SOIL SURVEY OF

[redacted]

Part of Millard County

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SOIL SURVEY OF DELTA AREA, UTAH

PART OF MILLARD COUNTY

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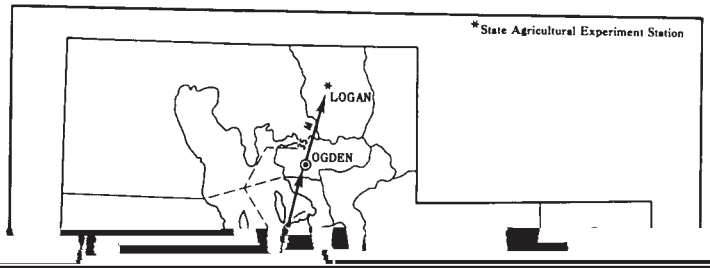
UNITED STATES DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE, UNITED STATES DEPARTMENT OF THE INTERIOR, BUREAU OF LAND MANAGEMENT
IN COOPERATION WITH UTAH AGRICULTURAL EXPERIMENT STATION

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.



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

mapped. Abraham and Sugarloaf, for example, are the names of two soil series. All the soils in the United

Soil scientists observe how soils behave when used as a growing place for native and cultivated plants, and

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,

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

5. *Uvada-Playas-Goshute association*

Deep, well drained, strongly saline to very strongly sa-

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

This association is used for range. It provides limited

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
			Playas	61,615	10.7
Abraham loam	11,995	2.1	Playas-Abbott association	5,110	0

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.

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

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 Paragonah soils.

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.

115 to 125 days. These soils are associated with Check-

annual air temperature is 49° to 52° F. The frost-free

tinct, pale-olive (5Y 6/4) and yellowish-brown (10YR 5/6) mottles; [illegible]

subangular blocky structure; hard, friable, slightly [illegible]

calcareous; strongly alkaline; clear, smooth boundary.

C1ca—4 to 14 inches, very pale brown (10YR 8/3) loam;

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

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

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

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

unit VIIs–S, nonirrigated. Escalante soil in Semidesert Limy Loam range site; Yenrab soil in Semidesert Sand range site.

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

lation 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.

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.

C3cm—29 inches, indurated, lime cemented hardpan.

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, friable, nonsticky and

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;

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

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, [illegible]

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;

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, [illegible]

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 [illegible]

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

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

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

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; com-

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

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

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

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; com

Slopes are 0 to 1 percent. Salt concentrations are too very cobbly soils and intermittent rock outcrop. Rock

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;

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

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

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

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

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-

to this Swasey soil, but bedrock is at a depth of less [illegible] of 10 and 40 inches in 20 to 25 percent, and more than 15

loam, grayish brown (10YR 5/2) when moist; [illegible] These soils formed in lake sediment on deltas. Slopes [illegible] 10 to 12 percent. Native vegetation is chaparral.

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

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.

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.

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.

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 11/ to 21/ inches. The hazard of water erosion is slight

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

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

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

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. Class

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

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.

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.

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 [illegible]

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. [illegible]

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 [illegible]

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 [illegible]

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

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 [illegible]

present plant community with the climax plant community, it is possible to see how individual species have increased while others decreased. Plants not in

alkali cordgrass, alkali sacaton, tufted hairgrass, squirreltail, and Great Basin wildrye. If overgrazing is excessive, saltgrass, smotherweed, snakeweed, hal-

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.

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

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 1,200 pounds per

salt and alkali. The potential plant community, based on total air-dry weight, consists of 65 to 75 percent

acre in favorable years and 600 pounds per acre in unfavorable years. Approximately 98 percent of this

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

tal 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

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

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

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-[illegible] of 60 to 70 percent grass, 20 to

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.

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

gineering 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.

