SOIL SURVEY

Richfield Area Utah

Series 1944, No. 9

Issued February 1958

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service
In cooperation with the
UTAH AGRICULTURAL EXPERIMENT STATION

How to Use THE SOIL SURVEY REPORT

THIS REPORT IS ABOUT the soils of the Richfield Area, Utah. It describes each kind of soil in the Area and tells how you can use it, how to take care of it, and what yields you can expect. The soil map shows the location and extent of each kind of soil.

SOILS OF A FARM

If you are a farmer, or if you work with farmers, you probably want to know about the soils of a farm or small tract. First find the right place on the soil map. The map shows township and section lines, towns and villages, roads, streams, most of the houses in rural areas, and other landmarks. Remember that an inch on the map is half a mile on the ground.

Each kind of soil is marked on the map by a symbol made up of two letters; for example, the symbol AB identifies Annabella gravelly sandy loam, 2 to 5 percent slopes. On the margin of the map are printed the names of all the soils mapped in the Richfield Area, the symbols that identify them, and the color in which each is shown on the map. Look up the symbols in the map legend to find the names of your soils. Then you can refer to the soil description in the report. Yields that you can expect from common crops are shown in table 4.

SOILS OF THE COUNTY AS A WHOLE

A general idea of the nature of the soils and their suitability for various uses is given in the section, Soils of the Richfield Area. This section describes how soils are placed in capability groups and gives the capability class and subclass for each soil mapped.

A newcomer to the Area, especially if he considers buying land, will want to know about the climate; types and sizes of farms; principal farm products and how they are marketed; kinds and conditions of farm tenure; availability of water, roads, and railroads; and location of towns and population centers. Information about these will be found in the sections, General Nature of the Area, Agriculture, and Irrigation. The section, Soil Formation and Classification, is a brief technical discussion of the soils and the soil-forming processes that produced them.

This publication on the soil survey of the Richfield Area, Utah, is a cooperative contribution from the—

SOIL CONSERVATION SERVICE

and the

UTAH AGRICULTURAL EXPERIMENT STATION

Series 1944, No. 9 Issued February 1958

SOIL SURVEY OF RICHFIELD AREA, UTAH

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United States Department of Agriculture in cooperation with the Utah Agricultural Experiment Station

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[1] Field work for this survey was done under the direction of the Division of Soil Survey while it was a part of the Bureau of Plant Industry, Soils, and Agricultural Engineering. Soil Survey was transferred to the Soil Conservation Service on November 15, 1952.

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Soil types—Continued

Soils of the Richfield Area—Continued

Soil types—Continued

THE RICHFIELD AREA COVERS parts of three counties in the mountainous, semiarid, central part of Utah. Livestock raising is the dominant enterprise, and beef cattle are the principal source of agricultural income. The main crops are hay, small grains, and sugar beets. The annual rainfall is only about 8 inches. Irrigation is essential, both to provide moisture for crops and to leach out the excess salts and alkali that are common in the soils of the Area.

To provide a basis for the best agricultural use of the soils, this soil survey of the Area was made cooperatively by the United States Department of Agriculture and the Utah Agricultural Experiment Station. Field work was completed in 1944. Information in this report is based on conditions at the time of the survey, unless otherwise specifically indicated.

GENERAL NATURE OF THE AREA

LOCATION AND EXTENT

The Richfield Area is in central Utah. It covers part of southwestern Sanpete County, the western part of Sevier County, and a strip in eastern Millard County, along the Millard-Sevier county boundary (fig. 1).

The Area contains about 511 square miles, or 327,117 acres. Richfield, the county seat and principal town of Sevier County, is about 135 miles south of Salt Lake City. Gunnison, the principal town in the Sanpete County part of the Area, is 105 miles southwest of Salt Lake City. Scipio is the only town in the Millard County part of the survey area.

