield of air-dry herbage is about 950 pounds per acre in favorable years and 400 pounds per acre in unfavorable years. About 90 percent of this production is from plants that furnish forage for livestock and big game.

Continued excessive grazing, especially during the growing season, results in a decrease in bluebunch wheatgrass, needleandthread, Indian ricegrass, squirreltail, globemallow, black sagebrush, and winterfat and in an increase in galleta, blue grama, owl clover, woody phlox, gib sagebrush, yellowbrush, snakeweed, prickly pear, and annual plants. If excessive grazing is prolonged, shadscale, big sagebrush, cheatgrass, and annual forbs invade.

SEMIDESERT SAND RANGE SITE

Only Yenrab fine sand, high rainfall, undulating, is in this range site. It is a deep, somewhat excessively drained soil on low-lying lake terraces. This soil formed in wind-laid deposits from igneous and sedimentary rocks. Slopes are undulating and rolling and range from 1 to 10 percent. Elevation ranges from 4,625 to 4,680 feet. The average annual precipitation is 8 to 11 inches. The average frost-free period is 120 to 125 days.

The soil is fine sand and loamy sand that extends to a depth of 60 inches or more.

Permeability is rapid. Runoff is slow. The hazard of water erosion is moderate, and the hazard of soil blowing is high. The water supplying capacity is 4 to 5 inches. Effective rooting depth is about 5 feet.

The vegetation of this range site is drought tolerant. The potential plant community, based on total air-dry weight, consists of 50 to 65 percent grasses, 25 to 30 percent shrubs, and 5 to 10 percent forbs.

The approximate composition, by weight, of the potential plant community is 25 percent Indian ricegrass; 20 percent needleandthread; 6 percent squirreltail; 14 percent other grasses; 6 percent total forbs, which are seldom grazed by livestock; 5 percent yellowbrush, which is seldom grazed by livestock; 5 percent four-wing saltbush; 10 percent big sagebrush; and 9 percent other shrubs that are seldom grazed by livestock.

If this site is in excellent condition, the total annual yield of air-dry herbage is about 1,000 pounds per acre in favorable years and 650 pounds per acre in unfavorable years. About 80 percent of this production is from plants that furnish forage for livestock and big game.

Continued excessive grazing, especially during the growing season, results in a decrease in Indian rice-

grass, needleandthread, squirreltail, western wheatgrass, sand dropseed, alkali sacaton, and four-wing saltbush and in an increase in scurfpea, evening primrose, Russian thistle, sandbur, yellowbrush, squawbush, rubber rabbitbrush and big sagebrush. If excessive grazing is prolonged, annual weeds and annual grasses take over. Sand blowing into dunes increases as vegetative cover decreases.

This soil is not suitable for seeding.

SEMIDESERT STONY HILLS RANGE SITE

Only Checkett-Rock land association is in this range site. It is on ridgetops and mountain slopes. The soil is shallow and exccessively drained. It formed in residuum from igneous and sedimentary rocks. Slopes are 20 to 40 percent. Elevation ranges from 5,300 to 6,000 feet. The average annual frost-free period is 120 to 125 days.

The soil is dominantly very cobbly loam. It is underlain by bedrock at a depth of about 19 inches.

Permeability is moderately rapid. Runoff is rapid. The hazard of erosion is high. The water supplying capacity is 3 to 4 inches. Effective rooting depth is about 1.5 feet.

The potential plant community, based on total air-dry weight, consists of 60 to 70 percent grass, 30 to 35 percent shrubs, and 1 to 5 percent forbs.

The approximate composition, by weight, of the potential plant community is 35 percent bluebunch wheatgrass; 15 percent Indian ricegrass; 5 percent needleandthread; 10 percent other grasses; 3 percent total forbs; 5 percent black sagebrush; 5 percent bud sagebrush; 10 percent shadscale; 5 percent yellowbrush, which is seldom grazed by livestock; and 7 percent other shrubs.

If this site is in excellent condition, the total annual yield of air-dry herbage is about 900 pounds per acre in favorable years and 400 pounds per acre in unfavorable years. About 90 percent of this production is from plants that furnish forage for livestock and big game.

Excessive grazing during the growing season results in a decrease in bluebunch wheatgrass, Indian ricegrass, needleandthread, Nevada bluegrass, black sagebrush, and winterfat and in an increase in galleta, Mormon tea, yellowbrush, shadscale, and horsebrush. If excessive grazing is prolonged, this site becomes mostly yellowbrush, weeds, cheatgrass, and Russian thistle. This site is not suitable for mechanical treatment or seeding.

Engineering Uses of the Soils [3]

This section is useful to those who need information about soils used as structural material or as foundation upon which structures are built. Among those who can benefit from this section are planning commissions, town and city managers, land developers, engineers, contractors, and farmers.

Among properties of soils highly important in engineering are permeability, strength, compaction characteristics, soil drainage condition, shrink-swell potential, grain size, plasticity, and soil reaction. Also important are depth to the water table, depth to bedrock, and soil slope. These properties, in various degrees and combinations, affect construction and maintenance of roads, airports, pipelines, foundations for small buildings, irrigation systems, ponds and small dams, and systems for disposal of sewage and refuse.

Information in this section of the soil survey can be helpful to those who—

1. Select potential residential, industrial, commercial, and recreational areas.
2. Evaluate alternate routes for roads, highways, pipelines, and underground cables.
3. Seek sources of gravel, sand, or clay.
4. Plan farm drainage systems, irrigation systems, ponds, terraces, and other structures for controlling water and conserving soil.
5. Correlate performance of structures already built with properties of the kinds of soil on which they are built, for the purpose of predicting performance of structures on the same or similar kinds of soil in other locations.
6. Predict the trafficability of soils for cross-country movement of vehicles and construction equipment.
7. Develop preliminary estimates pertinent to construction in a particular area.

Most of the information in this section is presented in tables 3, 4, and 5, which show, respectively, engineering test data; estimated soil properties significant in engineering; and interpretations for various engineering uses.

This information, along with the soil map and other parts of this publication, can be used to make interpretations in addition to those given in tables 5, and it also can be used to make other useful maps.

This information, however, does not eliminate need for further investigations at sites selected for engineering works, especially works that involve heavy loads or that require excavations to depths greater than those shown in tables, generally depths greater than 6 feet. Also, inspection of sites, especially the small ones, is needed because many delineated areas of a given soil mapping unit may contain small areas of other kinds of soil that have strongly contrasting properties and different suitabilities or limitations for soil engineering.

Some of the terms used in this soil survey have different meanings in soil science than in engineering. The Glossary defines many of these terms as they are commonly used in soil science.

Engineering soil classification systems

The two systems most commonly used in classifying samples of soils for engineering are the Unified system (*7*), used by the SCS engineers, Department of Defense, and others, and the AASHTO system, adopted by the American Association of State Highway [and Transportation] Officials (*1*).

In the Unified system soils are classified according to particle size, distribution, plasticity, liquid limit, and organic-matter content. Soils are grouped in 15 classes. There are eight classes of coarse-grained soils, identified as GW, GP, GM, GC, SW, SP, SM, and SC; six classes of fine-grained soils, identified as ML, CL,

[3] GORDON HANSEN, engineer, Soil Conservation Service, helped to prepare this section.

OL, MH, CH, and OH; and one class of highly organic soils, identified as Pt. Soils on the borderline between two classes are designated by symbols for both classes; for example, CL–ML.

The AASHTO system is used to classify soils according to those properties that affect use in highway construction and maintenance. In this system, a soil is placed in one of seven basic groups ranging from A–1 through A–7 on the basis of grain-size distribution, liquid limit, and plasticity index. In group A–1 are gravelly soils of high bearing strength, or the best soils for subgrade (foundation). At the other extreme, in group A–7, are clay soils that have low strength when wet and that are the poorest soils for subgrade. Where laboratory data are available to justify a further breakdown, the A–1, A–2, and A–7 groups are divided as follows the A–1–a, A–1–b, A–2–4, A–2–5, A–2–6, A–2–7, A–7–5, and A–7–6. As additional refinement, the engineering value of a soil material can be indicated by a group index number. Group indexes range from 0 for the best material to 20 or more for the poorest. The AASHTO classification for tested soils, with group index numbers in parentheses, is shown in table 3; the estimated classification, without group index numbers, is given in table 4 for all soils mapped in the survey area.

Soil test data

Table 3 contains the results of engineering tests performed by Utah State University on several soils in Delta Area.

The table shows the specific location where samples were taken, the depth to which sampling was done, and the results of tests to determine particle-size distribution and other properties significant in soil engineering.

Compaction, or moisture-density, data are important in earthwork. If a soil material is compacted at successively higher moisture content, assuming that the compactive effort remains constant, the density of the compacted material increases until the *optimum moisture content* is reached. After that, density decreases with increase in moisture content. The highest dry density obtained in the compactive test is termed *maximum dry density*. As a rule, maximum strength of earthwork is obtained if the soil is compacted to the maximum dry density.

Mechanical analyses show the percentages, by weight, of soil particles that would pass sieves of specified sizes. Sand and other coarser materials do not pass through the No. 200 sieve. Silt and clay pass through the No. 200 sieve. Silt is that material larger than 0.002 millimeter in diameter that passes through the No. 200 sieve, and clay is that fraction passing through the No. 200 sieve that is smaller than 0.002 millimeter in diameter. The clay fraction was determined by the hydrometer method rather than by the pipette method most soil scientists use in determining the clay in soil samples.

Tests to determine liquid limit and plasticity index measure the effect of water on the consistence of soil material. These terms are explained for table 4.

Estimated properties significant to engineering

Several estimated soil properties significant in engineering are given in table 4. These estimates are made for typical soil profiles, by layers sufficiently different to have different significance for soil engineering. The estimates are based on field observations made in the course of mapping, on test data for these and similar soils, and on experience with the same kinds of soil in other counties. Following are explanations of some of the columns in table 4.

Depth to bedrock is distance from the surface of the soil to the upper surface of the rock layer.

Depth to seasonal high water table is distance from the surface of the soil to the highest level that ground water reaches in the soil in most years.

Soil texture is described in table 4 in the standard terms used by the Department of Agriculture. These terms take into account relative percentages of sand, silt, and clay in soil material that is less than 2 millimeters in diameter. "Loam," for example, is soil material that contains 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the soil contains gravel or other particles coarser than sand, an appropriate modifier is added, as for example, "gravelly loamy sand." "Sand," "silt," "clay," and some of the other terms used in the USDA textural classification are defined in the Glossary.

Liquid limit and plasticity index indicate the effect of water on the strength and consistence of soil material. As the moisture content of a clayey soil is increased from a dry state, the material changes from a semisolid to a plastic state. If the moisture content is further increased, the material changes from a plastic to a liquid state. The plastic limit is the moisture content at which the soil material changes from the semisolid to plastic state; and the liquid limit, from a plastic to a liquid state. The plasticity index is the numerical difference between the liquid limit and the plastic limit. It indicates the range of moisture content within which a soil material is plastic. Liquid limit and plasticity index are estimated in table 4, but in table 3 the data on liquid limit and plasticity index are based on tests of soil samples.

Permeability is that quality of a soil that enables it to transmit water or air. It is estimated on the basis of those soil characteristics observed in the field, particularly porosity, structure, and texture. The estimates in table 4 do not take into account lateral seepage or such transient soil features as plowpans and surface crusts.

Available water capacity is the ability of soils to hold water for use by most plants. It is commonly defined as the difference between the amount of water in the soil at field capacity and the amount at the wilting point of most crop plants.

Reaction is the degree of acidity or alkalinity of a soil, expressed in pH values. The pH value and terms used to describe soil reaction are explained in the Glossary.

The amount of soluble salts in the soil is expressed as the *electrical conductivity* of the saturation extract, in mmhos per centimeter at 25°C. Salinity affects the suitability of a soil for crop production, its stability when used as construction material, and its corrosiveness to metals and concrete.

Shrink-swell potential is the relative change in volume to be expected of soil material with changes

TABLE 3.—*Engineering*

[Tests performed by Utah State University. Absence of

Soil name and location	Parent material	Depth from surface	Horizon	Moisture density [1]	
				Maximum dry density	Optimum moisture
		Inches		*Lb per cu ft*	*Percent*
Abbott silty clay: one-half mile east of Topaz chicken ranch, NE¼NE¼ sec. 23, T. 16 S., R. 8 W.	Lake sediment and alluvium.	0–40 40–61	A1–C C	98 109	23 22
Abraham loam: NW¼SW¼ sec. 7, T. 17 S., R. 7 W.	Lake sediment and alluvium.	0–7 7–18 18–26 29–43 43–57	A1 C C C C	110 110 104 102 101	17 16 18 18 22
Anco silty clay loam: sec. 6, T. 18 S., R. 6 W.	Lake sediment and alluvium.	0–21 21–33	A1–C C	107 107	21 18
Curdli loam: NW¼ sec. 4, T. 19 S., R. 10 W.	Lake sediment and alluvium.	4–14 14–60	C C	93 88	25 30
Goshute gravelly silt loam: SW¼ sec. 32, T. 19 S., R. 10 W.	Lake sediment.	4–12 17–60	B2t C	118	14
Hiko Springs sandy loam: NE¼ sec. 23, T. 20 S., R. 9 W.	Lake sediment and alluvium.	0–14 14–20 36–60	A1–C C C	124 125 123	10 10 11
Penoyer silt loam: SE¼ sec. 9, T. 17 S., R. 6 W.	Lake sediment and alluvium.	0–9 9–48 48–64	A1 C C	102 107 106	21 18 19
Poganeab silty clay loam, strongly saline: sec. 20, T. 16 S., R. 7 W.	Lake sediment and alluvium.	0–31 31–60	A1–C C	101 101	22 22
Uvada silt loam: NE¼ sec. 23, T. 18 S., R. 9 W.	Lake sediment.	4–17 17–47	B2t C	99 104	24 20
Yenrab fine sand: NW¼ sec. 17, T. 16 S., R. 6 W.	Eolian deposit.	0–60	C	102	12

[1] Based on AASHTO Designation T 99–57, Method A (*1*).

[2] Mechanical analyses according to the AASHTO Designation T 88 (*1*). Results by this procedure frequently may differ somewhat from results that would have been obtained by the soil survey procedure of the Soil Conservation Service (SCS). In the AASHTO procedure, the fine material is analyzed by the hydrometer method and the various grain-size fractions are calculated on the basis of all the material, including that coarser than 2 millimeters in diameter. In the SCS soil survey procedure, the fine material is analyzed by the pipette method and the material coarser than 2 millimeters in diameter is excluded from calculations of grain-size fractions. The mechanical analyses used in this table are not suitable for use in naming textural classes for soil.

test data

an entry indicates that no determination was made]

Mechanical analyses [2]									Liquid limit	Plasticity index	Classification	
Percentage passing sieve—					Percentage smaller than—							
1 inch [3]	No. 4 (4.7 mm)	No. 10 (2.00 mm)	No. 40 (0.42 mm)	No. 200 (0.074 mm)	0.05 mm	0.02 mm	0.005 mm	0.002 mm			AASHTO [4]	Unified [5]
			100	99	98	94	81	56	53	30	A–7–6(19)	CH
			100	91	85	72	50	36	32	14	A–6(10)	CL
			100	83	62	40	22	17	27	6	A–4(8)	ML–CL
			100	84	66	37	22	17	27	4	A–4(8)	ML
			100	61	31	16	9	7	0	[6] NP	A–4(5)	ML
			100	73	36	16	10	8	0	NP	A–4(8)	ML
			100	95	92	80	47	28	34	13	A–4(9)	CL
			100	86	74	57	30	21	29	9	A–4(8)	CL
			100	91	73	44	21	15	29	5	A–4(8)	ML
		100	98	82	68	44	21	15	36	7	A–4(8)	ML
		100	99	94	93	87	59	33	49	20	A–7(14)	ML
100	98	95	88	58	51	46	33	29	27	11	A–6(5)	CL
100	64	27	6	4	4	3	3	2	0	NP	A–1–a(0)	SW
100	97	94	69	34	25	14	7	4	0	NP	A–2–4(0)	SM
93	86	82	55	28	20	12	6	5	0	NP	A–2–4(0)	SM
88	70	65	45	23	19	14	10	8	24	6		SM–SC
			100	96	92	78	44	29	34	13	A–6(9)	CL
			100	95	87	54	26	19	31	9	A–4(8)	CL
			100	97	93	77	36	26	34	14	A–6(10)	CL
			100	86	74	64	56	40	38	16	A–6(10)	CL
			100	99	97	86	60	40	39	17	A–6(11)	CL
			100	95	93	87	73	53	44	21	A–7–6(13)	CL
			100	99	98	92	73	54	39	17	A–6(11)	CL
100	98	95	84	11	8	5	4	4	0	NP	A–2–4(0)	SP–SM

[3] Material larger than 3 inches was not discarded.

[4] Based on AASHTO Designation M 145–49 (*1*).

[5] Based on the Unified soil classification system (*7*).

[6] NP means nonplastic.