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	A1–C	98	23
		40–61	C	109	22
Abraham loam: NW¼SW¼ sec. 7, T. 17 S., R. 7 W.	Lake sediment and alluvium.	0–7	A1	110	17
		7–18	C	110	16
		18–26	C	104	18
		29–43	C	102	18
		43–57	C	101	22
Anco silty clay loam: sec. 6, T. 18 S., R. 6 W.	Lake sediment and alluvium.	0–21	A1–C	107	21
		21–33	C	107	18
Curdli loam: NW¼ sec. 4, T. 19 S., R. 10 W.	Lake sediment and alluvium.	4–14	C	93	25
		14–60	C	88	30
Goshute gravelly silt loam: SW¼ sec. 32, T. 19 S., R. 10 W.	Lake sediment.	4–12	B2t	118	14
		17–60	C		
Hiko Springs sandy loam: NE¼ sec. 23, T. 20 S., R. 9 W.	Lake sediment and alluvium.	0–14	A1–C	124	10
		14–20	C	125	10
		36–60	C	123	11
Penoyer silt loam: SE¼ sec. 9, T. 17 S., R. 6 W.	Lake sediment and alluvium.	0–9	A1	102	21
		9–48	C	107	18
		48–64	C	106	19
Poganeab silty clay loam, strongly saline: sec. 20, T. 16 S., R. 7 W.	Lake sediment and alluvium.	0–31	A1–C	101	22
		31–60	C	101	22
Uvada silt loam: NE¼ sec. 23, T. 18 S., R. 9 W.	Lake sediment.	4–17	B2t	99	24
		17–47	C	104	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	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
Lehonton: LA	>15	6–10	0–60	Silt loam	CH or CL	A–7 or A–6	0

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 Onsite investigation needed for Rock land part of SV.	5–15	(2)	0–19	Sandy loam	SM–SC or SC	A–2	0
			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	>15	>15	0–60	Sandy clay loam	CL–ML or CL	A–4 or A–6	0

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		Sanitary	Foundations for dwellings without	Local roads

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	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:	Moderately slow permeability; water table at a depth of 5 to	Moderately slow permeability; moderately difficult to till; high

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	Good to fair	Good	Rapid perme-	High to low perme-	Somewhat exces-	Rapid permeabil-

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 [illegible]	Severe: seasonal high water table [illegible]	Severe: seasonal high water table [illegible]	Severe: high potential frost [illegible]	Severe: high potential frost action; water table

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	Good below a depth of 17 inches.	Very rapid permeability below a depth of 1½ feet;	Low to medium shear strength; medium compressibility in top 1½	Well drained	Low available water capacity; sand and gravel below a depth of

TABLE 5.—*Interpretations of engineering*

Soil series and	Degree and kind of limitation for—				
	Septic tank		Sanitary	Foundations for	

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 to[illegible]	Unsuited: shows [illegible]	Poor: high [illegible]	Rapid perme[illegible]	Low to medium [illegible]	Well drained [illegible]	Slow permeabil[illegible]

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	Severe for SA.	Severe: seasonal	Severe: high	Severe: high

properties of the soils—Continued

Suitability as source of—			Soil features affecting—			
	Sand and		Reservoir		Drainage	

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	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	Somewhat excessively drained.	Rapid permeability; uneven slopes; low available water capacity; high

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 foun-

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

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

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

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

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.

TABLE 6.—*Classification of the soils series*

Series	Current classification			1938 Classification
	Family	Subgroup	Order	Soil
Abbott	Fine, montmorillonitic (calcareous)	Vertic Fluvaquents	Entisols	Alluvial soils

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	Exchange-able 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 [illegible] tative 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

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; 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 Rosanesh silty clay loam, strongly saline