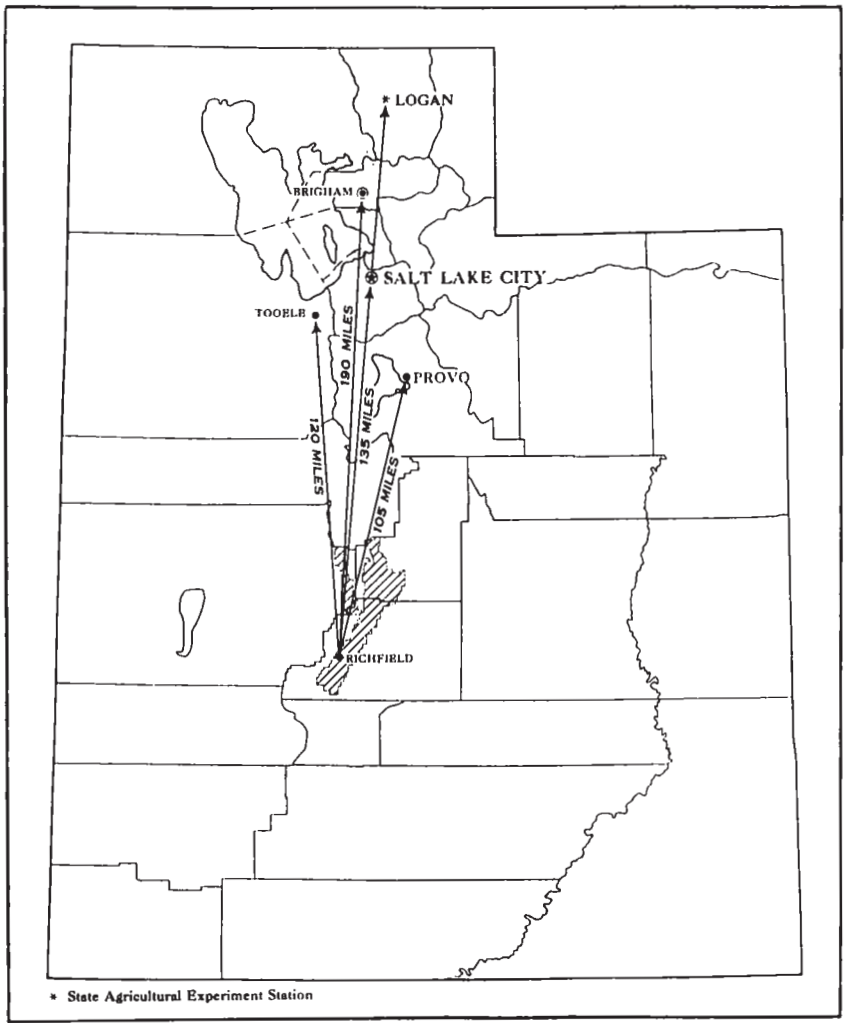

FIGURE 1.—Location of the Richfield Area in Utah.

PHYSIOGRAPHY, RELIEF, AND DRAINAGE

Physiographic features.—All of the Richfield Area is in the Colorado Plateaus physiographic province near the center of the High Plateaus of Utah section.[2] The Area is made up of two valleys separated and surrounded by mountain ranges or high plateaus. Sevier Valley extends north and south in the western parts of Sevier and Sanpete Counties. South of the town of Salina, in Sevier County, this valley is bordered by the Sevier Plateau on the east and the Pavant Plateau on the west. Between Salina and Gunnison, in Sanpete

[2] FENNEMAN, N. M., PHYSIOGRAPHY OF WESTERN UNITED STATES. 1st ed., 534 pp., illus. New York and London. 1931.

County, the Wasatch Plateau is on the east and the Valley Mountains on the west. From Gunnison to the northern boundary of Sanpete County, the eastern border of the valley is the Gunnison Plateau (also known as the Sanpete Mountains), and the Valley Mountains extend along the western border.

Round Valley is in Millard County. It extends north and south, roughly parallel to the Millard-Sevier county line. The Valley Mountains form the eastern boundary of Round Valley and separate it from Sevier Valley. On the west, upper Round Valley is bordered by the Pavant Plateau, and lower Round Valley by the Canyon Mountains.

The entire Area is about a mile above sea level. In Round Valley, elevation increases from about 5,260 feet at Scipio to 6,125 feet, the highest point, near the southern end of the valley. Sevier, near the southwestern corner of the Area, is about 5,342 feet above sea level, and Fayette, near the northeastern limit of the Area, is 5,000 feet high. At Richfield, the elevation is about 5,300 feet.