TABLE 4.—*Estimated soil properties*

[An asterisk in the first column indicates that at least one mapping unit in the series is made up of two or more kinds of soil. The instructions for referring to other series that appear in

Soil series and map symbols	Depth to—		Depth from surface	Dominant USDA texture	Classification		Percentage larger than 3 inches
	Bedrock	Seasonal water table			Unified	AASHTO	
	Feet	*Feet*	*Inches*				*Pct*
Abbott:							
Aa, Ab, AE	>15	(Aa,Ab) 5–12 (AE) 3	0–60	Silty clay	CH or CL	A–7 or A–6	0
Af, Ag	>15	6–12	0–40	Silty clay	CH or CL	A–7 or A–6	0
			40–60	Sand and sandy loam.	SM	A–2	0
Abraham: Ah, Ak, Am, An	>15	5–12	0–60	Silt loam and very fine sandy loam.	CL–ML or CL	A–4 or A–6	0
Alluvial land: AO. Onsite investigation needed.							
Alluvial land, wet: Ar. Onsite investigation needed.							
Anco:							
As, At	>15	5–12	0–60	Silty clay loam	CL–ML or CL	A–4	0
Av	>15	6–12	0–40	Silty clay loam	CL–ML or CL	A–4	0
			40–60	Sand and loamy fine sand.	SM	A–2	0
Bluewing: BLC2	>6	(2)	0–10	Very cobbly loam	GM–GC or GM	A–1 or A–2	30–40
			10–60	Very gravelly sand.	GW or GW–GM	A–1	0–15
Cache: CA	>15	0–4	0–60	Silty clay and silty clay loam.	CH or CL	A–7 or A–6	0
*Checkett: CR Onsite investigation needed for Rock land part.	1–2	(2)	0–19	Very cobbly clay loam.	GC, GM–GC, or GP–GC	A–2	20–60
			19	Bedrock.			
Curdli: CU	>15	10–15	0–60	Heavy silt loam and loam.	ML	A–4 or A–7	0
Deseret: De	>15	4–8	0–60	Silty clay loam and silt loam.	ML	A–4 or A–7	0
Drum: DU	>15	10–15	0–60	Silty clay loam	ML	A–4 or A–7	0
Duggins: Dv	>15	>10	0–60	Silty clay	CH or CL	A–7 or A–6	0
Dune land: Dw. Onsite investigation needed.							
*Escalante: ESB, EYC For Yenrab part of EYC, see Yenrab series.	>15	>15	0–41	Sandy loam	SM–SC or SC	A–4 or A–2	0
			41–60	Silt loam	ML or CL–ML	A–4	0

significant to engineering

soils in such mapping units may have different properties and limitations, and for this reason it is necessary to follow carefully the the first column of the table. The sign > means more than]

Percentage passing sieve—				Liquid limit	Plasticity index	Permeability	Available water capacity	Reaction (1:5)	Electrical conductivity	Shrink-swell potential	Hydrologic group	Susceptibility to frost action
No. 4 (4.7 mm)	No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.074 mm)									
				Pct		*In per hr*	*In per in of soil*	*pH*	*Mmhos per cm at 25° C*			
100	100	100	90–100	30–55	15–30	0.06–0.2	0.17–0.18	8.5–>9.1	(Aa,AE) 4–15 (Ab) 15–40	High	D	Moderate.
100	100	100	90–100	30–55	15–30	0.06–0.2	0.17–0.18	8.5–>9.1	(Af) 4–15 (Ag) 15–40	High	D	Moderate.
100	100	80–95	12–25	0	[1] NP	6.0–20	0.06–0.08	7.9–8.4	4–15	Low.		
100	100	95–100	65–85	15–25	5–15	0.6–2.0	0.13–0.16	8.5–9.0	(Ah,Am) 3–10 (Ak,An) 15–30	Low	B	High.
100	100	100	85–95	25–30	5–10	0.2–0.6	0.17–0.18	7.9–9.0	(As) 3–10 (At) 15–30	Moderate	C	High.
100	100	100	85–95	25–30	5–10	0.2–0.6	0.17–0.18	7.9–9.0	3–10	Moderate	C	High.
100	100	100	12–25	0	NP	6.0–20	0.06–0.08	7.9–8.4	3–10	Low.		
30–45	20–35	15–25	15–25	10–20	NP–7	6.0–20	0.06–0.10	8.5–>9.1	1–4	Low	B	Low.
20–35	15–25	5–15	0–10	0	NP	6.0–20	0.02–0.03	7.9–9.0	2–4	Low.		
100	100	100	90–100	30–55	15–30	0.06–0.2	0.17–0.18	7.9–9.0	30–60	High	D	Moderate.
25–45	20–40	15–30	5–20	15–20	6–10	2.0–6.0	0.07–0.08	7.9–9.0	1–3	Low	D	Low.
100	100	90–100	80–95	35–50	5–20	0.6–2.0	0.17–0.18	8.5–9.0	15–30	Moderate	C	High.
100	100	90–100	80–95	35–50	5–20	0.2–0.6	0.17–0.18	7.9–9.0	1–4	Moderate	C	High.
100	100	95–100	85–95	35–50	5–20	0.2–0.6	0.17–0.18	7.9–9.0	15–40	Moderate	C	High.
100	100	100	90–100	30–55	15–30	.06–0.2	0.17–0.18	8.5–9.0	1–4	High	D	Moderate.
100	100	70–80	30–40	15–25	5–10	2.0–6.0	0.10–0.12	7.9–>9.1	1–4	Low	B	Moderate.
100	100	90–100	65–85	25–35	5–10	0.6–2.0	0.17–0.18	7.9–9.0	1–4	Low to moderate.		

TABLE 4.—*Estimated soil properties*

Soil series and map symbols	Depth to—		Depth from surface	Dominant USDA texture	Classification		Percentage larger than 3 inches
	Bedrock	Seasonal water table			Unified	AASHTO	
	Feet	*Feet*	*Inches*				*Pct*
Goshute: GO	>10	>15	0–17	Silty clay loam and gravelly silt loam.	CL	A–6	0
			17–60	Fine gravel	SW or SP	A–1	0
Hiko Springs: HKC2	>6	(2)	0–14	Sandy loam	SM	A–2	0
			14–60	Gravelly sandy loam and gravelly light clay loam.	SM, SC, or SM–SC	A–1 or A–2	0–10
Hiko Springs variant: HLC	2–3	(2)	0–29	Cobbly loam and cobbly sandy loam.	GM–GC or GM	A–2 or A–1	40–50
			29	Indurated lime hardpan.			
Kanosh: Ka	>15	1–4	0–60	Very fine sandy loam.	CL–ML	A–4	0
Kessler: KEB, KLB, KsA	>15	>10	0–60	Silt loam and silty clay loam.	ML or CL	A–7 or A–4	0
Lahontan: LA	>15	6–12	0–60	Silty clay	CH or CL	A–7 or A–6	0
Lahontan variant: LC	>15	10–15	0–34	Silty clay and silty clay loam.	CH or CL	A–7 or A–6	0
			34–60	Sand	SM or SP–SM	A–2	0
Lava flows: LF. Onsite investigation needed.							
Mellor: ME	>15	>10	0–60	Silty clay loam	CL	A–6	0
Modena: Mo	>15	>10	0–41	Sandy loam	SM–SC or SC	A–2	0
			41–60	Silty clay loam	CL	A–6	0
Musinia: Mu	>15	>10	0–60	Silty clay loam	CL	A–6	0
Pahranagat: PA	>15	0–4	0–60	Silt loam	CL	A–6	0
Penoyer: Pe, Ph	>15	>15 (Ph) 7–13	0–60	Silt loam	CL	A–6	0
*Playas: PM, PN. Onsite investigation needed for Playas part of PM and PN. For Abbott part of PN, see Abbott series.							
*Poganeab: Po, Pr	>15	5–12	0–60	Silty clay loam	CL	A–6	0
Pt, PU	>15	6–12	0–40	Silty clay loam	CL	A–6	0
			40–60	Loamy sand and sand.	SM	A–2	0
For Uffens part of PU, see Uffens series.							

significant to engineering—Continued

Percentage passing sieve—				Liquid limit	Plasticity index	Permeability	Available water capacity	Reaction (1:5)	Electrical conductivity	Shrink-swell potential	Hydrologic group	Susceptibility to frost action
No. 4 (4.7 mm)	No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.074 mm)									
				Pct		*In per hr*	*In per in of soil*	*pH*	*Mmhos per cm at 25° C*			
80–100	75–95	70–90	50–65	20–30	10–15	0.2–0.6	0.17–0.18	8.5–>9.1	15–30	Moderate	D	High.
50–70	20–35	5–10	0–5	0	NP	20	0.02–0.03	7.9–9.0	10–30	Low	-------	Low.
90–100	80–95	45–70	20–35	0	NP	0.6–2.0	0.06–0.10	7.9–9.0	2–4	Low	B	Moderate.
65–95	80–95	20–55	12–30	15–25	NP–10	2.0–6.0	0.12–0.13	8.5–>9.1	2–4	Low.		
35–45	30–40	25–35	20–30	10–20	NP–7	2.0–6.0	0.05–0.07	8.5–9.0	2–4	Low	C	Moderate.
100	100	100	60–80	15–25	4–7	2.0–6.0	0.12–0.14	7.9–8.4	15–30	Moderate	C	High.
100	90–100	75–90	70–85	30–45	5–20	0.6–2.0	0.17–0.18	7.9–>9.1	1–4 (KLB) 10–30	Moderate	C	High.
100	100	100	90–100	35–55	15–30	0.06–0.2	0.17–0.18	7.9–>9.1	4–15	High	D	Moderate.
100	100	100	80–100	30–55	15–30	0.06–0.2	0.17–0.18	7.9–9.0	30–60	High	D	Moderate.
95–100	95–100	80–90	5–15	0	NP	6.0–20	0.02–0.03	7.9–9.0	30–60	Low.		
100	100	100	80–95	35–40	15–20	0.2–0.6	0.17–0.18	7.9–>9.1	15–30	Moderate	D	High.
100	100	60–75	25–35	15–25	5–10	2.0–6.0	0.08–0.10	7.9–9.0	1–4	Low	B	Moderate.
100	100	100	80–95	35–40	15–20	0.2–0.6	0.17–0.18	8.5–9.0	1–4	Low to moderate.	-------	Moderate.
100	100	100	80–95	35–40	15–20	0.2–0.6	0.17–0.18	7.9–9.0	1–4	Moderate	C	High.
100	100	85–100	80–95	30–35	10–15	0.2–0.6	0.17–0.18	7.9–9.0	15–30	Moderate	D	High.
100	100	100	75–100	30–35	10–15	0.6–2.0	0.17–0.18	7.9–9.0	(Pe) 3–10 (Ph) 10–30	Low	C	High.
100	100	100	80–100	35–40	15–20	0.2–0.6	0.17–0.18	7.9–9.0	(Po) 3–10 (Pr) 15–30	Moderate	C	High.
100	100	100	80–100	35–40	15–20	0.2–0.6	0.17–0.18	7.9–9.0	3–10	Moderate	C	High.
100	100	80–95	12–25	0	NP	6.0–20	0.06–0.08	7.9–9.0	3–10	Low.		

TABLE 4.—*Estimated soil properties*

Soil series and map symbols	Depth to—		Depth from surface	Dominant USDA texture	Classification		Percentage larger than 3 inches
	Bedrock	Seasonal water table			Unified	AASHTO	
	Feet	*Feet*	*Inches*				*Pct*
Rock land: Onsite investigation needed. Mapped only in association with Sugarloaf and Checkett soils.							
Saltair: SA, SD	>15	0–5	0–60	Silt loam	CL	A–6	0
Saltair variant: SE	>15	3–5	0–49	Silty clay loam	CL	A–6	0
			49–60	Loamy sand	SM or SP–SM	A–2	0
Shear: ShB	>15	8–15	0–60	Clay and silty clay	CL	A–7	0
Stony colluvial land: ST. Onsite investigation needed.							
Sugarloaf: SU, SV	5–15	(2)	0–19	Sandy loam	SM–SC or SC	A–2	0
Onsite investigation needed for Rock land part of SV.			19–60	Loamy fine sand and fine gravelly sand.	SM or SP–SM	A–1	0
Swasey: SWC	2–4	(2)	0–4	Very cobbly loam	GM–GC or GM	A–2	35–50
			4–27	Clay loam and sandy clay loam.	ML or CL	A–4 or A–6	0
			27	Bedrock.			
Toddler: TO	>15	>15	0–60	Sandy clay loam	CL–ML or CL	A–4 or A–6	0
*Uffens: UE, UFC, UH2 For Swasey part of UFC see Swasey series; for Uvada part of UH2, see Uvada series.	>15	>15	0–60	Sandy clay loam	CL–ML or CL	A–4 or A–6	0
*Uvada: UL, UM, UN2, UYC For Toddler part of UN2, see Toddler series; for Yenrab part of UYC, see Yenrab series.	>15	>15	0–17	Silty clay and silty clay loam.	CL	A–7	0
			17–60	Silty loam and silty clay loam.	CL	A–6	0
Woodrow: Wo	>15	>10	0–60	Silty clay loam	CL	A–6	0
*Yenrab: YBC, YDC, YeC, YL, YUC. For Lava flows part of YL, see Lava flows; for Uffens part of YUC, see Uffens series.	>15	>15	0–60	Sand and loamy sand.	SP–SM or SM	A–3 or A–2	0
Yuba: YV	>15	7–12	0–60	Silty clay loam	CL	A–6	0

[1] NP means nonplastic.
[2] Water table is not present within the depth of observation, which is generally 5 feet or more, unless otherwise specified.

significant to engineering—Continued

Percentage passing sieve—				Liquid limit	Plasticity index	Permeability	Available water capacity	Reaction (1:5)	Electrical conductivity	Shrink-swell potential	Hydrologic group	Susceptibility to frost action
No. 4 (4.7 mm)	No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.074 mm)									
				Pct		*In per hr*	*In per in of soil*	*pH*	*Mmhos per cm at 25° C*			
100	100	85–100	80–95	30–35	10–15	0.6–2.0	0.17–0.18	7.9–9.0	30–60	Moderate	D	High.
100	100	90–100	85–95	30–35	10–15	0.2–0.6	0.17–0.18	8.5–>9.1	15–40	Moderate	C	High.
100	100	75–90	5–15	0	NP	6.0–20	0.05–0.07	7.9–9.0	15–40	Low.		
100	100	80–95	75–85	40–45	20–25	0.2–0.6	0.17–0.18	7.9–9.0	15–30	High	D	Moderate.
85–100	75–90	45–60	20–35	15–25	5–10	2.0–6.0	0.09–0.11	7.9–9.0	3–8	Low	B	Moderate.
60–85	40–75	20–45	5–25	0	NP	6.0–20	0.02–0.06	7.9–9.0	3–8	Low.		
25–50	20–45	15–40	12–35	10–20	NP–7	0.6–2.0	0.07–0.09	8.5–9.0	8–15	Low	D	High.
100	100	65–75	55–65	25–40	5–20	0.2–0.6	0.16–0.18	7.9–>9.1	8–15	Moderate.		
100	100	80–95	50–60	25–40	5–20	0.6–2.0	0.16–0.18	7.9–9.0	15–30	Moderate	C	Moderate.
100	100	65–75	55–65	25–40	5–20	0.2–0.6	0.17–0.18	8.5–>9.1	15–30	Moderate	D	Moderate.
100	100	95–100	75–100	40–45	20–25	0.06	0.17–0.18	8.5–>9.1	10–30	High	D	High.
100	100	95–100	70–100	35–40	15–20	0.06–0.2	0.17–0.18	8.5–>9.1	15–40 (UM,UYC) 30–60	High.		
100	100	100	85–95	35–40	15–20	0.2–0.6	0.17–0.18	7.9–9.0	1–4	Moderate	C	High.
95–100	90–100	80–100	5–15	0	NP	6.0–20	0.05–0.07	8.5–>9.1	1–8	Low	A	Low.
100	100	100	85–95	35–40	15–20	0.06–0.2	0.17–0.18	7.9–9.0	10–30	Moderate	D	High.

TABLE 5.—*Interpretations of engineering*

[An asterisk in the first column indicates that at least one mapping unit in the series is made up of two or more kinds of soil. The instructions for referring to other series

Soil series and map symbols	Degree and kind of limitation for—				
	Septic tank absorption fields	Sewage lagoons	Sanitary landfill (trench type)	Foundations for dwellings without basements (single story)	Local roads and streets
Abbott: Aa, Ab, AE	Severe: slow permeability.	Severe for AE: seasonal water table at a depth of 3 feet. Slight for Aa, Ab.	Severe: silty clay texture.	Severe: high shrink-swell potential; low strength.	Severe: high shrink-swell potential; low strength.
Af, Ag	Severe: slow permeability above a depth of 40 inches.	Severe: rapid permeability below a depth of 40 inches.	Severe: silty clay texture above a depth of 40 inches; rapid permeability below a depth of 40 inches.	Severe: high shrink-swell potential; low strength.	Severe: high shrink-swell potential; low strength.
Abraham: Ah, Ak, Am, An.	Moderate: moderate permeability.	Moderate: moderate permeability.	Moderate: somewhat poorly drained.	Severe: high potential frost action.	Severe: high potential frost action.
Anco: As, At	Severe: moderately slow permeability.	Slight	Moderate: somewhat poorly drained.	Severe: high potential frost action.	Severe: high potential frost action.
Av	Slight	Severe: rapid permeability below a depth of 40 inches.	Severe: rapid permeability below a depth of 40 inches.	Severe: high potential frost action.	Severe: high potential frost action.

properties of the soils

soils in such mapping units may have different properties and limitations, and for this reason it is necessary to follow carefully the that appear in the first column of the table]

Suitability as source of—			Soil features affecting—			
Topsoil	Sand and gravel	Road fill	Reservoir areas	Embankments [1]	Drainage for crops	Irrigation
Poor: silty clay texture.	Unsuitable: excessive fines.	Poor: high shrink-swell potential; low strength.	Slopes of 0 to 2 percent; slow permeability.	Low shear strength; medium to high compressibility.	Slow permeability; seasonal water table at a depth of 5 to 12 feet in Aa, Ab; seasonal water table at a depth of 3 feet in AE.	Silty clay; slow permeability; very slow intake; difficult to till; high available water capacity; Aa is slightly to moderately saline; Ab, AE are strongly saline.
Poor: silty clay texture.	Unsuitable in top 40 inches: excessive fines. Unsuitable for gravel and poor for sand below a depth of 40 inches: excessive fines.	Poor in top 40 inches: high shrink-swell potential; low strength. Good below a depth of 40 inches.	Rapid permeability below a depth of 40 inches.	Low shear strength; medium to high compressibility above a depth of 40 inches; medium to low permeability when compacted; medium shear strength, low to medium compressibility, and medium to high susceptibility to piping below a depth of 40 inches.	Rapid permeability below a depth of 40 inches.	Silty clay; difficult to till; Af is slightly to moderately saline; Ag is strongly saline.
Fair to poor: excessive salts.	Unsuitable: excessive fines.	Poor: high potential frost action.	Moderate permeability; slopes of 0 to 2 percent.	Medium to low permeability when compacted; low shear strength; medium compressibility; medium to high susceptibility to piping.	Moderate permeability; water table at a depth of 5 to 12 feet where drained and irrigated.	Moderate permeability; easy to till; high available water capacity; slightly saline to strongly saline.
Fair to poor: excessive salts; silty clay loam texture.	Unsuitable: excessive fines.	Poor: high potential frost action.	Moderately slow permeability; slopes of 0 to 1 percent.	Medium to low permeability when compacted; low shear strength; medium compressibility; medium to high susceptibility to piping.	Moderately slow permeability; water table at a depth of 5 to 12 feet where drained and irrigated.	Moderately slow permeability; moderately difficult to till; high available water capacity; As is slightly saline to moderately saline; Af is strongly saline.
Fair: excessive salts.	Unsuitable in top 40 inches: excessive fines. Unsuitable for gravel below a depth of 40 inches. Poor for sand below a depth of 40 inches.	Poor: high potential frost action.	Rapid permeability below a depth of 40 inches; slopes of 0 to 1 percent.	Medium to low permeability when compacted, low shear strength, medium compressibility, and medium to high susceptibility to piping above a depth of 40 inches; high to low permeability when compacted, medium shear strength, low to medium compressibility, and medium to high susceptibility to piping below a depth of 40 inches.	Rapid permeability below a depth of 40 inches.	Moderately difficult to till; high available water capacity; slightly saline to moderately saline.