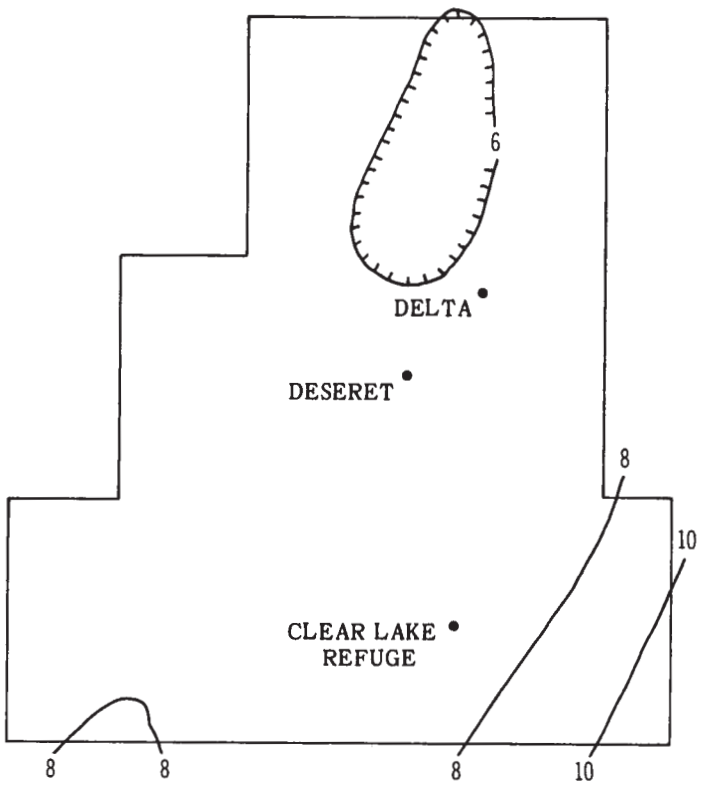


Figure 2.—**Average annual precipitation, 1931–60 (in inches).**

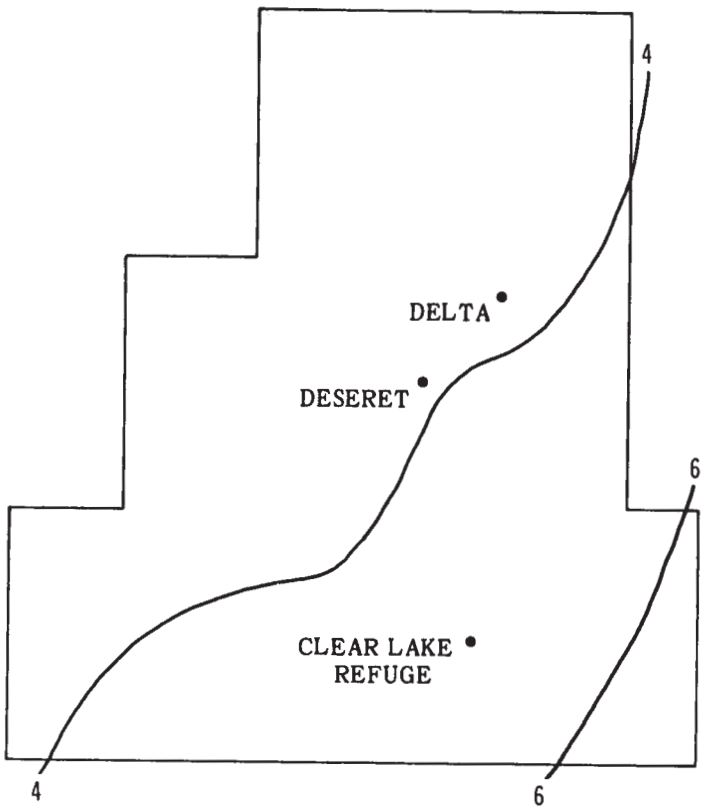


Figure 3.—**Average annual precipitation, October through April, 1931–60 (in inches).**

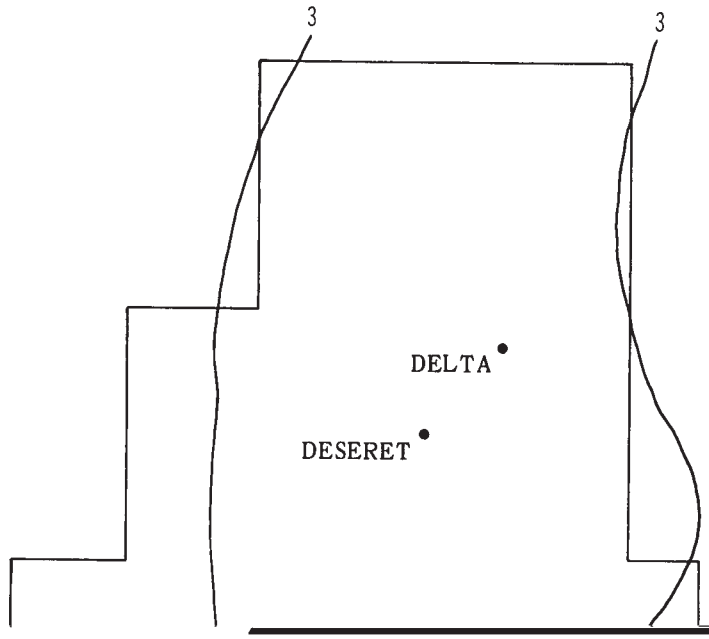
sive; hard, firm, sticky and plastic; strongly calcareous; moderately alkaline.

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; 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



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

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

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

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 [illegible]

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

accumulation of humus. The horizon may have lost one or more of soluble salts, clay, and sesquioxides (iron and

pH value. A numerical means for designating acidity and alka-

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

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
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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