Relief.—Sevier Valley is fairly level. It is marked by numerous old oxbows formed by the meandering Sevier River. On both sides of the river, above the flood plain, is the gently sloping smooth valley plain, which is the most important agricultural land in the Area. Near the base of the mountains this plain grades into sloping alluvial fans that are cut by many intermittent stream channels.

Round Valley is more irregular in relief. Both the upper and lower parts are small, and proportionately more of their area consists of the steep fans at the base of the mountains.

Drainage.—The Sevier River meanders northeastward from the extreme southwestern corner of the Area to a point almost 2 miles north of Salina; from there it flows nearly due north for 16 miles, passes through the Sevier Bridge Reservoir, and at the northern end of the Canyon Mountains turns southward and ultimately drains into Sevier Lake, which lies 50 to 60 miles west of the survey area. Numerous drainage courses enter the valley of the Sevier River from the high plateaus on either side, but only a few are perennial streams. The most important are Clear Creek, Salina Creek, Lost Creek, and Willow Creek. The San Pitch River, which drains an extensive area in Sanpete Valley, joins the Sevier about 3 miles west of Gunnison.

Round Valley is an inclosed basin that has no surface drainage outlet. Its southern part is drained by 3 small creeks that join to form Ivie Creek. Ivie Creek flows northward about 5 miles to Scipio Lake, a reservoir for irrigation water. Round Valley Creek, which drains Scipio Lake, terminates just northwest of Scipio, in the lowest part of Round Valley.

CLIMATE

The Richfield Area has a continental, or inland, climate characterized by a high percentage of sunny days and wide daily and annual variation in temperature. Most of the Area is arid. Only in the Millard County part is there enough rainfall to grow crops without irrigation.

Table 1 gives normal temperature and precipitation for the Area. The table was compiled from records at two United States Weather Bureau stations, one at Scipio in Round Valley, and the other at Richfield in the southern part of Sevier Valley.

Rainfall is somewhat greater in Round Valley (Scipio station) than in the rest of the Area, but that section also has more severe temperature variations, a lower average annual temperature, and a shorter growing season. At Scipio, the frost-free season averages only 98 days. The average date of the last frost in spring is June 9, and of the first in fall, September 15. At both locations, killing frosts have been recorded every month in the year. At Richfield, the frost-free season averages 123 days. The average date of the last killing frost in spring is May 22, and the first in fall, September 21.

Rainfall is fairly evenly distributed throughout the year but is heaviest in March and lightest in June. During most of the year, precipitation comes as extended showers, but in summer violent thunderstorms are frequent along the plateaus. In steeper areas the torrential rains that accompany these storms cause floods that carry debris into the valleys and occasionally cause local damage.

Severe and prolonged droughts cause serious damage in the dry-farming sections of Round Valley, where, from 1931 to 1935, precipitation was less than 10 inches each year. In the Sevier Valley,

TABLE 1.—*Normal monthly, seasonal, and annual temperature and precipitation for two weather stations in the Richfield Area, Utah*

[Scipio, Millard County, elevation 5,306 feet]

Month	Temperature [1]			Precipitation [2]			
	Average	Absolute maximum	Absolute minimum	Average	Driest year	Wettest year	Average snowfall
	° *F.*	° *F.*	° *F.*	*Inches*	*Inches*	*Inches*	*Inches*
December	27.1	67	−36	1.12	0.10	2.96	8.0
January	25.2	69	−33	1.23	1.04	3.34	9.7
February	30.8	70	−39	1.47	.20	3.11	9.2
Winter	28.0	70	−39	3.82	1.34	9.41	26.9
March	38.4	78	−15	1.61	.10	1.41	7.9
April	46.6	89	4	1.17	2.09	2.61	2.7
May	54.2	94	13	1.23	.01	.66	.7
Spring	46.4	94	−15	4.01	2.20	4.68	11.3
June	63.3	102	24	.64	.10	[3]	[3]
July	70.5	106	28	.79	[3]	1.52	0
August	68.7	101	26	1.03	.37	2.10	0
Summer	67.5	106	24	2.46	.47	3.62	[3]
September	59.7	95	17	.93	1.17	1.16	[3]
October	48.4	88	6	1.25	.57	.28	1.0
November	36.7	77	−23	.99	1.17	2.66	4.2
Fall	48.2	95	−23	3.17	2.91	4.10	5.2
Year	47.5	106	−39	13.46	[4] 6.92	[5] 21.81	43.4

Footnotes at end of table.