TABLE 5.—*Interpretations of engineering*

Soil series and map symbols	Degree and kind of limitation for—				
	Septic tank absorption fields	Sewage lagoons	Sanitary landfill (trench type)	Foundations for dwellings without basements (single story)	Local roads and streets
Bluewing: BLC2	Slight	Severe: rapid permeability.	Severe: rapid permeability; very cobbly or gravelly.	Slight	Slight
Cache: CA	Severe: slow permeability; high seasonal water table.	Severe: high seasonal water table.	Severe: silty clay texture; high water table.	Severe: high water table; high shrink-swell potential; low strength.	Severe: high seasonal water table; high shrink-swell potential; low strength.
*Checkett: CR Onsite investigation needed for Rock land part.	Severe: slopes of 20 to 40 percent; shallow depth to bedrock.	Severe: slopes of 20 to 40 percent; shallow depth to bedrock.	Severe: slopes of 20 to 40 percent; shallow depth to bedrock.	Severe: slopes of 20 to 40 percent; shallow depth to bedrock.	Severe: slopes of 20 to 40 percent; shallow depth to bedrock.
Curdli: CU	Moderate: moderate permeability.	Moderate: moderate permeability.	Moderate: moderate permeability.	Severe: high potential frost action.	Severe: high potential frost action.
Deseret: De	Severe: moderately slow permeability; seasonal high water table.	Moderate: seasonal high water table.	Severe: seasonal high water table.	Severe: high potential frost action.	Severe: high potential frost action.
Drum: DU	Severe: moderately slow permeability.	Slight	Moderate: silty clay loam texture.	Severe: high potential frost action.	Severe: high potential frost action.
Duggins: Dv	Severe: slow permeability.	Slight	Severe: silty clay texture.	Severe: high shrink-swell potential; low strength.	Severe: high shrink-swell potential; low strength.
Dune land: DW. Onsite investigation needed.					

properties of the soils—Continued

Suitability as source of—			Soil features affecting—			
Topsoil	Sand and gravel	Road fill	Reservoir areas	Embankments [1]	Drainage for crops	Irrigation
Poor: very cobbly surface layer.	Good to fair below a depth of 1 foot.	Good	Rapid permeability; slopes of 3 to 10 percent.	High to low permeability when compacted; high to medium shear strength.	Somewhat excessively drained.	Rapid permeability; uneven slopes of 3 to 10 percent; very cobbly surface layer; low available water capacity.
Poor: silty clay; high water table; very strongly saline.	Unsuited: excessive fines.	Poor: high shrink-swell potential; high seasonal water table; low strength.	Slow permeability; slopes of 0 to 1 percent.	Low shear strength; medium to high compressibility.	Slow permeability; water table at a depth of 0 to 4 feet; outlets are a concern.	Slow permeability; water table at a depth of 0 to 4 feet; very strongly saline; hard to till.
Poor: very cobbly; shallow depth to bedrock.	Poor: shallow depth to bedrock.	Poor: shallow depth to bedrock.	Bedrock at a depth of 19 inches; slopes of 20 to 40 percent.	High permeability when compacted; high shear strength.	Excessively drained.	Shallow depth to bedrock; very cobbly; slopes of as much as 40 percent.
Poor: strongly saline.	Unsuited: excessive fines.	Poor: high potential frost action.	Moderate permeability; slopes of 0 to 1 percent.	Medium to low permeability when compacted; low shear strength; medium compressibility; medium to high susceptibility to piping.	Well drained	Moderate permeability; high lime zone at a depth of 4 inches; strongly saline; high available water capacity.
Good to poor: high in gypsum below a depth of 15 inches.	Unsuited: excessive fines.	Poor: high potential frost action.	Moderately slow permeability; slopes of 0 to 1 percent; high gypsum content below a depth of 15 inches.	Low permeability when compacted; medium to low shear strength; compressibility; medium to high susceptibility to piping; high gypsum content below a depth of 15 inches.	Moderately slow permeability; water table at a depth of 4 to 8 feet.	Moderately slow permeability; water table at a depth of 4 to 8 feet; easy to till; high gypsum content.
Poor: strongly saline.	Unsuited: excessive fines.	Poor: high potential frost action.	Moderately slow permeability; slopes of 0 to 2 percent.	Medium permeability when compacted; low shear strength; medium compressibility; medium to high susceptibility to piping.	Moderately well drained.	Moderately slow permeability; easy to till; high lime zone at a depth of 11 inches; strongly saline; high available water capacity.
Poor: silty clay texture.	Unsuited: excessive fines.	Poor: high shrink-swell potential; low strength.	Slow permeability; slopes of 0 to 1 percent.	Low to medium shear strength; medium to high compressibility.	Well drained	Slow permeability; hard to till; crusting; high available water capacity.

TABLE 5.—*Interpretations of engineering*

Soil series and map symbols	Degree and kind of limitation for—				
	Septic tank absorption fields	Sewage lagoons	Sanitary landfill (trench type)	Foundations for dwellings without basements (single story)	Local roads and streets
*Escalante: ESB, EYC — For Yenrab part of EYC, see Yenrab series.	Slight	Moderate: slopes of 1 to 5 percent; moderate permeability.	Slight	Moderate: moderate potential frost action.	Moderate: moderate potential frost action.
Goshute: GO	Slight: very rapid permeability below a depth of 1½ feet; may be a pollution hazard to water supplies.	Severe: very rapid permeability below a depth of 1½ feet.	Severe: very rapid permeability below a depth of 1½ feet.	Severe in top 1½ feet: high potential frost action. Slight below a depth of 1½ feet.	Severe: high potential frost action.
Hiko Springs: HKC2	Moderate: slopes of 3 to 10 percent.	Severe: slopes of 3 to 10 percent; moderately rapid permeability below a depth of 14 inches.	Slight	Moderate: potential frost action.	Moderate: moderate potential frost action.
Hiko Springs variant: HLC.	Severe: hardpan at a depth of 2½ feet.	Severe: hardpan at a depth of 2½ feet.	Severe: hardpan at a depth of 2½ feet.	Moderate: moderate potential frost action; hardpan at a depth of 2½ feet.	Moderate: moderate potential frost action; hardpan at a depth of 2½ feet.
Kanosh: Ka	Severe: seasonal high water table at a depth of 1 to 4 feet.	Severe: seasonal high water table at a depth of 1 to 4 feet.	Severe: seasonal high water table at a depth of 1 to 4 feet.	Severe: high potential frost action; water table at a depth of 1 to 4 feet.	Severe: high potential frost action; water table at a depth of 1 to 4 feet.
Kessler: KEB, KLB, KsA	Moderate: moderate permeability.	Moderate: slopes of 1 to 5 percent.	Slight	Severe: high potential frost action.	Severe: high potential frost action.
Lahontan: LA	Severe: slow permeability.	Slight	Severe: silty clay texture.	Severe: high shrink-swell potential; low strength.	Severe: high shrink-swell potential; low strength.

properties of the soils—Continued

Suitability as source of—			Soil features affecting—			
Topsoil	Sand and gravel	Road fill	Reservoir areas	Embankments [1]	Drainage for crops	Irrigation
Good	Unsuited for gravel; poor for sand; excessive fines.	Fair: moderate susceptibility to frost action.	Moderately rapid permeability above a depth of 40 inches. Moderate below a depth of 40 inches; slopes of 1 to 5 percent.	Medium to low permeability when compacted; medium shear strength; low to medium compressibility; medium to high susceptibility to piping.	Well drained	Moderately rapid to moderate permeability; easy to till, moderately high available water capacity.
Poor: strongly saline-alkali; gravelly below a depth of 1½ feet.	Unsuited to a depth of 1½ feet. Poor for gravel below a depth of 1½ feet. Good for sand below a depth of 1½ feet.	Good below a depth of 17 inches.	Very rapid permeability below a depth of 1½ feet; slopes of 0 to 2 percent.	Low to medium shear strength; medium compressibility in top 1½ feet; high permeability when compacted below a depth of 1½ feet.	Well drained	Low available water capacity; sand and gravel below a depth of 1½ feet; strongly saline and alkali.
Poor: gravelly	Unsuited for gravel. Poor for sand: excessive fines.	Fair: moderate susceptibility to frost action.	Moderately rapid permeability; slopes of 3 to 10 percent.	Medium to low permeability when compacted; medium shear strength; low to medium compressibility; medium to high susceptibility to piping.	Well drained	Moderate permeability; slopes of 3 to 10 percent; moderately low available water capacity.
Poor: very cobbly or very gravelly.	Poor: lime cemented hardpan at a depth of 2½ feet; excessive fines.	Poor: hardpan at a depth of 2½ feet.	Slopes of 3 to 10 percent; hardpan at a depth of 2½ feet.	Medium to low permeability when compacted; high to medium shear strength; hardpan at a depth limit 2½ feet.	Well drained	Slopes of 3 to 10 percent; low available water capacity; hardpan at a depth of 2½ feet; very cobbly or very gravelly surface.
Poor: strongly saline; seasonal high water table at a depth of 1 to 4 feet.	Unsuited: water table at a depth of 1 to 4 feet; excessive fines.	Poor: high potential frost action.	Moderately rapid permeability; slopes of 0 to 1 percent; water table at a depth of 1 to 4 feet.	Medium to low permeability when compacted; low to medium shear strength; high susceptibility to piping; medium compressibility.	Water table at a depth of 1 to 4 feet; outlets are a concern.	Strongly saline; water table at a depth of 1 to 4 feet.
Good for KEB, KsA. Poor for KLB: strongly saline.	Unsuited: excessive fines.	Poor: high potential frost action.	Moderate permeability; slopes of 1 to 5 percent.	Medium to low permeability when compacted; low to medium shear strength; medium compressibility; medium to high susceptibility to piping.	Well drained	Moderate permeability; slopes of 1 to 5 percent; high available water capacity; high lime zone below a depth of 10 inches; KLB is strongly saline.
Poor: silty clay; strongly saline.	Unsuited: excessive fines.	Poor: high shrink-swell potential; low strength.	Slow permeability; slopes of 0 to 1 percent; water table at a depth of 6 to 12 feet.	Medium to low shear strength; medium to high compressibility.	Slow permeability; water table at a depth of 6 to 12 feet where drained and irrigated.	Slow permeability; silty clay; hard to till; strongly saline.

TABLE 5.—*Interpretations of engineering*

Soil series and map symbols	Degree and kind of limitation for—				
	Septic tank absorption fields	Sewage lagoons	Sanitary landfill (trench type)	Foundations for dwellings without basements (single story)	Local roads and streets
Lahontan variant: LC.	Slight below a depth of 34 inches.	Severe: rapid permeability below a depth of 34 inches.	Severe: clay texture; rapid permeability.	Severe: high shrink-swell potential; low strength.	Severe: high shrink-swell potential; low strength.
Lava flows: LF. Onsite investigation needed.					
Mellor: ME	Severe: moderately slow permeability.	Slight	Moderate: texture is silty clay loam.	Severe: high potential frost action.	Severe: high potential frost action; low strength.
Modena: Mo	Moderate: moderately slow permeability below a depth of 40 inches.	Slight below a depth of 40 inches.	Moderate: texture is silty clay loam below a depth of 40 inches.	Moderate: moderate potential frost action.	Moderate: moderate potential frost action.
Musinia: Mu	Severe: moderately slow permeability.	Slight	Moderate: texture is silty clay loam.	Severe: high potential frost action.	Severe: high potential frost action; low strength.
Pahranagat: PA	Severe: moderately slow permeability; high seasonal water table.	Severe: high seasonal water table.	Severe: high seasonal water table.	Severe: high potential frost action; high water table.	Severe: high potential frost action; water table at a depth of 0 to 4 feet.
Penoyer: Pe, Ph	Moderate: moderate permeability.	Slight	Moderate: moderate permeability.	Severe: high potential frost action.	Severe: high potential frost action.
*Playas: PM, PN. Onsite investigation needed for Playas part of PM and PN; for Abbott part of PN, see Abbott series.					

properties of the soils—Continued

Suitability as source of—			Soil features affecting—			
Topsoil	Sand and gravel	Road fill	Reservoir areas	Embankments [1]	Drainage for crops	Irrigation
Poor: clay texture; strongly saline.	Unsuited above a depth of 36 inches: excessive fines: unsuited below a depth of 36 inches for gravel, but fair for sand.	Poor: high shrink-swell potential; low strength.	Rapid permeability below a depth of 36 inches; slopes of 0 to 2 percent.	Low to medium shear strength, medium compressibility in top 36 inches; high to low permeability when compacted, high to medium shear strength, low to medium compressibility, and medium to high susceptibility to piping below a depth of 36 inches.	Well drained	Slow permeability in top 36 inches and rapid permeability below a depth of 36 inches; hard to till; high available water capacity; very strongly saline.
Poor: moderately to strongly saline-alkali.	Unsuited: excessive fines.	Poor: high potential frost action; low strength.	Moderately slow permeability; slopes of 0 to 1 percent.	Low to medium shear strength; medium compressibility.	Well drained	Moderate to strongly saline-alkali, moderately slow permeability; hard to till; high available water capacity.
Good	Unsuited: excessive fines.	Good in top 40 inches. Poor below a depth of 40 inches: plastic silty clay loam.	Moderately rapid permeability in top 40 inches, moderately slow below a depth of 40 inches; slopes of 0 to 1 percent.	Low to medium permeability when compacted; medium shear strength; low to medium compressibility.	Well drained	Moderately rapid permeability; easy to till; moderately high available water capacity.
Good	Unsuited: excessive fines.	Poor: high potential frost action; low strength.	Moderately slow permeability; slopes of 0 to 1 percent.	Medium to low shear strength; medium compressibility.	Well drained	Moderately slow permeability; easy to till; high available water capacity.
Poor: strongly saline.	Unsuited: excessive fines; high seasonal water table.	Poor: high potential frost action; poorly drained.	Moderately slow permeability; slopes of 0 to 2 percent; water table at a depth of 0 to 4 feet.	Medium to low shear strength; medium compressibility.	Not suited: low lying area next to Sevier Lake.	Not suited; strongly saline; water table at a depth of 0 to 4 feet.
Poor for Ph: strongly saline. Fair for Pe: slightly to moderately saline.	Unsuited: excessive fines.	Poor: high potential frost action.	Moderate permeability; slopes of 0 to 2 percent.	Low to medium shear strength; medium compressibility.	Moderate permeability, water table at a depth of 7 to 13 feet where drained and irrigated.	Moderate permeability; easy to till; high available water capacity; Ph is strongly saline.

TABLE 5.—*Interpretations of engineering*

Soil series and map symbols	Degree and kind of limitation for—				
	Septic tank absorption fields	Sewage lagoons	Sanitary landfill (trench type)	Foundations for dwellings without basements (single story)	Local roads and streets
*Poganeab: Po, Pr	Severe: moderately slow permeability.	Slight	Severe: seasonal water table at a depth of less than 6 feet.	Severe: high potential frost action.	Severe: high potential frost action.
Pt, PU For Uffens part of PU, see Uffens series.	Moderate: moderately slow permeability in top 40 inches, rapid permeability below a depth of 40 inches.	Severe: rapid permeability below a depth of 40 inches; seasonal high water table.	Severe: rapid permeability below a depth of 40 inches.	Severe: high potential frost action.	Severe: high potential frost action.
Saltair: SA, SD	Severe: water table at a depth of less than 48 inches.	Severe for SA. Moderate for SD: seasonal high water table.	Severe: seasonal high water table.	Severe: high potential frost action.	Severe: high potential frost action.
Saltair variant: SE	Severe: water table at a depth of 3 to 5 feet.	Severe: rapid permeability below a depth of 4 feet; water table at a depth of 3 to 5 feet.	Severe: rapid permeability below a depth of 49 inches; water table at a depth of 3 to 5 inches.	Severe: high potential frost action.	Severe: high potential frost action.
Shear: ShB	Severe: moderately slow permeability.	Moderate: slopes of 1 to 5 percent.	Severe: clay texture.	Severe: high shrink-swell potential.	Severe: high shrink-swell potential; low strength.
Stony colluvial land: ST. Onsite investigation needed.					
Sugarloaf: SU, SV Onsite investigation needed for Rock land part of SV.	Severe: slopes of more than 15 percent.	Severe: slopes of more than 7 percent.	Severe: rapid permeability.	Severe: slopes of more than 15 percent.	Severe: slopes of more than 15 percent.

properties of the soils—Continued

Suitability as source of—			Soil features affecting—			
Topsoil	Sand and gravel	Road fill	Reservoir areas	Embankments [1]	Drainage for crops	Irrigation
Fair for Po: slightly to moderately saline; silty clay loam. Poor for Pr: strongly saline.	Unsuited: excessive fines.	Poor: high potential frost action.	Moderately slow permeability; slopes of 0 to 1 percent.	Low to medium shear strength; medium compressibility.	Moderately slow permeability; water table at a depth of 5 to as much as 12 feet where drained and irrigated.	Moderately slow permeability; some crusting and tillage problems; Pr is strongly saline.
Fair: slightly to moderately saline; silty clay loam.	Unsuited in top 40 inches. Unsuited for gravel and poor for sand below a depth of 40 inches; excessive fines.	Poor: high potential frost action.	Rapid permeability below a depth of 40 inches; slopes of 0 to 1 percent.	Low to medium shear strength and medium compressibility above a depth of 40 inches; high to low permeability when compacted, high to medium shear strength, low to medium compressibility, and medium to high susceptibility to piping below a depth of 40 inches.	Moderately slow permeability above 40 inches; rapid permeability below a depth of 40 inches. Water table at a depth of 6 to 12 feet where drained and irrigated.	Moderately slow permeability above a depth of 40 inches; some crusting and tillage problems; rapid permeability below a depth of 40 inches.
Poor: very strongly saline.	Unsuited: excessive fines.	Poor: high potential frost action.	Moderate permeability; slopes of 0 to 3 percent; water table at a depth of 0 to 4 feet.	Low to medium shear strength; medium compressibility.	Poorly drained; high water table; outlets are a concern.	Very strongly saline, high water table; drainage outlets are a concern.
Poor: strongly saline-alkali.	Unsuited in top 4 feet. Unsuited for gravel and poor for sand below a depth of 4 feet: excessive fines.	Poor: high potential frost action.	Moderately slow permeability in top 4 feet; rapid permeability below a depth of 4 feet; water table at a depth of 0 to 2 feet.	Low to medium shear strength and medium compressibility in top 4 feet; low to high permeability when compacted, high to medium shear strength, low to medium compressibility and medium to high susceptibility to piping below a depth of 4 feet.	Moderately slow permeability in top 4 feet, rapid permeability below a depth of 4 feet; water table at a depth of 3 to 5 feet; outlets are a concern.	Moderately slow permeability; strongly saline; water table at a depth of 3 to 5 feet.
Poor: strongly saline; clay texture.	Unsuited: excessive fines.	Poor: high shrink-swell potential; low strength.	Moderately slow permeability; slopes of 1 to 5 percent.	Low to medium shear strength; medium compressibility.	Moderately slow permeability; water table at a depth of 8 to 15 feet.	Moderately slow permeability; clay, hard to till; strongly saline.
Poor: slopes of more than 15 percent.	All unsuited for gravel. Poor for sand in top 18 inches. Fair for sand below a depth of 18 inches; excessive fines.	Moderate: moderate susceptibility to frost action.	Rapid permeability below a depth of 18 inches; slopes of 1 to 30 percent.	Low to medium permeability when compacted; medium shear strength; low to medium compressibility; medium to high susceptibility to piping.	Somewhat excessively drained.	SU suitable for sprinkler irrigation; moderately low available water capacity. SV not suited to irrigation.

TABLE 5.—*Interpretations of engineering*

Soil series and map symbols	Degree and kind of limitation for—				
	Septic tank absorption fields	Sewage lagoons	Sanitary landfill (trench type)	Foundations for dwellings without basements (single story)	Local roads and streets
Swasey: SWC	Severe: depth to bedrock is 27 inches.	Severe: depth to bedrock is 27 inches.	Severe: depth to bedrock is 27 inches.	Severe: high potential frost action.	Severe: high potential frost action.
Toddler: TO	Moderate: moderate permeability.	Moderate: moderate permeability; slopes of 1 to 5 percent.	Slight	Moderate: moderate potential frost action; moderate shrink-swell potential.	Moderate: moderate potential frost action; moderate shrink-swell potential.
*Uffens: UE, UFC, UH2— For Swasey part of UFC, see Swasey series; for Uvada part of UH2, see Uvada series.	Severe: moderately slow permeability.	Slight	Slight	Moderate: potential frost action; moderate shrink-swell potential.	Moderate: moderate potential frost action; moderate potential shrink-swell.
*Uvada: UL, UM, UN2, UYC. For Toddler part of UN2, see Toddler series; for Yenrab part of UYC, see Yenrab series.	Severe: very slow permeability.	Slight	Moderate: silty clay loam texture.	Severe: high potential frost action.	Severe: high potential frost action; low strength.
Woodrow: Wo	Severe: moderately slow permeability.	Slight	Moderate: silty clay loam texture.	Severe: high potential frost action.	Severe: high potential frost action; low strength.
*Yenrab: YBC, YDC, YeC, YL, YUC. For Lava flows part of YL, see Lava flows; for Uffens part of YUC, see Uffens series.	Moderate: slopes of 1 to 10 percent.	Severe: rapid permeability.	Severe: rapid permeability.	Slight	Slight
Yuba: YV	Severe: slow permeability.	Slight	Moderate: silty clay loam texture.	Severe: high potential frost action.	Severe: high potential frost action; low strength.

[1] Engineers and others should not apply specific values to estimates of bearing capacity.

properties of the soils—Continued

Suitability as source of—			Soil features affecting—			
Topsoil	Sand and gravel	Road fill	Reservoir areas	Embankments [1]	Drainage for crops	Irrigation
Poor: depth to bedrock is 27 inches.	Unsuited: depth to bedrock is 27 inches.	Poor: depth to bedrock is 27 inches; high potential frost action.	Moderately slow permeability; slopes of 3 to 10 percent; depth to bedrock is 27 inches.	Low to medium permeability when compacted; low to medium shear strength; medium compressibility; medium to high susceptibility to piping.	Well drained	Very cobbly surface; moderately to strongly saline-alkali; slopes of 3 to 10 percent; bedrock at a depth of 27 inches.
Poor: moderately to strongly saline.	Unsuited: excessive fines.	Fair: moderate shrink-swell potential.	Moderate permeability; slopes of 1 to 3 percent.	Low to medium permeability when compacted; low to medium shear strength; medium compressibility; medium to high susceptibility to piping.	Well drained	Moderate permeability; high available water capacity; strongly saline; soil blowing hazard.
Poor: moderately to strongly saline-alkali.	Unsuited: excessive fines.	Fair: moderate shrink-swell potential.	Moderately slow permeability; slopes of 0 to 2 percent.	Low to medium permeability when compacted; low to medium shear strength; medium compressibility; medium to high susceptibility to piping.	Well drained	Moderately slow permeability; high available water capacity; strongly saline-alkali.
Poor: strongly saline-alkali.	Unsuited: excessive fines.	Poor: high potential frost action; low strength.	Very slow permeability; slopes of 0 to 2 percent.	Low to medium shear strength; medium compressibility.	Well drained	Slow to very slow permeability; high available water holding capacity; strongly saline-alkali.
Fair: silty clay loam texture.	Unsuited: excessive fines.	Poor: high potential frost action; low strength.	Moderately slow permeability; slopes of 0 to 1 percent.	Low to medium shear strength; medium compressibility.	Well drained	Moderately slow permeability; high available water capacity.
Poor: high in content of sand; high hazard of soil blowing; low available water capacity.	Unsuited for gravel, fair to poor for sand: excessive fines.	Good	Rapid permeability; slopes of 1 to 10 percent.	Low to high permeability when compacted; high to medium shear strength; low to medium compressibility; medium to high susceptibility to piping.	Somewhat excessively drained.	Rapid permeability; uneven slopes; low available water capacity; high soil blowing hazard.
Poor: very strongly saline.	Unsuited: excessive fines.	Poor: high potential frost action; low strength.	Slow permeability; slopes of 0 to 2 percent.	Low to medium shear strength; medium compressibility.	Well drained	Slow permeability; very strongly saline; crusting and tilling problems.

in moisture content, that is, the extent to which the soil shrinks as it dries out or swells when it gets wet. Extent of shrinking and swelling is influenced by the amount and kind of clay in the soil. Shrinking and swelling of soils causes much damage to building foundations, roads, and other structures. A high shrink-swell potential indicates a hazard to maintenance of structures built in, on, or with material having this rating.

Hydrologic groups are listed in table 4. In group A are soils that have the highest rate of infiltration, even when they are thoroughly wet, and the lowest runoff potential. These soils are deep sand or are gravelly. In group B are soils that are shallower or contain more clay than those in group A. Soils in group B have a moderate rate of infiltration and moderate runoff potential. In group C are soils that are shallow over an impermeable layer or that contain a considerable amount of clay. These soils have a slow rate of infiltration and high runoff potential. In group D are mainly clayey soils that have high swelling potential or that contain a clay layer. The soils in group D have a very slow rate of infiltration and very high runoff potential.

Susceptibility to frost action refers to the probable effects on structures resulting from the freezing of soil material and its subsequent thawing. These probable effects are important factors in selecting sites for highways and runways and are also important in planning any structure that is to be supported or abutted by soil that freezes. The action not only pertains to the heaving of soil as freezing progresses, but also the excessive wetting and loss of soil strength during thaw.

Soils having properties that are not conducive to damage from frost action are rated low. Those having properties that make them moderately susceptible to frost action are rated moderate, and those soils with properties that make them highly susceptible to frost action are rated high.

Engineering interpretations of the soils

The interpretations in table 5 are based on the estimated engineering properties of soils shown in table 4, on test data for soils in this survey area and others nearby or adjoining, and on the experience of engineers and soil scientists with the soils of Delta Area. In table 5, ratings are used to summarize limitation or suitability of the soils for all listed purposes other than for drainage of cropland and pasture, irrigation, reservoirs, and embankments. For these particular uses, table 5 lists those soil features not to be overlooked in planning, installation, and maintenance.

Soil limitations are indicated by the rating slight, moderate, and severe. *Slight* means that soil properties are generally favorable for the rated use, or in other words, limitations are minor and easily overcome. *Moderate* means that some soil properties are unfavorable but can be overcome or modified by special planning and design. *Severe* means that soil properties are so unfavorable and so difficult to correct or overcome as to require major soil reclamation, special designs, or intensive maintenance.

Soil suitability is rated by the terms *good, fair,* and *poor,* which have, respectively, meanings approximately parallel to the terms slight, moderate, and severe.

Following are explanations of some of the columns in table 5.

Septic tank absorption fields are subsurface systems of tile or perforated pipe that distribute effluent from a septic tank into natural soil. The soil material from a depth of 18 inches to 6 feet is evaluated. The soil properties considered are those that affect both absorption or effluent and construction and operation of the system. Properties that affect absorption are permeability, depth to water table or rock, and susceptibility to flooding. Slope is a soil property that affects difficulty of layout and construction and also the risk of soil erosion, lateral seepage, and downslope flow of effluent. Large rocks or boulders increase construction costs.

Sewage lagoons are shallow ponds constructed to hold sewage within a depth of 2 to 5 feet long enough for bacteria to decompose the solids. A lagoon has a nearly level floor and sides, or embankments, of compacted soil material. The assumption is made that the embankment is compacted to medium density and the pond is protected from flooding. Properties are considered that affect the pond floor and the embankment. Those that affect the pond floor are permeability, organic-matter content, and slope, and if the floor needs to be leveled, depth to bedrock becomes important. The soil properties that affect the embankment are the engineering properties of the embankment material as interpreted from the Unified soil classification and the amounts of stones, if any, that influence the ease of excavation and compaction of the embankment material.

Sanitary landfill is a method of disposing of refuse in dug trenches. The waste is spread in thin layers, compacted, and covered with soil throughout the disposal period. Landfill areas are subject to heavy vehicular traffic. Some soil properties that affect suitability for landfill are ease of excavation, hazard of polluting ground water, and trafficability. The best soils have moderately slow permeability, withstand heavy traffic, and are friable and easy to excavate. Unless otherwise stated, the ratings in table 5 apply only to a depth of about 6 feet, and therefore limitation ratings of *slight* or *moderate* may not be valid if trenches are to be much deeper than that. For some soils, reliable predictions can be made to a depth of 10 or 15 feet, but regardless of that, every site should be investigated before it is selected.

Dwellings, as rated in table 5, are not more than one story high and are supported by foundation footings placed in undisturbed soil. The features that affect the rating of a soil for dwellings are those that relate to capacity to support load and resist settlement under load, and those that relate to ease of excavation. Soil properties that affect capacity to support load are wetness, susceptibility to flooding, density, plasticity, texture, and shrink-swell potential. Those that affect excavation are wetness, slope, depth to bedrock, and content of stones and rocks.

Road fill is soil material used in embankments for roads. The suitability ratings reflect (1) the predicted performance of soil after it has been placed in an embankment that has been properly compacted and provided with adequate drainage and (2) the relative ease of excavating the material at borrow areas.

Local roads and streets, as rated in table 5, have an all-weather surface expected to carry automobile traffic all year. They have a subgrade of underlying soil material; a base consisting of gravel, crushed rock, or soil material stabilized with lime or cement; and a flexible or rigid surface, commonly asphalt or concrete. These roads are graded to shed water and have ordinary provisions for drainage. They are built mainly from soil at hand, and most cuts and fills are less than 6 feet deep.

Soil properties that most affect design and construction of roads and streets are load supporting capacity and stability of the subgrade, and the workability and quantity of cut and fill material available. The AASHTO and Unified classifications of the soil material, and also the shrink-swell potential, indicate traffic supporting capacity. Wetness and flooding affect stability of the material. Slope, depth to hard rock, content of stones and rocks, and wetness affect ease of excavation and amount of cut and fill needed to reach an even grade.

Topsoil is used for topdressing an area where vegetation is to be established and maintained. Suitability is affected mainly by ease of working and spreading the soil material, as for preparing a seedbed; natural fertility of the material, or the response of plants when fertilizer is applied; and absence of substances toxic to plants. Texture of the soil material and its content of stone fragments are characteristics that affect suitability, but also considered in the ratings is damage that will result in the area from which topsoil is taken.

Sand and gravel are used in great quantities in many kinds of construction. The ratings in table 5 provide guidance about where to look for probable sources. A soil rated as a *good* or *fair* source of sand or gravel generally has a layer at least 3 feet thick, the top of which is within a depth of 6 feet. The ratings do not take into account thickness of overburden, location of the water table, or other factors that affect mining of the materials, and neither do they indicate quality of the deposit.

Reservoir areas hold water behind a dam or embankment. Soils suitable for reservoir areas have low seepage, which is related to their permeability and depth to fractured or permeable bedrock or other permeable material.

Embankments require soil material resistant to seepage and piping and of favorable stability, shrink-swell potential, shear strength, and compactibility. Presence of stones or organic material in a soil are among factors that are unfavorable.

Drainage for crops is affected by such soil properties as permeability, texture, and structure; depth to claypan, rock, or other layers that influence rate of water movement; depth to the water table; slope; stability in ditchbanks; susceptibility to stream overflow; salinity or alkalinity; and availability of outlets for drainage.

Irrigation of a soil is affected by such features as slope; susceptibility to stream overflow, water erosion or soil blowing; soil texture; content of stones; accumulations of salts and alkali; depth of root zone; rate of water intake at the surface; permeability of soil layers below the surface layer and in fragipans or other layers that restrict movement of water; amount of water held available to plants; need for drainage; and depth to water table or bedrock.

Formation and Classification of Soils

This section describes how the factors of soil formation have affected the development of soils in the Delta Area. It also classifies the soil series in this area according to the system of soil classification.

Factors of Soil Formation

Soil is formed by forces of the environment acting upon soil material deposited or accumulated by various geologic agencies. The characteristics of a soil at any particular place on the earth depend upon the chemical and mineralogical composition of the parent material; the climate under which the parent material has existed since accumulation; the plant and animal life on and in the soil; the relief, or lay of the land; and the length of time the parent material has been subject to active weathering forces.

The relative importance of each factor differs from place to place, but generally interaction of all factors determines the kind of soil that forms in any given place.

Soil development is reflected in the kinds and distinctness of horizons and their arrangement in the profile.

Many of the soils in this survey area have little or no horizon development. Some are stratified, and some are mottled because of wetness. The most important features that reflect soil formation in this survey area are clay enrichment in the subsoil, usually accompanied by high sodium content; calcium carbonate accumulation; and salt accumulation.

Parent material

Parent material is the weathered rock or unconsolidated materials in which soils form. In this survey area parent materials have been modified by salt carried into the Area by streams. Many of the soils formed in lake sediment and alluvium. Some formed in residuum, and a few formed in wind-laid deposits. The main source of parent material is sediment carried into the Area by the Sevier River.

Minor sources of parent material are the Cricket Mountains and Pavant Butte.

The sediment deposited by the Sevier River is derived from a wide range of rocks, including shale, sandstone, limestone, siltstone, basalt, andesite, latite, rhyolite, breccia, and trachyte. Most of these materials are of Tertiary age. Some of the sediment from shale and siltstone is of Jurassic age and is high in salt and gypsum. The rocks of Pavant Butte are of late Tertiary age and consist mainly of basalt and andesite. The rocks of the Cricket Mountains are mainly Paleozoic quartzite.

About 85 percent of the soils in the survey area formed in lake sediment and alluvium of mixed min-

eralogy. These soils were originally high in salt. Many of these soils have little or no horizon development. Texture of the soil profile is mainly a result of stream and lake sorting of sediment. Soils such as Duggins and Woodrow soils reflect this sorting. Soils such as Abbott, Abraham, Anco, and Poganeab soils reflect texture sorting of sediment and salt enrichment from a high water table.

Cache and Saltair soils formed in lake sediment and alluvium strongly enriched with salts. These soils have formed layers of salt accumulation.

In some of the soils, such as Deseret and Kanosh soils, layers of carbonate accumulation have formed. They are also influenced by a high water table and have salt enriched layers. Soils such as Escalante and Hiko Springs soils are near or immediately above the shoreline of ancient Lake Bonneville. Layers of carbonate accumulation have formed in these soils. They are not affected by salt accumulation or a high water table. They are moderately coarse textured. Sugarloaf soils have been influenced by volcanic cinder parent material. They are sandy and have layers of carbonate accumulation.

Sandy parent material has been deposited in some areas by wind action. Yenrab soils reflect this source of material. They are also high in sodium. These sandy materials are subject to movement by wind and are not stable. No genetic soil horizons have formed in these soils.

Climate

The climate in the survey area is arid or semiarid. Most of the area is arid and has cold winters and warm summers. The average annual precipitation is 6 to 8 inches. The average annual temperature is 49° to 52° F. The average frost-free period is 115 to 120 days.

A minor part of this survey area is semiarid. In this part of the area, winters are cold and summers are warm. The average annual precipitation is about 8 to 11 inches. The average annual temperature is 48° to 54° F. The frost-free period is 115 to 125 days. Cricket Mountain and Pavant Butte are in this area. Typically, the soils in this area have a darker colored surface layer and are slightly higher in organic matter than the soils in the area that is arid.

Plant and animal life

The principal effects of plant and animal life on soil formation are the accumulation of organic matter and the translocation of plant nutrients from the lower layers to the upper layers. Soil structure, porosity, air and water movement, and soil horizon formation are also influenced by plants and animals.