TABLE 1.—*Normal monthly, seasonal, and annual temperature and precipitation for two weather stations in the Richfield Area, Utah*—Con.

[Richfield, Sevier County, elevation 5,300 feet]

Month	Temperature [1]			Precipitation [2]			
	Average	Absolute maximum	Absolute minimum	Average	Driest year	Wettest year	Average snowfall
	° *F.*	° *F.*	° *F.*	*Inches*	*Inches*	*Inches*	*Inches*
December	29. 3	73	−20	0. 67	0. 00	1. 34	5. 8
January	27. 6	71	−24	. 63	. 45	. 88	6. 2
February	32. 7	70	−26	. 76	. 20	2. 13	6. 8
Winter	29. 9	73	−26	2. 06	. 65	4. 35	18. 8
March	40. 7	81	−8	. 94	. 00	. 80	4. 3
April	48. 1	90	5	. 79	. 60	. 37	1. 5
May	56. 2	103	19	. 66	. 08	. 47	[3]
Spring	48. 3	103	−8	2. 39	. 68	1. 64	5. 8
June	64. 4	100	20	. 44	[3]	1. 89	0
July	71. 4	102	30	. 77	. 00	3. 28	0
August	69. 3	101	22	. 81	. 07	. 78	0
Summer	68. 4	102	20	2. 02	. 07	5. 95	0
September	60. 6	98	12	. 69	. 07	. 14	0
October	49. 7	90	10	. 68	. 05	. 82	. 7
November	38. 1	79	−6	. 57	. 30	. 10	2. 2
Fall	49. 5	98	−6	1. 94	. 42	1. 06	2. 9
Year	49. 0	103	−26	8. 41	[4] 1. 82	[5] 13. 00	27. 5

[1] Scipio: Average temperature based on a 51-year record through 1953; highest and lowest temperatures on a 34-year record through 1930. Richfield: Average temperature based on a 34-year record through 1953; highest and lowest temperatures on a 33-year record through 1930.

[2] Scipio: Average precipitation based on a 53-year record through 1953; wettest and driest years based on a 57-year record during the period 1895 through 1953; snowfall based on a 32-year record through 1930. Richfield: Average precipitation based on a 35-year record, including 1953; wettest and driest years based on a 48-year record during the period 1890 through 1953; snowfall, based on a 27-year record through 1930.

[3] Trace. [4] In 1900. [5] In 1909. [6] In 1936.

drought damage has not been severe, because much of the land is irrigated. The Sevier River originates far to the south in the high plateaus and usually carries enough water to irrigate the Sevier Valley. Reservoirs on the river help to conserve water.

Winds are generally southwesterly. Wind velocities are lowest in winter and highest during spring and early summer. Light afternoon winds are common during summer and early fall.

Evaporation is rapid because of the dry atmosphere and wind movement. The average seasonal evaporation loss measured by the

United States Weather Bureau at Sevier Bridge dam, just outside the survey area, is about 60 inches.

WATER SUPPLY

Mountain streams or good springs provide water suitable for household use and for livestock in most of the Richfield Area. In some rural sections, water for domestic use is obtained from flowing wells, and water for livestock from streams and canals. Most communities have well-equipped water systems, and nearly all farm homes have running water. The Sevier River is the principal source of irrigation water.

VEGETATION

In Sevier Valley there is a considerable variety of plant growth. On and near the flood plain of the Sevier River, salt-tolerant grasses and sedges predominate. Saltgrass, alkali sacaton, and greasewood are common. On patches of fine-textured soil having strong concentrations of salt or alkali, samphire and pickleweed are prevalent. Along the river south of Annabella is a thick growth of willows, cottonwoods, mountain brush, and various berry bushes, such as squawberry, chokecherry, and serviceberry. On the higher alluvial fans, used mostly for grazing, shadscale is most common, but greasewood, rabbitbrush, white sage, and sagebrush are also important. Overgrazed rangelands have been invaded by Russian-thistle and, in the extreme southern part of Sevier Valley, by a low-growing variety of rabbitbrush locally called yellowbrush. Valley lands that have not been cleared for farming support mostly greasewood, shadscale, and rabbitbrush. There is very little grass.