Bacteria and fungi have an important role in soil formation. They break down undecomposed organic matter and change it to humus. Some bacteria take nitrogen from the air and change it into a form that can be used by plants. The life processes of earthworms, small rodents, insects, slugs, and snails also influence soil formation.

In places the original vegetation is nearly gone and has been replaced by less desirable vegetation.

The present vegetation is usually associated with the kind and amounts of salt in the soil.

Relief

The survey area consists dominantly of nearly level lake plains and flood plains. Minor areas are sloping alluvial fans, lake terraces, and steep mountain slopes. Elevation ranges from 4,500 to 6,000 feet.

Two kinds of soil formed on the lake plains and flood plains. Uvada and Uffens series are representative of well-drained soils that formed clay-enriched layers high in sodium. Abbott and Abraham series are representative of poorly drained and somewhat poorly drained soils that have little horizon development but have salt-enriched layers and mottles.

Soils in the Sugarloaf and Hiko Springs series are representative of well-drained and somewhat excessively drained soils that formed on alluvial fans and lake terraces. They have carbonate-enriched layers.

Checkett soils are steep, excessively drained soils that are on mountain slopes. Clay-enriched layers have formed in these soils.

Time

The soils in this survey area range from young soils that have little or no horizon differentiation to soils that have strong differentiation. The least horizon differentiation is in the soils of the more recent alluvial and eolian deposits. Examples are Penoyer, Toddler, Woodrow, Abbott, Abraham, and Poganeab soils.

Soils such as Escalante, Hiko Springs, and Sugarloaf soils formed in older alluvial deposits and have developed layers of carbonate accumulation. Still older soils, such as Uffens and Uvada soils, have developed horizons of clay accumulation that are also high in sodium.

Classification of Soils

Soils are classified so that we can more easily remember their significant characteristics. Classification enables us to assemble knowledge about the soils, to see their relationship to one another and to the whole environment, and to develop principles that help us to understand their behavior and their response to manipulation. First through classification, and then through use of soil maps, we can apply our knowledge of soils to specific fields and other tracts of land.

The narrow categories of classification, such as those used in detailed soil surveys, allow us to organize and apply knowledge about soils in managing farms, fields, and woodlands; in developing rural areas; in engineering work; and in many other ways. Soils are placed in broad classes to facilitate study and comparison in large areas such as countries and continents.

The system of soil classification currently used was adopted by the National Cooperative Soil Survey in 1965 (*5*). Readers interested in further details about the system should refer to the latest literature available (*2*).

The system of classification has six categories. Beginning with the broadest, these categories are order, suborder, great group, subgroup, family, and series. In this system the differentiae used as a basis for classification are soil properties that can be observed

TABLE 6.—*Classification of the soils series*

Series	Current classification			1938 Classification
	Family	Subgroup	Order	Soil
Abbott	Fine, montmorillonitic (calcareous), mesic.	Vertic Fluvaquents	Entisols	Alluvial soils.
Abraham	Coarse-silty, mixed (calcareous), mesic.	Aquic Xerofluvents	Entisols	Alluvial soils.
Anco	Fine-silty, mixed (calcareous), mesic	Aquic Xerofluvents	Entisols	Alluvial soils.
Bluewing	Sandy-skeletal, mixed, mesic	Typic Torriorthents	Entisols	Regosols.
Cache	Fine, mixed, mesic	Typic Salorthids	Aridisols	Solonchaks.
Checkett	Loamy-skeletal, mixed, mesic	Lithic Xerollic Haplargids	Aridisols	Lithosols; Sierozems.
Curdli	Fine-silty, carbonatic, mesic	Typic Calciorthids	Aridisols	Calcisols.
Deseret	Fine-silty, mixed, mesic	Aquic Calciorthids	Aridisols	Calcisols.
Drum	Fine-silty, mixed, mesic	Typic Calciorthids	Aridisols	Calcisols.
Duggins	Fine, mixed (calcareous), mesic	Xeric Torrifluvents	Entisols	Alluvial soils.
Escalante	Coarse-loamy, mixed, mesic	Xerollic Calciorthids	Aridisols	Calcisols.
Goshute	Clayey over sandy or sandy-skeletal, mixed, mesic.	Typic Natrargids	Aridisols	Solonetz soils.
Hiko Springs	Coarse-loamy, mixed, mesic	Typic Calciorthids	Aridisols	Calcisols.
Kanosh	Coarse-loamy, mixed, mesic	Aquic Calciorthids	Aridisols	Calcisols.
Kessler	Fine-silty, carbonatic, mesic	Xerollic Calciorthids	Aridisols	Calcisols.
Lahontan	Fine, montmorillonitic (calcareous), mesic.	Aquic Xerofluvents	Entisols	Alluvial soils.
Lahontan variant	Clayey over sandy or sandy-skeletal, mixed (calcareous), mesic.	Typic Torrifluvents	Entisols	Alluvial soils.
Mellor	Fine-silty, mixed, mesic	Xerollic Natrargids	Aridisols	Solonetz soils.
Modena	Coarse-loamy, mixed (calcareous), mesic.	Xeric Torrifluvents	Entisols	Alluvial soils.
Musinia	Fine-silty, mixed, mesic	Torrifluventic Haploxerolls	Mollisols	Alluvial soils.
Pahranagat	Fine-silty, mixed (calcareous), mesic	Fluvaquentic Haplaquolls	Mollisols	Humic Gley.
Penoyer	Coarse-silty, mixed (calcareous), mesic	Typic Torriorthents	Entisols	Regosols.
Poganeab	Fine-loamy, mixed (calcareous), mesic	Typic Fluvaquents	Entisols	Alluvial soils.
Saltair	Fine-silty, mixed, mesic	Typic Salorthids	Aridisols	Solonchaks.
Shear	Fine, mixed (calcareous), mesic	Typic Torrifluvents	Entisols	Alluvial soils.
Sugarloaf	Sandy, mixed, mesic	Xerollic Calciorthids	Aridisols	Calcisols.
Swasey	Fine-loamy, mixed, mesic	Typic Natrargids	Aridisols	Solonetz soils.
Toddler	Fine-loamy, mixed (calcareous), mesic	Typic Torrifluvents	Entisols	Alluvial soils.
Uffens	Fine-loamy, mixed, mesic	Typic Natrargids	Aridisols	Solonetz soils.
Uvada	Fine, montmorillonitic, mesic	Typic Natrargids	Aridisols	Solonetz soils.
Woodrow	Fine-silty, mixed (calcareous), mesic	Xeric Torrifluvents	Entisols	Alluvial soils.
Yenrab	Mixed, mesic	Typic Torripsamments	Entisols	Regosols.
Yuba	Fine, mixed (calcareous), mesic	Typic Torriorthents	Entisols	Alluvial soils.

in the field or that can be inferred either from other properties that are observable in the field or from the combined data of soil science and other disciplines. The properties selected for the higher categories are the result of soil genesis or are properties that affect soil genesis. In table 6 the soil series represented in the Delta Area are placed in categories of the current system. Classes of the current system are defined briefly in the following paragraphs.

ORDERS: Ten soil orders are recognized. The differentiae for the orders are based on the kind and degree of the dominant sets of soil-forming processes that have gone on. Each order is named with a word of three or four syllables ending in *sol.* An example is Mollisol.

SUBORDERS: Each order is subdivided into suborders that are based primarily on properties that influence soil genesis and that are important to plant growth, or were selected to reflect what seemed to be the most important variables within the orders. The names of suborders have exactly two syllables. The last syllable indicates the order. An example is Aquoll (*Aqu,* meaning water, plus *oll,* from Mollisol).

GREAT GROUPS: Soil suborders are separated into great groups on the basis of class similarities in kind, arrangement, and degree of expression of pedogenic horizons, in soil moisture and temperature regimes, and in base status. The names of great groups have three or four syllables and end with the name of a suborder. A prefix added to the name suggests something about the properties of the soil. An example is Haplaquoll (*Hapl,* meaning minimum horizon differentiation, plus *aquoll,* the suborder of Mollisols that have an aquic moisture regime).

SUBGROUPS: Great groups are subdivided into three kinds of subgroups: the central (typic) concept of the great groups (not necessarily the most extensive subgroup); the intergrades, or transitional forms to other orders, suborders, or great groups; and extragrade subgroups that have some properties that are representative of the great groups but that do not indicate transitions to any other known kind of soil. The names

TABLE 7.—*Chemical analyses*

[Absence of data indicates that

Soil name and horizon	Depth from surface	Reaction		Total organic matter	Organic carbon
		Saturated paste	1:5 ratio		
	Inches	*pH*	*pH*	*Pct*	*Pct*
Abbott silty clay:					
A1	0–8	7.9	8.8	1.7	1.0
B2	8–22	7.9	8.8	1.2	.7
C1	22–40	7.9	8.8	.9	.5
C2	40–54	8.2	9.0	.3	.2
C3	54–61	8.2	9.5	.3	.2
C4	61–68	8.2	9.4	.3	.2
Abraham loam:					
AP	0–8	7.7	8.8	1.6	.1
C1	8–33	7.5	9.0	0.4	.2
C2	33–53	7.6	8.8	.2	.1
C3	53–63	7.6	8.5	.3	.1
Anco silty clay loam:					
AP	0–10	8.1	9.1	1.9	1.1
C1	10–18	8.2	9.3		
C2	18–32	8.1	9.2		
C3	32–40	8.0	9.1		
C4	40–60	8.0	9.1		
Saltair silt loam					
A11	½–3	7.5	8.8		
A12	3–8	7.5	8.6		
A13	8–12	7.2	8.5		
A14	12–17	7.6	8.6		
A15	17–20	7.5	8.5		
A16	20–28	7.5	8.5		
C1	28–38	7.5	9.2		
Uvada silt loam:					
A2	0–2	8.2	9.7	.9	.5
A&B	2–4	8.1	9.7	.6	.4
B21t	4–7	8.1	9.6	.7	.4
B22t	7–12	7.9	9.3	.7	.4
B3t	12–17	7.7	9.0	.6	.3
C1	17–25	7.7	8.6	.3	.2
C2	25–47	7.8	8.2	.5	.3
C3sa	47–65	8.0	8.8	.2	.1
Lahontan silty clay:					
AP	0–7	7.9	9.0	2.7	1.6
C1	7–23	8.0	9.5	.8	.5
C2	23–46	7.9	9.6	.3	.2
C3	46–56	8.2	9.7	.4	.2
Poganeab silty clay loam, strongly saline:					
A1	0–10	8.0	9.2	.9	.5
C1	10–15	7.8	8.9		
C2	15–26	7.9	8.5		
C3	26–42	7.8	8.6		
C4	42–60	8.0	9.0		

of representative soils

values were not determined]

Nitrogen	C/N ratio	Electrical conductivity (EC x 10^3)	Calcium carbonate equivalent	Moisture content, 15 Atmos	Cation exchange capacity	Exchangeable sodium
Pct		*Mmhos per cm at 25° C*	*Pct*	*Pct*	*Meq per 100g*	*Pct*
		8.6	29.7		27.1	
		9.9	31.5		27.6	
		11.5	28.0		31.1	
		17.2	30.2		18.1	
		9.4	30.2		16.6	
		17.2	34.1		19.3	
.087	10.5	4.6	19.6		12.8	20
		12.4	24.4		14.6	40
		10.9	20.7		11.5	28
		13.4	27.0		15.5	46
		4.0	31.4			
		3.5	32.0			
		3.2	35.1			
		3.4	35.6			
		4.5	28.3			
		124.0	1.3	29.8	10.3	79
		61.8	22.6	37.5	42.2	26
		49.2	13.1	38.4	46.1	37
		49.2	12.3	32.0	35.1	24
		40.8	3.2	33.8	34.2	30
		32.4	3.7	33.1	40.5	11
		19.0	39.8	20.9	17.0	28
.063	8.1	3.1	24.1	8.0	13.6	36
.046	7.6	9.5	21.6	17.6	25.2	59
.051	8.4	11.5	24.8	20.3	26.8	61
.044	9.1	24.2	26.1	22.5	26.3	65
		34.5	28.9	21.2	24.2	66
		37.2	25.3	19.1	21.6	58
		37.2	32.0	21.0	21.1	54
		56.7	27.5	7.9	15.4	81
.148	10.7	1.7	28.2		21.8	13
		3.0	37.5		26.6	27
		6.5	34.9		22.6	35
		5.3	36.1		24.6	48
		10.1	29.0			
		28.1	24.5			
		20.2	32.0			
		18.1	33.5			
		14.4	35.0			

TABLE 8.—*Mechanical analyses of selected soils*

Soil name and horizon	Depth from surface	Very coarse sand (2–0.1 mm)	Coarse sand (1–0.5 mm)	Medium sand (0.5–0.25 mm)	Fine sand (0.25–0.10 mm)	Very fine sand (0.10–0.5 mm)	Silt (0.05–0.002 mm)	Clay (>0.02 mm)
	Inches	*Pct*	*Pct*	*Pct*	*Pct*	*Pct*	*Pct*	*Pct*
Abbott silty clay:								
A1	0–8	0.2	0.3	0.2	0.9	2.5	40.3	55.6
B2	8–22	.1	.2	.2	.8	2.0	42.2	54.5
C1	22–40	0	0	.1	.4	1.9	35.5	62.9
C2	40–54	.1	.2	.2	2.2	13.1	57.1	27.1
C3	54–61	0	.1	.2	1.5	17.8	65.5	14.9
C4	61–68	0	.1	.1	.7	4.7	70.6	23.8
Saltair silt loam:								
A11	½–3	.6	2.1	1.2	7.3	23.0	58.3	7.5
A12	3–8	.6	2.1	1.7	6.9	11.5	60.3	16.9
A13	8–12	.7	2.1	0.3	7.0	12.4	57.0	20.5
A14	12–17	2.4	2.0	1.0	4.8	11.9	51.8	26.1
A15	17–20	1.5	1.8	.9	3.0	6.5	61.3	25.0
A16	20–28	0.7	.7	0.1	2.3	7.8	60.7	27.7
C1	28–38	0.9	2.5	2.3	6.8	10.0	54.9	22.6
Uvada silt loam[1]:								
A2	0–2	.58	.69	.8	11.5	14.5	69.3	2.6
A&B	2–4	.09	.21	.69	6.8	6.8	28.2	57.2
B21t	4–7	.15	.25	.62	5.1	5.2	26.9	61.8
B22t	7–12	.1	.1	.3	4.2	6.5	34.5	54.3
B3t	12–17	.1	.1	.1	.8	2.4	41.2	55.3
C1	17–25	.1	.1	.1	1.0	3.9	49.7	45.1
C2	25–47	.1	.1	.1	.2	1.8	49.1	48.6
C3sa	47–65	.1	.1	.1	3.1	26.9	56.6	13.1

[1] Much of the clay in Uvada silt loam is nearly silt size; consequently, field determinations of texture, rather than laboratory determinations, were used in the profile description on this soil.

of subgroups are derived by placing one or more adjectives before the name of the great group. The adjective Typic is used for the subgroup that is thought to typify the great group. An example is Typic Calciorthid.

FAMILIES: Soil families group soils within a subgroup that have similar enough physical and chemical properties that responses to management and manipulation for use are nearly the same for comparable size distribution, mineralogy, temperature regime, thickness of the soil penetrable by roots, consistence, moisture equivalent, and permanent cracks. A family name consists of the name of a subgroup and a series of adjectives. The adjectives are the class names for particle-size, mineralogy, reaction, and so on, that are used as family differentiae (see table 6). An example is Typic Torriorthents, fine, mixed (calcareous), mesic.

Laboratory Analyses [4]

The results of physical and chemical analyses of selected soils in the survey area are shown in tables 7 and 8. The data shown for the Abbott and Uvada soils are based on the profile that is described as representative of their respective series in the section, "Descriptions of the Soils." Profile descriptions for the other soils mentioned in tables 7 and 8 are given in this section.

The soil samples were air-dried and, then, screened through a 2-millimeter sieve. The material that passed through the sieve was thoroughly mixed and subsamples of this material were used in all analyses, except for organic carbon and calcium carbonate equivalent. For these analyses the samples were ground finer, to pass an 80-mesh sieve. All results were reported on an ovendry basis.

Methods that were used in obtaining the data can be found in Soil Survey Investigations Report No. 1 (*6*). They are briefly described and are identified by code numbers in the following paragraphs.

Reaction, expressed as a pH value, was obtained by using a glass-electrode pH meter and a soil-water ratio of 1 to 5 (8C1a) or a saturated paste (8C1b).

Organic carbon was determined by acid-dichromate digestion and ferrous sulfate titration (6A1a). The percentage of *total organic matter* equals the percentage of organic carbon multiplied by the conversion factor, 1.72.

Total nitrogen is the result of Kjeldahl digestion (6B1) and ammonia distillation (6B1a) processes.

Electrical conductivity of the saturation extract (8A1a) was made by using a Wheatstone bridge apparatus (8A2).

[4] JAMES P. THORNE, soil scientist, Utah State University Soils Laboratory, Logan, made the chemical and physical analyses.

Calcium carbonate equivalent was calculated from the amount of carbon dioxide evolved following hydrochloric acid treatment (6E1b).

Water retention at 15 atmospheres of pressure was measured by pressure-membrane extraction (4B2).

Cation exchange capacity was determined by sodium acetate saturation at a pH of 8.2 (5A2a), and the *exchangeable sodium percentage* (5D1) was calculated from data of this analysis.

Particle-size analyses were made by pipette and sieve methods. After treatment of the sample to remove organic matter and soluble salts, the individual particles were dispersed by sodium hexametaphosphate treatment and mechanical shaking (3A).

Profile of Abraham loam (see table 7):

Survey area: Delta Area
Location: ½ mile south from Oases Church
Physiography: Flood plains
Drainage: Somewhat poorly drained
Vegetation: Irrigated crops

Ap—0 to 8 inches, light brownish-gray (10YR 6/2) loam, dark brownish gray (10YR 4/2) when moist; weak, coarse, platy structure; slightly hard, very friable, slightly sticky and slightly plastic; common fine and very fine roots; common fine pores; strongly calcareous; mildly alkaline; abrupt, smooth boundary.

C1—8 to 33 inches, light brownish-gray (10YR 6/2) silt loam, grayish brown (10YR 5/2) when moist; few, fine, faint (2.5Y 5/4) mottles; massive; slightly hard, very friable, slightly sticky and slightly plastic; few medium and coarse roots; common fine pores; strongly calcareous; mildly alkaline; clear, smooth boundary.

C2—33 to 53 inches, light-gray (10YR 7/2) very fine sandy loam, grayish brown (10YR 5/2) when moist; common, fine, faint, olive-brown (2.5Y 4/4) mottles; massive; soft, very friable, nonsticky and nonplastic; few medium and fine roots; few fine pores; strongly calcareous; mildly alkaline; abrupt, smooth boundary.

C3—53 to 63 inches, similar to C2 horizon but texture is silt loam.

Profile of Anco silty clay loam (see table 7):

Survey Area: Delta Area
Location: T. 16 S., R. 7 W. sec. 29; ½ mile southeast of Big Delta Ranch
Physiography: Flood plains
Drainage: Somewhat poorly drained
Vegetation: Irrigated crops

Ap—0 to 10 inches, light brownish-gray (2.5Y 6/2) silty clay loam, dark grayish brown (2.5Y 4/2) when moist; moderate, medium, granular structure; very hard, firm, sticky and plastic; common medium and fine roots; common medium and fine pores; strongly calcareous; moderately alkaline; abrupt, smooth boundary.

C1—10 to 18 inches, light brownish-gray (10YR 6/2) silty clay loam, grayish brown (10YR 5/2) when moist; weak, fine, granular structure; very hard, firm, sticky and plastic; common medium and fine roots; few medium and fine pores; strongly calcareous; moderately alkaline; gradual, smooth boundary.

C2—18 to 32 inches, light-gray (10YR 7/2) silty clay loam, dark grayish brown (10YR 4/2) when moist; massive; very hard, very firm, very sticky and very plastic; very few fine roots; few medium and fine pores; strongly calcareous; moderately alkaline; gradual, smooth boundary.

C3—32 to 40 inches, light-gray (10YR 7/2) silty clay loam, grayish brown (10YR 5/2) when moist; massive; very hard, very firm, sticky and very plastic; very few roots; common fine pores; strongly calcareous; moderately alkaline; gradual, smooth boundary.

C4—40 to 60 inches, light brownish-gray (10YR 6/2) heavy silty clay loam, gray (2.5Y 5/1) when moist; massive; very hard, very firm, very sticky and very plastic; no roots; common fine pores; strongly calcareous; moderately alkaline.

Profile of Lahontan silty clay (see table 7):

Survey area: Delta Area
Location: T. 18 S., R. 6 W. sec. 4; 30 feet south and 150 feet west from the east quarter corner of sec. 4
Physiography: Flood plains
Drainage: Somewhat poorly drained
Vegetation: Irrigated crops

Ap—0 to 7 inches, pale-brown (10YR 6/3) silty clay, brown (10YR 5/3) when moist; weak, medium, subangular blocky structure; hard, firm, sticky and very plastic; common fine and medium roots; few fine pores; strongly calcareous; moderately alkaline; abrupt, smooth boundary.

C1—7 to 23 inches, very pale brown (10YR 7/3) silty clay, brown (10YR 5/3) when moist; massive; very hard, very firm, very sticky and very plastic; common fine roots; common fine pores; strongly calcareous; moderately alkaline; abrupt, smooth boundary.

C2—23 to 46 inches; light-gray (10YR 7/2) heavy silt loam, grayish brown (10YR 5/2) when moist; common, distinct, yellowish-brown (10YR 5/6) mottles; massive; slightly hard, firm, sticky and plastic; few fine roots and pores; strongly calcareous; moderately alkaline; abrupt, smooth boundary.

C3—46 to 56 inches, pale-brown (10YR 6/3) silty clay, brown (10YR 5/3) when moist; common, distinct, yellowish-brown (10YR 5/6) mottles; very hard, very firm, very sticky and very plastic; few fine roots and pores; strongly calcareous; moderately alkaline.

Profile of Poganeab silty clay loam, strongly saline (see table 7):

Survey area: Delta Area
Location: T. 16 S., R. 7 W., sec. 24
Physiography: Flood plains
Drainage: Poorly drained
Vegetation: Irrigated crops

A1—0 to 10 inches, pale-brown (10YR 6/3) silty clay loam, brown (10YR 5/3) when moist; weak, medium and fine, subangular blocky structure; hard, friable, sticky and plastic; common medium and fine roots; common medium and fine pores; strongly calcareous; moderately alkaline; abrupt, smooth boundary.

C1—10 to 15 inches, light brownish-gray (10YR 6/2) very fine sandy loam, dark grayish brown (10YR 4/2) when moist; few, distinct, light olive-brown (2.5Y 5/6) mottles; massive; soft, very friable, nonsticky and nonplastic; common fine roots; few fine pores; strongly calcareous; mildly alkaline; abrupt, smooth boundary.

C2—15 to 26 inches, light-gray (10YR 7/2) heavy silt loam, dark grayish brown (10YR 4/2) when moist; few, distinct, light olive-brown (2.5Y 5/4) mottles; massive; slightly hard, friable, slightly sticky and slightly plastic; common fine roots; few medium and fine pores; strongly calcareous; moderately alkaline; abrupt, smooth boundary.

C3—26 to 42 inches, light-gray (10YR 7/2) heavy silty clay loam, grayish brown (10YR 5/2) when moist; few, fine, faint, yellowish-brown (10YR 5/4) mottles; massive; hard, firm, sticky and plastic; few fine roots; few fine pores; strongly calcareous; mildly alkaline; clear, smooth boundary.

C4—42 to 60 inches, light-gray (2.5Y 7/2) heavy silty clay loam, grayish brown (2.5Y 5/2) when moist; few, fine, yellowish-brown (10YR 5/4) mottles; mas-

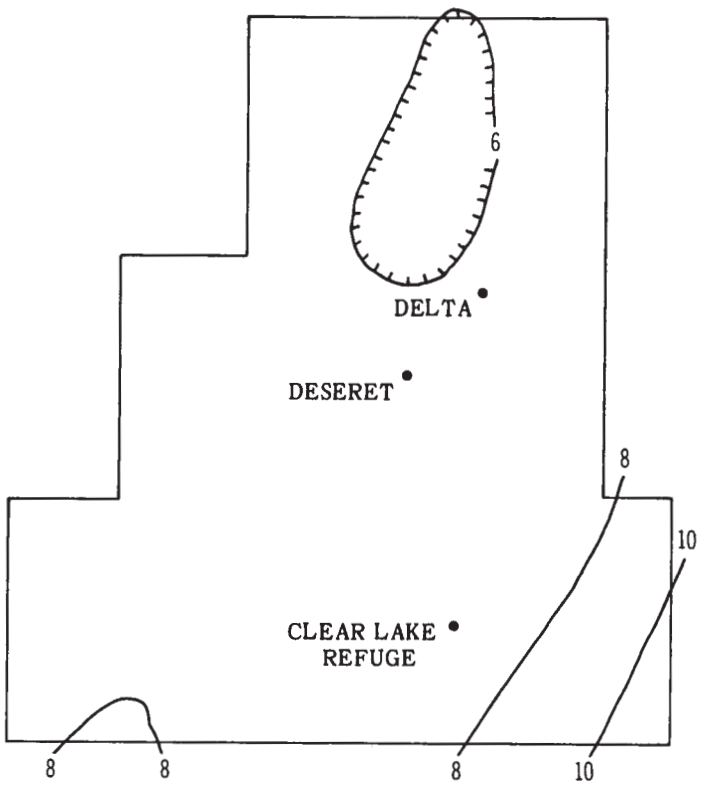

Figure 2.—**Average annual precipitation, 1931–60 (in inches).**

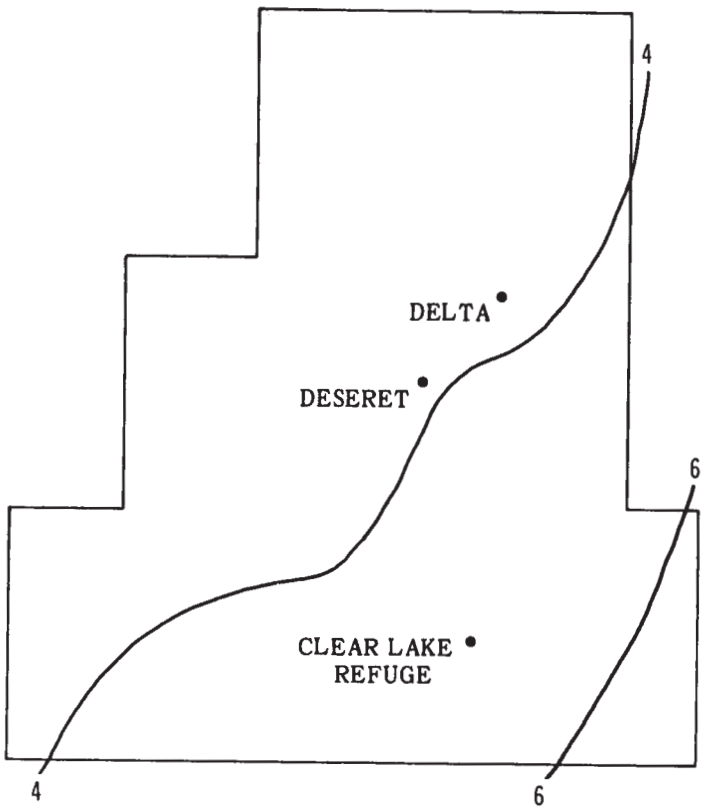

Figure 3.—**Average annual precipitation, October through April, 1931–60 (in inches).**

sive; hard, firm, sticky and plastic; strongly calcareous; moderately alkaline.

Profile of Saltair silt loam (see table 7):
Survey area: Delta Area
Location: 2.7 miles east of Clear Lake, north of Clear Lake highway, NE¼ of sec. 23, T. 19 S., R. 7 W.
Physiography: Old lake bottom
Drainage: Poorly drained
Vegetation: Pickleweed, saltgrass

A11—½ to 3 inches, silt loam, dark gray (10YR 4/1) when moist; weak, platy structure breaking to weak, fine, granular; friable, slightly sticky and slightly plastic; few, fine, random, tubular pores; common very fine roots; mildly calcareous, lime is disseminated; mildly alkaline; clear, wavy boundary.

A12—3 to 8 inches, silt loam, black (10YR 2/1) when moist; weak, fine, granular structure; very friable, slightly sticky and slightly plastic; common fine pores and medium tubular pores; common fine and medium roots and few large roots; strongly calcareous, lime is disseminated; neutral; clear, wavy boundary.

A13—8 to 12 inches, silt loam, black (10YR 2/1) when moist, chroma is less than 1; weak, fine, granular structure; very friable, slightly sticky and slightly plastic; common, fine and medium, random, tubular pores; common fine, medium and a few large tubular pores; common fine, medium and a few large roots; moderately calcareous, lime is disseminated; neutral; clear, wavy boundary.

A14—12 to 17 inches, silt loam, black (2.5Y 2/1) when moist; weak, fine, granular structure; very friable, slightly sticky and slightly plastic; common fine, few medium random tubular pores; common, fine, medium roots and few large roots; few salt flecks; moderately calcareous; lime is disseminated; mildly alkaline; clear, wavy boundary.

A15—17 to 20 inches, silt loam, very dark brown (10YR 2/2) when moist; weak, fine, granular structure; friable (firm in place), slightly sticky and slightly plastic; few, fine and medium, random, tubular pores; common fine, and medium roots and few large roots; slightly calcareous, lime is disseminated; mildly alkaline; clear, slightly wavy boundary.

A16—20 to 28 inches, silty clay loam, black (10YR 2/1) when moist; weak, fine, granular structure; very friable, slightly sticky and slightly plastic; few, medium and fine, random, tubular pores; common medium and fine roots; slightly calcareous; lime is disseminated; mildly alkaline; clear, slightly wavy boundary.

C1—28 to 38 inches, silt loam, gray (10YR 5/1) when moist; massive; slightly sticky and slightly plastic; few, fine, random, tubular pores; very few fine roots; few, medium, faint, olive (5Y 5/4) mottles; strongly calcareous, lime is disseminated; mildly alkaline.

Climate [5]

Delta Area covers the major portion of the Sevier Desert in the east-central part of Millard County. In general, this valley is bounded by the House Mountain Range on the west and the Pavant and Canyon Mountains on the east. The area is quite flat. Elevation

[5] By E. ARLO RICHARDSON, climatologist for Utah, National Weather Service, U.S. Department of Commerce.

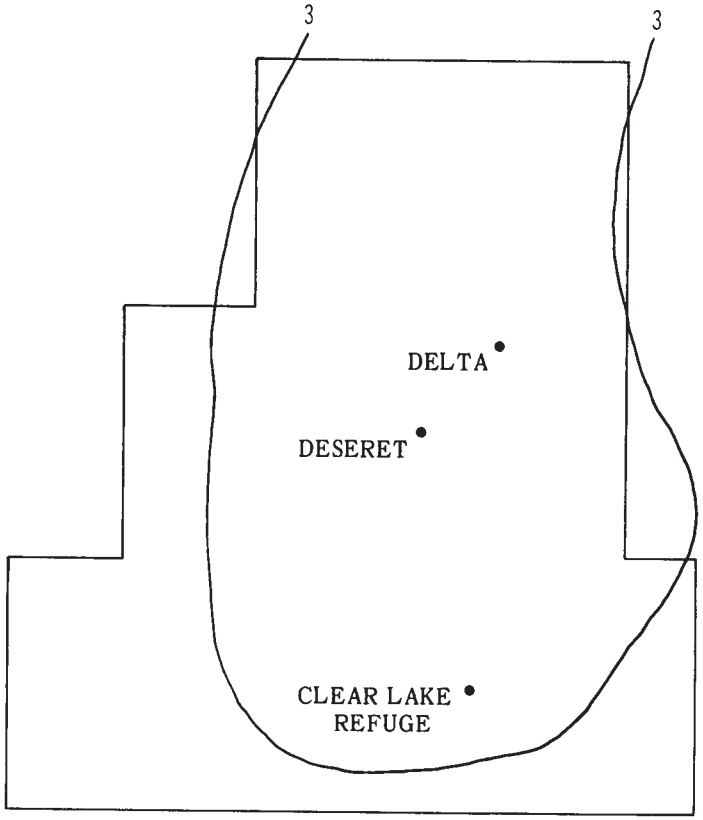

Figure 4.—**Average annual precipitation, May through September, 1931–60 (in inches).**

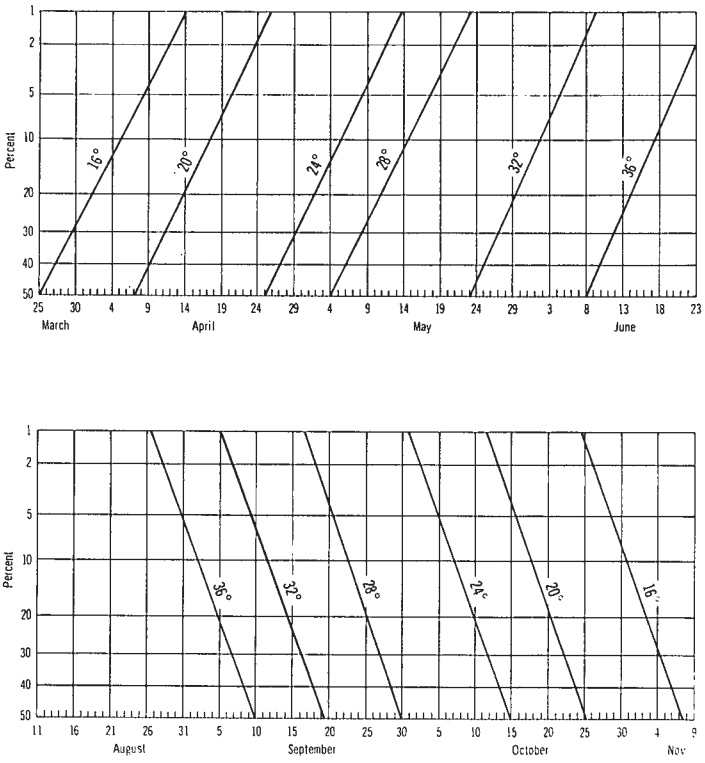

Figure 5.—**Probability of specific temperatures in spring and in fall at Deseret.**

ranges from 4,570 feet to 4,770 feet throughout most of the valley, but a few volcanic cones and buttes rise several hundred feet above the valley floor.

The climate of this valley is essentially that of a cold desert. The annual precipitation ranges between 6 and 10 inches, most of which falls during two periods. Spring is the wettest period of the year. About one-third of the annual moisture is generally received in spring. The second period of maximum precipitation is late in fall or early in winter. Precipitation received during this period is generally associated with the passage of Pacific storm fronts, which sweep across the State from the northwest. The spring maximum is associated with not only frontal activity, but also with a large number of stagnating lows aloft.

Precipitation in summer is the result of occasional, isolated thunderstorms, which form as air from the Gulf of Mexico moves northward. This moist air is quite unstable, and the eastern mountain ranges stimulate the development of thunderstorm cells. Figures 2, 3, and 4 show the general distribution of annual and seasonal precipitation at Deseret, which is representative of the survey area. The greatest annual total precipitation since 1892, when records were first kept at Deseret, was 11.33 inches in 1915. The least amount recorded for any calendar year was 3.11 inches in 1950. Since records were first kept, the annual total has been less than 5 inches during 10 different years. Figure 5 shows the probability of specific temperatures at Deseret in spring and in fall.

Most of the moisture in winter falls in the form of snow, but the seasonal accumulation seldom exceeds 25 inches anywhere in the Area. Table 9 provides data relative to average climatic conditions for Deseret. These data are representative of those of the survey area.

Winter temperatures as low as 32° below zero have been recorded, but such extremes are very rare. Most years have a few days with minimum temperatures below 0°, and maximum temperatures of 100° or higher during most summers have been reported.

Winds are extremely variable, depending on the local topography and the orientation of the pressure gradient. In general, the prevailing winds have a southerly component. As winter storms sweep across the valley, however, the direction is likely to shift to the northwest, and windspeeds are occasionally more than 60 miles per hour. The strongest winds are associated with either active winter storm fronts or local summer thunderstorms. The average windspeed in the valley bottom is about 10 miles per hour.