In Round Valley, big sagebrush is the dominant plant on the higher alluvial fans, and shadscale and greasewood on the lower parts. In the extreme southern part of this valley, Utah juniper and pinyon grow thickly. Oak brush is prominent on the high fans on the west side of upper Round Valley.

RECREATIONAL RESOURCES

Big-game hunting attracts sportsmen to the Area, many from considerable distances. Deer and elk in large numbers range on the high plateaus surrounding Sevier Valley.

Pheasants are hunted in the farming areas and foothills, upland game birds are plentiful, and ducks and geese live on numerous small ponds along the Sevier River. The Utah Fish and Game Department has a fish hatchery at Glenwood and annually stocks the mountain streams, high lakes, and reservoirs with legal-sized trout.

Maple Grove, a summer recreational area in upper Round Valley, is used for camping, fishing, and hiking. Warm-spring bathing is provided by Monroe Hot Springs, just northeast of Monroe.

EARLY SETTLEMENT AND PRESENT POPULATION

The first settlers in the Richfield Area were Mormons who came to Sevier Valley in the late 1850's and early 1860's. Gunnison was settled in 1859, and Fayette in 1861. Richfield, Salina, and Monroe were settled in 1863, and Glenwood in 1864. The early settlers were

harried by the Indians, and in 1866 and 1867 all the settlements except Gunnison and Glenwood were abandoned. After the Indian wars were settled, about 1870, the abandoned towns were reoccupied and additional settlements were made at Annabella, Aurora, Elsinore, Joseph, Mayfield, Redmond, and Vermillion.

The present population is composed almost entirely of descendants of the early Mormon settlers. A few Mormon converts have immigrated from northern Europe, or have moved in from nearby communities. Most of the people are of northern European descent.

The Area is practically all rural. Richfield, the only town classified as urban by the Federal census, had a population of 4,212 in 1950. It is the county seat and principal town of Sevier County and is the most important agricultural trading and shipping center in the Area. Other important towns are Salina (pop. 1,789), Monroe (pop. 1,214), both in Sevier County, and Gunnison (pop. 1,144) in Sanpete County. Smaller communities are Aurora (pop. 614), Elsinore (pop. 657), Scipio (pop. 491), Centerfield (pop. 601), Redmond (pop. 600), Annabella (pop. 263), Glenwood (pop. 338), Joseph (pop. 208), Sigurd (pop. 431), and Mayfield (pop. 390).

INDUSTRIES

Industry in the Richfield Area centers around the processing of agricultural products and mining. A modern refinery at Centerfield processes all the sugar beets grown in the Area. Dairy products are processed at Aurora and Monroe. Turkey-packing plants are located at Richfield and Gunnison, where the Utah Poultry Producers Association also has egg-packing plants.

Gypsum, rock salt, and clay are mined. The salt mines are west of Axtell, near the Savier-Sanpete County line. Salt is blasted from open cuts and is sold in lumps for cattle or is ground and sacked to be sold as sheep or hay salt. Plaster products are made from gypsum at Sigurd. Clay-products plants at Redmond and Aurora use bentonite from deposits in the nearby hills.

RAILWAYS AND ROADS

Since 1900, a branch line of the Denver and Rio Grande Western Railroad has served the Sanpete and Sevier Valleys. United States Highway No. 89, running north and south through these two valleys, is a hard-surfaced road that connects Salt Lake City with southern Utah, the Grand Canyon, and Phoenix, Ariz. Another hard-surfaced highway, State Highway 28, connects Gunnison with United States Highway 91 at Levan in Juab County. United States Highway 91, a hard-surfaced highway between Los Angeles and Salt Lake City, crosses lower Round Valley. State Highway 63, hard-surfaced, connects Scipio with Salina and the Sevier Valley. All towns not on main highways are on hard-surfaced or partly hard-surfaced connecting roads. Many rural roads are graded or graveled.