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(4) ————. 1954. Diagnosis and improvement of saline and alkali soils. U.S. Dep. of Agric. Handb. No. 60, 160 pp., illus.

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(6) ————. 1967. Soil survey investigations report no. 1. 50 pp., illus.

TABLE 9.—*Temperature and*

[Elevation, 4,585 feet; longitude 112°39';

Month	Temperature				
	Average daily maximum	Average daily minimum	Monthly	Record highest	Year
	°F	°F	°F	°F	
January	38.7	12.3	25.5	64	1956
February	45.8	18.7	32.3	72	1951
March	54.4	23.4	38.9	80	1913
April	64.3	31.4	47.8	88	1946
May	74.4	39.6	57.0	94	1900
June	83.1	46.1	64.6	106	1900
July	93.0	54.8	73.9	105	1943
August	90.1	53.0	71.6	105	1969
September	81.6	42.3	62.0	100	1950
October	68.6	32.2	50.4	89	1910
November	52.2	21.8	37.0	79	1906
December	41.0	15.7	28.4	67	1893
Year	65.6	32.6	49.1	106	[2] 1900

[1] Trace.

[2] Month of occurrence, June.

(7) United States Department of Defense. 1968. Unified soil classification system for roads, airfields, embankments, and foundations. MIL–STD 619B, 30 pp., illus.

Glossary

Alkali soil. Generally, a highly alkaline soil. Specifically, an alkali soil has so high a degree of alkalinity (pH 8.5 or higher) or so high a percentage of exchangeable sodium (15 percent or more of the total exchangeable bases), or both, that the growth of most crop plants is low from this cause.

Moderately alkali.—Soils have an exchangeable sodium percentage of 15 to 30 percent in more than 35 percent of the area.

Strongly alkali.—Soils have an exchangeable sodium percentage of more than 30 percent in more than 10 percent of the area.

Alkaline soil. A soil that has a pH value greater than 7.3. See also Reaction, soil.

Alluvial fan. A fan-shaped deposit of sand, gravel, and fine material dropped by a stream where the gradient lessens abruptly. In the survey area, some alluvial fans are cone shaped and are at the base of mountains.

Alluvial plain. A series of alluvial fans that have coalesced.

Alluvium. Soil material, such as sand, silt, or clay, that has been deposited on land by streams.

Argillic horizon. A soil horizon containing illuvial layer-lattice clays with defined percentages and with defined thicknesses with respect to the overlapping eluvial horizons; defined structures; and defined evidence of clay orientation.

Association, soil. A group of soils or miscellaneous land types geographically associated in a characteristic repeating pattern.

Available water capacity. The capacity of a soil to retain water in a form available to plants. The amount of moisture held in soil between field capacity (about one-third atmosphere of tension) and the wilting coefficient (about 15 atmospheres of tension). Readily available water means the amount of water in a soil that plants can obtain from the soil while maintaining rapid growth. It is approximately one-half of the total available water capacity of the root zone.

Calcareous soil. A soil containing enough calcium carbonate (often with magnesium carbonate) to effervesce (fizz) visibly when treated with cold, dilute hydrochloric acid. The following are terms used in this soil survey to describe calcareous soils, and the approximate amounts of lime these soils contain:

Slightly calcareous ——— 1 to 3 percent lime
Moderately calareous ——— 3 to 15 percent lime
Strongly calcareous ——— 15 to 40 percent lime
Very strongly calcareous ——— 40 percent lime or more

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

Coarse fragments. Gravel, cobbles, or stones in a soil, ranging from 2 millimeters in diameter to 3 feet.

Cobblestones. Rounded fragments of minerals or rocks between 3 and 10 inches in diameter.

Cobbly soil. A soil that is 20 to 50 percent coarse fragments, dominantly the size of cobblestones. Very cobbly soils have more than 50 percent coarse fragments.

Complex, soil. A mapping unit consisting of different kinds of soils that occur in such small individual areas or in such an intricate pattern that they cannot be shown separately on a publishable soil map.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence when air-dry are: loose, soft, slightly hard, hard, very hard, and extremely hard. Terms used to describe consistence are—

Loose.—Noncoherent; will not hold together in a mass.

Soft.—When dry, very weakly coherent and fragile; breaks to powder or individual grains under very slight pressure.

Slightly hard.—When dry, weakly resistent to pressure; easily broken between thumb and forefinger.

Hard.—When dry, moderately resistant to pressure; can barely be broken between thumb and forefinger.

Very hard.—When dry, very resistant to pressure; not breakable between thumb and forefinger.

Friable.—When moist, crushed easily under moderate pressure between thumb and forefinger and can be pressed together in a lump.

precipitation data at Deseret

latitude, 39°17′; period of record, 1891–1970]

Temperature—continued		Precipitation					
					Snow		
Record lowest	Year	Average	Greatest daily	Year	Average	Maximum monthly	Year
°F		Inches	Inches		Inches	Inches	
−32	1937	0.49	0.95	1954	5.1	26.3	1949
−28	1903	.41	2.00	1915	3.1	15.0	1922
−14	1966	.69	.82	1941	3.7	18.0	1952
6	1929	.86	1.06	1953	1.5	17.0	1921
20	1929	.74	1.80	1901	.3	4.0	1964
26	1929	.50	.95	1908	[1]	[1]	1951
32	1902	.36	1.08	1937	[1]	[1]	1950
26	1908	.60	1.24	1965	[1]	[1]	1952
19	1945	.44	1.20	1908	.2	5.0	1965
6	1935	.66	1.82	1946	.2	5.0	1954
−8	1931	.56	1.07	1964	1.5	12.0	1902
−32	1932	.59	.82	1931	3.5	20.0	1948
−32	[3] 1937	6.90	2.00	1916	19.1	----------	----------

[3] Month of occurrence, January.

[4] Month of occurrence, February.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Very firm.—When moist, crushes under strong pressure; barely crushable between thumb and forefinger.

Nonsticky.—When wet, after release of pressure, practically no soil material adheres to thumb or finger.

Slightly sticky.—When wet, after pressure, soil material adheres to both thumb and finger but comes off one or the other rather cleanly. It is not appreciably stretched when the digits are separated.

Sticky.—When wet, after pressure, soil material adheres to both thumb and finger and tends to stretch somewhat and pull apart rather than to pull free from either digit.

Very sticky.—When wet, after pressure, soil material adheres strongly to both thumb and forefinger and is decidedly stretched when they are separated.

Nonplastic.—When wet, no wire is formable.

Slightly plastic.—When wet, wire formable and moderate pressure required for deformation of the soil mass.

Plastic.—When wet, wire formable and moderate pressure required for deformation of the soil mass.

Very plastic.—When wet, wire formable; much pressure required for deformation of the soil mass.

Cemented.—Hard and brittle; little affected by moistening.

Depth, soil. In this survey, the following terms and their meanings are used to describe depth of the soil over bedrock or over a restricting layer:

Deep	More than 36 inches
Moderately deep	20 to 36 inches
Shallow	10 to 20 inches
Very shallow	Less than 10 inches.

Drainage class (natural). Refers to the conditions of frequency and duration of periods of saturation or partial saturation that existed during the development of the soil, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden depening of channels or the blocking of drainage outlets. Seven different classes of natural soil drainage are recognized.

Excessively drained soils are commonly very porous and rapidly permeable and have a low available water capacity.

Somewhat excessively drained soils are also very permeable and are free from mottling throughout their profile.

Well-drained soils are nearly free from mottling and are commonly of intermediate texture.

Moderately well drained soils commonly have a slowly permeable layer in or immediately beneath the solum. They have uniform color in the A and upper B horizons and mottling in the lower B and the C horizons.

Somewhat poorly drained soils are wet for significant periods but not all the time, and some soils commonly have mottling at a depth below 6 to 16 inches.

Poorly drained soils are wet for long periods and are light gray and generally mottled from the surface downward, although mottling may be absent or nearly so in some soils.

Very poorly drained soils are wet nearly all the time. They have a dark-gray or black surface layer and are gray or light gay, with or without mottling, in the deeper parts of the profile.

Erosion hazard. Susceptibility of a soil to erosion if the cover of plants is removed. Relative terms are *none, slight,* and *moderate.*

Field moisture capacity. The amount of water held in the soil at 1/3 to 1/10 atmosphere tension. The 1/10 atmosphere tension is used for sandy soils. Field capacity is usually considered as the amount of water a well-drained soil holds after free water has drained off or the maximum amount it holds against gravity.

Flood plain. Nearly level land, consisting of stream sediment, that borders a stream and is subject to flooding unless protected artificially.

Gravelly soil. A soil in which 20 to 50 percent of the solum is coarse fragments between 1/4 inch and 3 inches in diameter. A very gravelly soil is one in which more than 50 percent of the solum is coarse fragments the size of gravel.

Horizon, soil. A layer of soil, approximately parallel to the surface, that has distinct characteristics produced by soil-forming processes. These are the major horizons:

O horizon.—The layer of organic matter on the surface of a mineral soil. This layer consists of decaying plant residue.

A horizon.—The mineral horizon at the surface or just below an O horizon. This horizon is the one in which living organisms are most active and therefore is marked by the

accumulation of humus. The horizon may have lost one or more of soluble salts, clay, and sesquioxides (iron and aluminum oxides).

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of change from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics caused (1) by accumulation of clay, sesquioxides, humus, or some combination of these; (2) by prismatic or blocky structure; (3) by redder or stronger colors than those in the A horizon; or (4) by some combination of these. Combined A and B horizons are usually called the solum, or true soil. If a soil lacks a B horizon, the A horizon alone is the solum.

C horizon.—The weathered rock material immediately beneath the solum. In most soils this material is presumed to be like that from which the overlying horizons were formed. If the material is known to be different from that in the solum, a Roman numeral precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock usually underlies a C horizon but may be immediately beneath an A or B horizon.

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are—

Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Basin.—Water is applied rapidly to relatively level plots surrounded by levees or dikes.

Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops, or in orchards, to confine the flow of water to one direction.

Furrow.—Water is applied in small ditches made by cultivation implements used for tree and row crops.

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding.—Irrigation water, released at high points, flows onto the field without controlled distribution.

Leaching. The removal of material in solution by the passage of water throughout the soil.

Leveling (of land). The reshaping or modification of the land surface to a planned grade to provide a more suitable surface for the efficient application of irrigation water and to provide proper surface drainage.

Lime. Strictly, calcium oxide (CaO), but as commonly used in agricultural terminology, calcium carbonate ($CaCO_3$).

Mollic epipedon. A surface horizon consisting of mineral material and having defined structure, color, and thickness (*6*).

Mottling, soil. Irregularly marked with spots of different colors that vary in number and size. Mottling in soils usually indicates poor aeration and lack of drainage. Descriptive terms are as follows: abundance—*few, common,* and *many;* size—*fine, medium,* and *coarse;* and contrast—*faint, distinct,* and *prominent.* The size measurements are these: *fine,* less than 5 millimeters (about 0.2 inch) in diameter along the greatest dimension; *medium,* ranging from 5 millimeters to 15 millimeters (about 0.2 to 0.6 inch) in diameter along the greatest dimension; and *coarse,* more than 15 millimeters (about 0.6 inch) in diameter along the greatest dimension.

Munsell notation. A system for designating color by degrees of the three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with a hue of 10YR, a value of 6, and a chroma of 4.

Parent material. Disintegrated and partly weathered rock from which soil has formed.

Permeability. The quality that enables the soil to transmit water or air. Terms used to describe permeability are as follows:

	Inches per hour
Very slow	Less than 0.06
Slow	0.06 to 0.2
Moderately slow	0.2 to 0.6
Moderate	0.6 to 2.0
Moderately rapid	2.0 to 6.0
Rapid	6.0 to 20
Very rapid	More than 20

pH value. A numerical means for designating acidity and alkalinity in soils. A pH value of 7.0 indicates precise neutrality; a higher value, alkalinity; and a lower value, acidity.

Profile, soil. A vertical section of the soil through all its horizons and extending into the parent material.

Reaction, soil. The degree of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is precisely neutral in reaction because it is neither acid nor alkaline. An acid, or "sour," soil is one that gives an acid reaction; an alkaline soil is one that is alkaline in reaction. In words, the degrees of acidity or alkalinity are expressed thus:

	pH		*pH*
Extremely acid	Below 4.5	Neutral	6.6 to 7.3
Very strongly acid	4.5 to 5.0	Mildly alkaline	7.4 to 7.8
Strongly acid	5.1 to 5.5	Moderately alkaline	7.9 to 8.4
Medium acid	5.6 to 6.0	Strongly alkaline	8.5 to 9.0
Slightly acid	6.1 to 6.5	Very strongly alkaline	9.1 and higher

Roots (abundance of). Following are terms used to describe abundance of roots; (1) *Many,* more than 25 percent of the surface area is penetrated; *common,* 3 to 25 percent of the surface area is penetrated; *few,* less than 3 percent of the surface area is penetrated.

Saline soil. A soil that contains soluble salts in quantities that impair its productivity for plants, but that does not contain an excess of exchangeable sodium. Following are terms for degrees of salinity:

Slightly saline.—Conductivity of the saturation extract of the soils is 4 to 8 millimhos within 30 inches of the surface.

Moderately saline.—Conductivity of the saturation extract of the soils is 8 to 15 millimhos within 30 inches of the surface.

Strongly saline.—Conductivity of the saturation extract is 15 to 30 millimhos within 30 inches of the surface.

Very strongly saline.—Conductivity of the saturation extract is more than 30 millimhos within 30 inches.

Moderately saline-alkali.—Conductivity of the saturation extract is 8 to 15 millimhos within 30 inches and the exchangeable sodium percent is 15 to 30 percent in more than 35 percent of the area.

Strongly saline-alkali.—Conductivity of the saturation extract is 15 to 30 millimhos within 30 inches and the exchangeable sodium percent is more than 30 percent in more than 10 percent of the area.

Sand. Individual rock or mineral fragments in a soil that range in diameter from 0.05 to 2.0 millimeters. Most sand grains consist of quartz, but they may be of any mineral composition. The textural class name of any soil that contains 85 percent or more sand and not more than 10 percent clay.

Silt. Individual mineral particles in a soil that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). Soil of the silt textural class is 80 percent or more silt and less than 12 percent clay.

Slope classes. The following slope classes are used in this soil survey:

Nearly level	0 to 1 percent
Gently sloping	1 to 3 percent
Moderately sloping	3 to 6 percent
Strongly sloping	6 to 10 percent
Moderately steep	10 to 16 percent
Steep	16 to 30 percent
Very steep	More than 30 percent

Soil. A natural, three-dimensional body on the earth's surface that supports plants and that has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Solum. The upper part of a soil profile, above the parent material, in which the processes of soil formation are active. The solum in mature soil includes the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and other plant and animal life characteristic of the soil are largely confined to the solum.

Stones. Coarse fragments more than 10 inches in diameter.

Structure, soil. The arrangement of primary soil particles into compound particles or clusters that are separated from adjoining aggregates and have properties unlike those of an

equal mass of unaggregated primary soil particles. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles) adhering together without any regular cleavage, as in many claypans and hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Substratum. Technically, the part of the soil below the solum.

Surface soil. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, about 5 to 8 inches in thickness. The plowed layer.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that it may soak into the soil or flow slowly to a prepared outlet without harm. Terraces in fields are generally built so they can be farmed. Terraces intended mainly for drainage have a deep channel that is maintained in permanent sod.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay*, and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Topography. The elevation or inequalities of the land surface, the slope gradient, and the pattern of these conditions.

Topsoil. A presumed fertile soil or soil material, or one that responds to fertilization, ordinarily rich in organic matter, used to topdress roadbanks, lawns, and gardens.

Water-supplying capacity. The capacity of a soil to supply water that is stored during periods of plant dormancy plus the precipitation during the growing season until moisture is depleted.

Water table. The highest part of the soil or underlying rock material that is wholly saturated with water. In some places an upper, or perched, water table may be separated from a lower one by a dry zone. In this soil survey, reference to a moderately deep water table means that the water table is within 20 to 36 inches of the surface during part of the growing season. Reference to a shallow water table means that the water table is at the surface during part of the growing season.

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GUIDE TO MAPPING UNITS

For a full description of a mapping unit, read both the description of the mapping unit and that of the soil series to which the mapping unit belongs. In referring to a capability unit or to a range site, read the introduction to the section it is in for general information about its management. Management by capability unit of all irrigated soils is suggested on pages 33 and 34.

Map symbol	Mapping unit	Page	Capability unit, Irrigated: Symbol	Capability unit, Nonirrigated: Symbol	Capability unit, Nonirrigated: Page	Range site: Name	Range site: Page
Aa	Abbott silty clay	6	IIIw-275	-------	--	----------	--
Ab	Abbott silty clay, strongly saline	6	IIIw-275	VIIs-D8	35	Desert Alkali Flats	38
AE	Abbott silty clay, wet	7	--------	VIIw-28	34	Salt Meadow	38
Af	Abbott silty clay, sandy substratum	7	IIIw-275	-------	--	----------	--
Ag	Abbott silty clay, sandy substratum, strongly saline	7	IIIw-275	VIIs-D8	35	Desert Alkali Flats	38
Ah	Abraham loam	8	IIw-27	VIIs-D8	35	Desert Alkali Flats	38
Ak	Abraham loam, strongly saline	8	IIw-27	VIIs-D8	35	Desert Alkali Flats	38
Am	Abraham silty clay loam	8	IIw-27	-------	--	----------	--
An	Abraham silty clay loam, strongly saline	8	IIw-27	VIIs-D8	35	Desert Alkali Flats	38
AO	Alluvial land	8	--------	VIIIs-8	36	----------	--
Ar	Alluvial land, wet	8	--------	VIIw-28	34	Salt Meadow	38
As	Anco silty clay loam	9	IIw-27	-------	--	----------	--
At	Anco silty clay loam, strongly saline	9	IIw-27	VIIs-D8	35	Desert Alkali Flats	38
Av	Anco silty clay loam, sandy substratum	9	IIw-27	-------	--	----------	--
BLC2	Bluewing very cobbly loam, 3 to 10 percent slopes, eroded	10	--------	VIIe-D	34	Desert Gravelly Loam	39
CA	Cache silty clay loam	11	--------	VIIw-28	34	Salt Meadow	38
CR	Checkett-Rock land association	11	--------	VIIs-S	35	Semidesert Stony Hills	42
CU	Curdli loam	12	--------	VIIe-D	34	Desert Silt Flats	40
De	Deseret silt loam	12	IIc-2	VIIs-S8	35	Semidesert Alkali Flats	41
DU	Drum loam	13	IIw-27	VIIs-D8	35	Desert Flats	39
Dv	Duggins silty clay	13	IIIs-25	-------	--	----------	--
DW	Dune land	13	--------	VIIIs-5	36	----------	--
ESB	Escalante sandy loam, 1 to 5 percent slopes	14	--------	VIIe-S	34	Semidesert Limy Loam	41
EYC	Escalante-Yenrab complex, undulating	14	--------	VIIs-S	35	----------	--
	Escalante sandy loam, 1 to 5 percent slopes	--	--------	-------	--	Semidesert Limy Loam	41
	Yenrab fine sand, high rainfall, undulating	--	--------	-------	--	Semidesert Sand	41
GO	Goshute gravelly silt loam	15	--------	VIIs-D8	35	Desert Alkali Bench	38
HKC2	Hiko Springs sandy loam, 3 to 10 percent slopes, eroded	15	--------	VIIe-D	34	Desert Gravelly Loam	39
HLC	Hiko Springs very gravelly loam, hardpan variant, 3 to 10 percent slopes	16	--------	VIIs-D	35	Desert Gravelly Loam	39
Ka	Kanosh very fine sandy loam	16	--------	VIIw-28	34	Salt Meadow	38
KEB	Kessler loam, 1 to 5 percent slopes	17	--------	VIIe-S	34	Semidesert Limy Loam	41
KLB	Kessler loam, strongly saline, 1 to 5 percent slopes	17	--------	VIIs-S8	35	Semidesert Alkali Flats	41
KsA	Kessler silt loam, 1 to 2 percent slopes	17	IIc-2	-------	--	----------	--
LA	Lahontan silty clay	18	--------	VIIs-D8	35	Desert Alkali Flats	38
LC	Lahontan silty clay loam, sandy subsoil variant	18	--------	VIIIs-8	36	----------	--
LF	Lava flows	18	--------	VIIIs-X	36	----------	--
ME	Mellor silt loam	19	--------	VIIs-S8	35	Semidesert Alkali Flats	41
Mo	Modena sandy loam	20	IIc-2	-------	--	----------	--
Mu	Musinia silt loam	20	IIc-2	-------	--	----------	--
PA	Pahranagat loam	21	--------	VIIw-28	34	Salt Meadow	38
Pe	Penoyer silt loam	21	IIw-27	VIIe-D	34	Desert Silt Flats	40
Ph	Penoyer silt loam, strongly saline	21	IIw-27	VIIs-D8	35	Desert Alkali Flats	38

GUIDE TO MAPPING UNITS--Continued

Map symbol	Mapping unit	Page	Capability unit Irrigated Symbol	Capability unit Nonirrigated Symbol	Capability unit Nonirrigated Page	Range site Name	Range site Page
PM	Playas	22	--------	VIIIw-8	36	----------	--
PN	Playas-Abbott association	22	--------	-------	--	----------	--
	Playas	--	--------	VIIIs-8	36	----------	--
	Abbott silty clay, strongly saline	--	--------	VIIs-D8	35	Desert Alkali Flats	38
Po	Poganeab silty clay loam	22	IIw-27	-------	--	----------	--
Pr	Poganeab silty clay loam, strongly saline	22	IIw-27	VIIs-D8	35	Desert Alkali Flats	38
Pt	Poganeab silty clay loam, sandy substratum	23	IIw-27	-------	--	----------	--
PU	Poganeab-Uffens association	23	--------	VIIs-D8	35	----------	--
	Poganeab silty clay loam, strongly saline	--	--------	-------	--	Desert Alkali Flats	38
	Uffens silt loam	--	--------	-------	--	Desert Alkali Bench	38
	Uvada silt loam	--	--------	-------	--	Desert Flats	39
SA	Saltair silt loam	24	--------	VIIw-28	34	Salt Meadow	38
SD	Saltair silt loam, deep water table	24	--------	VIIw-28	34	Alkali Bottom	37
SE	Saltair silty clay loam, very strongly calcareous variant	24	--------	VIIw-28	34	Alkali Bottom	37
ShB	Shear silty clay, 1 to 5 percent slopes	25	IIIe-27	VIIs-D8	35	Desert Alkali Flats	38
ST	Stony colluvial land	25	--------	VIIIs-X	36	----------	--
SU	Sugarloaf sandy loam, 0 to 10 percent slopes	26	--------	VIIe-S	34	Semidesert Limy Loam	41
SV	Sugarloaf-Rock land association	26	--------	-------	--	----------	--
	Sugarloaf sandy loam, 10 to 30 percent slopes	--	--------	VIIe-S	34	Semidesert Limy Loam	41
	Rock land	--	--------	VIIIs-X	36	----------	--
SWC	Swasey very cobbly loam, 3 to 10 percent slopes	26	--------	VIIs-D8	35	Desert Alkali Bench	38
TO	Toddler sandy clay loam	27	--------	VIIs-D8	35	Desert Flats	39
UE	Uffens silt loam	28	--------	VIIs-D8	35	Desert Alkali Bench	38
UFC	Uffens-Swasey complex, 0 to 10 percent slopes	28	--------	VIIs-D8	35	Desert Alkali Bench	38
UH2	Uffens-Uvada silt loams, eroded	28	--------	VIIs-D8	35	----------	--
	Uffens silt loam, 0 to 5 percent slopes, eroded	--	--------	-------	--	Desert Alkali Bench	38
	Uvada silt loam, 0 to 5 percent slopes, eroded	--	--------	-------	--	Desert Flats	39
UL	Uvada silt loam	29	--------	VIIs-D8	35	Desert Flats	39
UM	Uvada silt loam, strongly saline	29	--------	VIIs-D8	35	Desert Salt Flats	40
UN2	Uvada-Toddler complex, eroded	29	--------	VIIs-D8	35	----------	--
	Uvada silt loam	--	--------	-------	--	Desert Flats	39
	Toddler sandy loam, 1 to 5 percent slopes, eroded	--	--------	-------	--	Desert Flats	39
	Anco silty clay loam, strongly saline, eroded	--	--------	-------	--	Desert Alkali Flats	38
UYC	Uvada-Yenrab complex, undulating	29	--------	-------	--	----------	--
	Uvada silt loam, strongly saline	--	--------	VIIs-D7	35	Desert Salt Flats	40
	Yenrab fine sand, undulating	--	--------	VIIs-D8	35	Desert Alkali Sand	40
Wo	Woodrow silt loam	30	IIc-2	-------	--	----------	--
YBC	Yenrab fine sand, undulating	30	--------	VIIs-D8	35	Desert Alkali Sand	40
YDC	Yenrab fine sand, high rainfall, undulating	30	--------	VIIs-S	35	Semidesert Sand	41
YeC	Yenrab sandy loam, 1 to 10 percent slopes	30	--------	VIIs-D8	35	Desert Alkali Bench	38
YL	Yenrab-Lava flows association	30	--------	-------	--	----------	--
	Yenrab fine sand, undulating	--	--------	VIIs-D8	35	Desert Alkali Sand	40
	Lava flows	--	--------	VIIIs-X	36	----------	--

Map symbol	Mapping unit	Page	Capability unit Irrigated Symbol	Capability unit Nonirrigated Symbol	Capability unit Nonirrigated Page	Range site Name	Range site Page
YUC	Yenrab-Uffens complex, 0 to 10 percent slopes	30	--------	VIIs-D8	35	Desert Alkali Bench	38
YV	Yuba silty clay loam	31	--------	VIIs-D7	35	Desert Salt Flats	40

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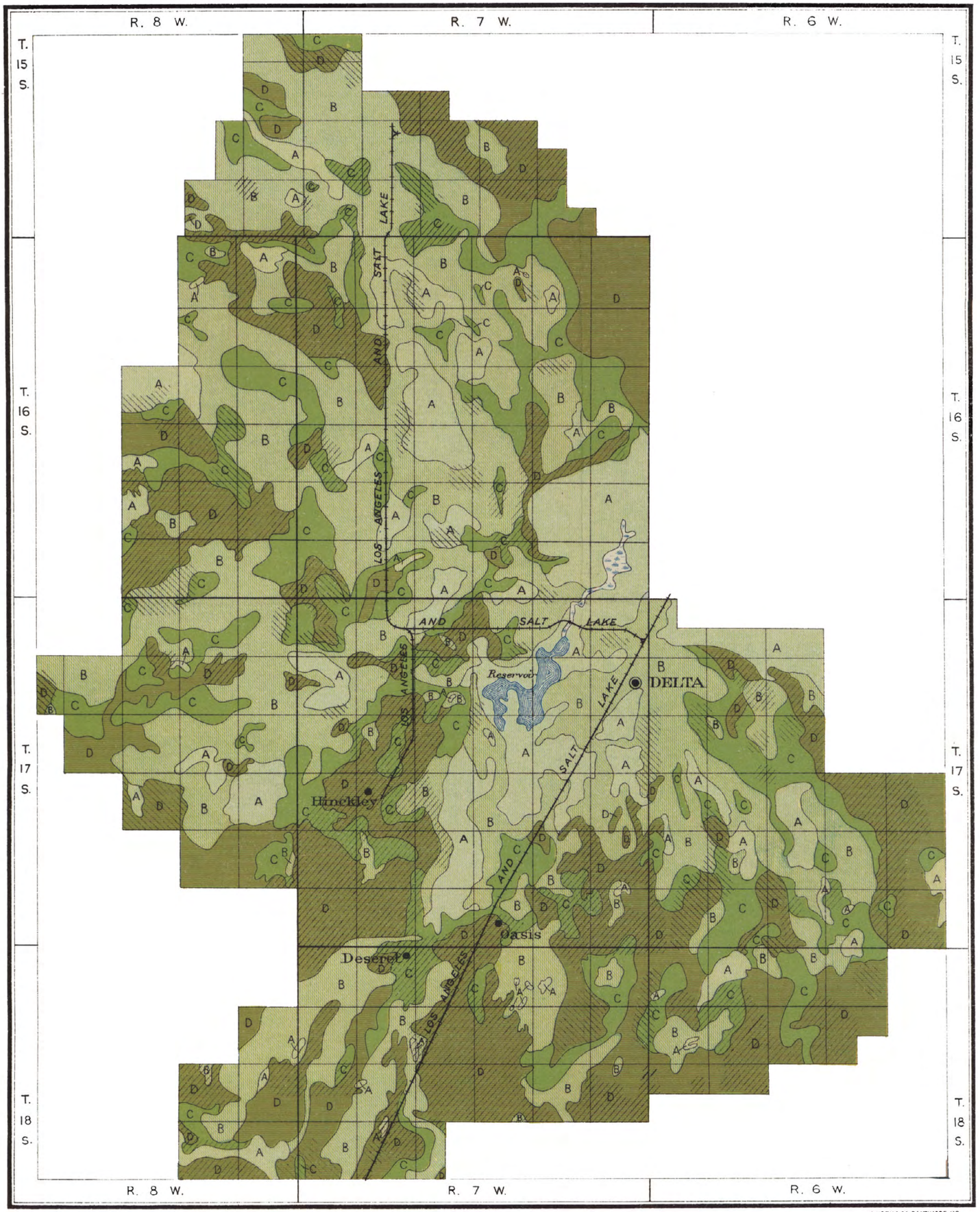

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ALKALI MAP, DELTA AREA, UTAH.

A	B	C	D		
Alkali free	Moderate concentrations	High concentrations	Excessive concentrations	Concentrations in surface soil	Concentrations in subsoil

U. S. DEPT. OF AGRICULTURE
BUREAU OF SOILS
MILTON WHITNEY, CHIEF
CURTIS F. MARBUT, IN CHARGE SOIL SURVEY

SOIL MAP
UTAH
DELTA AREA SHEET

UTAH AGRICULTURAL EXPERIMENT STATION
F. S. HARRIS, DIRECTOR
D. S. JENNINGS, IN CHARGE SOIL SURVEY.

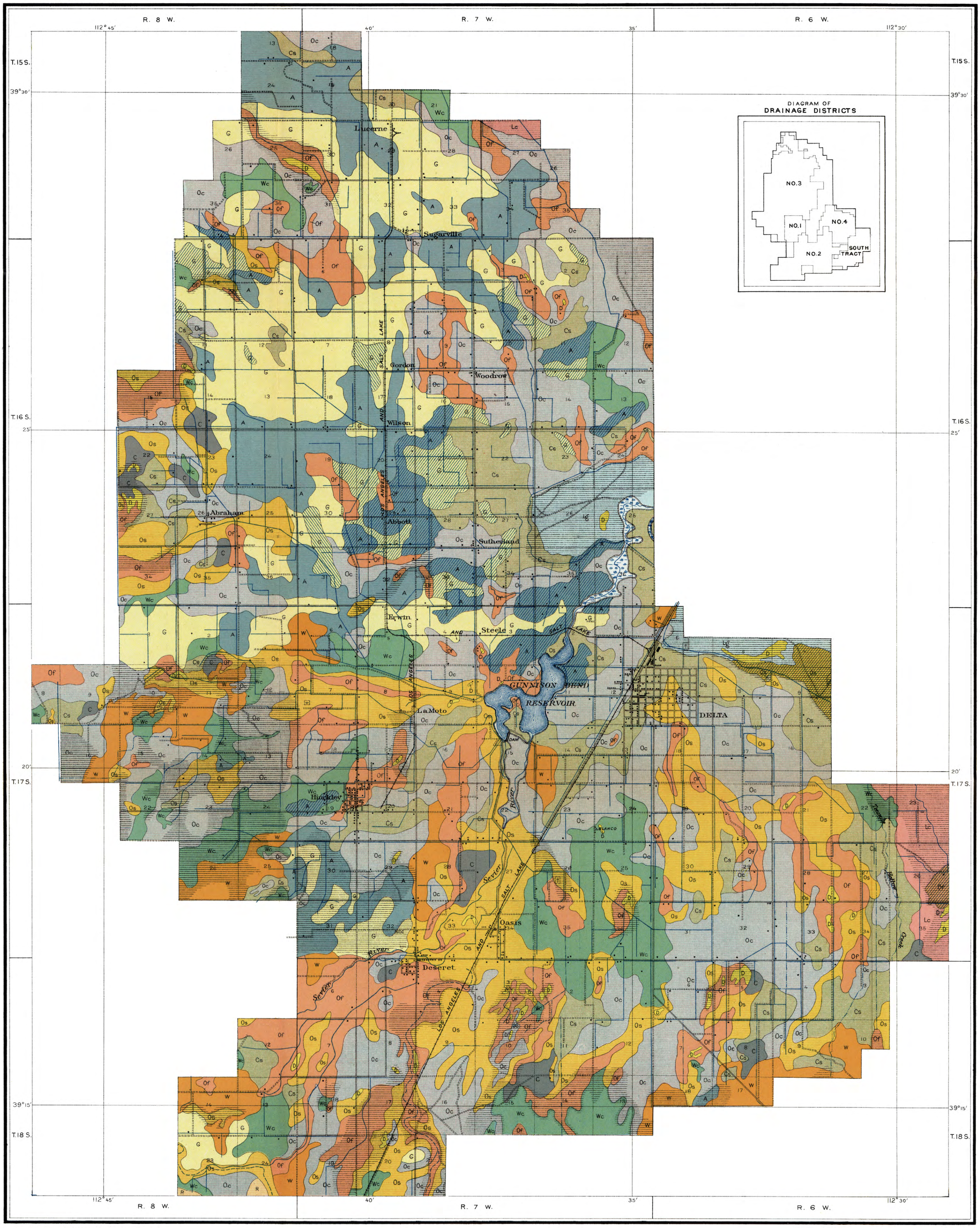

DIAGRAM OF
DRAINAGE DISTRICTS

LEGEND

- Abbott clay — A
- Lyndyl gravelly sandy loam — Lg
- Silty phase — A
- Oasis fine sandy loam — Of
- Cache loam — C
- Bench phase — Of
- Cache silty clay loam — Cs
- Oasis silty clay loam — Os
- Gordon clay — G
- Light-textured bench phase — Os
- Friable phase — G
- Oasis clay — Oc
- Slick phase — G
- Woodrow clay loam — Wc
- Lahontan clay loam — Lc
- Woodrow clay — W
- Dunesand — D
- Rough stony land — R
- Gently rolling topography

CONVENTIONAL SIGNS

CULTURE
(Printed in black)

- City or Village Roads, Buildings, Wharves, Jetties, Breakwater, Levee, Lighthouse, Fort.
- Secondary roads and Trails
- Railroads Steam and Electric (DOUBLE TRACK, SINGLE TRACK, JUXTAPOSITION IN ROAD)
- Bridges, Ferry
- R.R. crossings, Tunnel (R.R. ABOVE, R.R. BELOW)
- Ford, Dam
- School or Church, Cemeteries (CEM)
- Mine or Quarry, Mine dumps, Made land
- Bluff, Escarpment, Rock outcrop and Triangulation station
- Stony and Gravelly areas
- Soil boundaries
- Boundary lines (STATE, COUNTY)
- Boundary lines (LAND GRANT, CITY OR VILLAGE)
- Boundary lines (CIVIL TOWNSHIP, RESERVATION)
- U.S. township and section lines

RELIEF
(Printed in brown or black)

- Contours, Depression contours (700, 750, 800)
- Prominent Hills, Mountain Peaks
- Sand, Wash, and Sand dunes
- Shore and Low-water line, Sandbar

DRAINAGE
(Printed in blue)

- Streams
- Lakes, Ponds, Intermittent lakes
- Intermittent streams
- Springs, Canals and Ditches, Flumes
- Swamp, Salt marshes
- Submerged marsh, Tidal flats

The above signs are in current use on the soil maps. Variations from this usage appear in some maps of earlier dates.

Macy H. Lapham, Inspector, Western Division.
Soils surveyed by A. T. Strahorn of the U.S. Department of Agriculture, in charge, and H. Stucki and D. S. Jennings of the Utah Agricultural Experiment Station.

1 ½ 0 1 2 3 4 Miles
Scale 1 inch = 1 mile

A. HOEN & CO. BALTIMORE, MD.

Field Operations
Bureau of Soils
1919