SCHOOLS AND CHURCHES

Almost every town has its own grade school. High schools are centralized. School buses carry pupils from rural districts and

smaller towns to and from high schools at Monroe, Richfield, Salina, and Gunnison. High school students at Scipio are transported to a central school at Fillmore in Millard County. There is a Latter-Day Saints (Mormon) Church in each town.

FARM AND HOME IMPROVEMENTS

Most farm homes are in towns or community centers. The number of farm dwellings having electricity and telephones has increased substantially in recent years. Electric power is supplied mostly by a privately owned power company on the Beaver River, in Beaver County. Monroe has a municipal electric power plant, and there is a small private plant at Glenwood.

AGRICULTURE

According to the 1950 census, 86.8 percent of the total area of Sevier County, or 22,237 acres, is in farms. Livestock raising is the predominant agricultural activity in both number of farms and value of products. A small part of the total farm income is derived from the sale of field crops. The field crops, especially corn, are marketed indirectly by feeding them to livestock.

CROPS

Alfalfa and the small grains are the crops most extensively grown in the Area. Alfalfa was introduced in 1860 and quickly became a major crop. Recently, diseases and insects have brought about a decline in acreage, but alfalfa still exceeds all other crops in acreage and dollar value.

The small grains—wheat, barley, and oats—are second to alfalfa in importance. Barley was a minor crop until the introduction of the Trebi variety in 1926. Since then barley acreage has increased steadily, but wheat and oat acreages have declined. The amount of silage corn grown in the Area is increasing.

Sugar beets were first grown in the Area in 1900 and have remained an important crop, though the acreage fluctuates considerably. Good yields of potatoes are obtained in some localities, particularly near Joseph and Monroe in the southern part of Sevier Valley. Vegetable crops are locally important. On a few farms west of Gunnison, cabbage, cauliflower, and celery are grown for market. Peas are grown in commercial quantities at various places.

Since the survey area is not a county unit, exact data on the relative importance of the various crops cannot be extracted from published census reports. However, the part of the survey area that is in Sevier County is larger than the parts in either Sanpete County or Millard County, and includes most of the agricultural land of Sevier County. Census data for Sevier County are therefore considered to be fairly representative of the Richfield Area. Table 2 shows acreages of the major crops as reported for Sevier County in the 1930, 1940, and 1950 census.

AGRICULTURAL PRACTICES

Agricultural practices vary according to the soil type. The silty clay loams and clays are generally plowed in the fall; the coarser tex-

TABLE 2.—*Acreage of principal crops and number of bearing fruit trees in Sevier County, Utah, for stated years*

Crop	1929	1939	1949
	Acres	*Acres*	*Acres*
Corn for silage	161	396	1, 306
Small grains threshed:			
Oats	2, 245	2, 138	1, 648
Wheat	5, 394	4, 170	4, 063
Barley	2, 888	7, 636	7, 011
Rye	36	25	38
All hay	35, 001	22, 182	20, 074
Clover and timothy, alone or mixed	567	90	513
Alfalfa	32, 151	19, 919	16, 657
Small grains cut for hay	11	57	205
Wild hay	1, 455	1, 356	2, 309
All other hay	817	760	390
Sugar beets harvested for sugar	2, 614	4, 334	5, 201
Potatoes, for sale and home use	283	659	[1] 1, 701
Other vegetables harvested for sale	38	262	299
	Number [2]	*Number* [2]	*Number* [2]
Apple trees	4, 787	3, 087	1, 867
Peach trees	1, 838	604	650
Pear trees	677	154	64
Plum and prune trees	642	122	390
Cherry trees	400	139	87
Grapevines	116	[3]	6

[1] For 1949, does not include acreage on farms harvesting less than 10 bags.
[2] In the census year, which is one year later than the crop year given at the head of the column.
[3] Not reported.

tured soils are often plowed in the spring. Depth of plowing varies; where power equipment is used, deep plowing is accomplished. After plowing, the land is harrowed and dragged to pulverize the clods and make a firm seedbed. For row crops, the land is furrowed for irrigation before planting. For close-growing crops, such as grain, the furrows are made immediately after seeding.

In Round Valley, some dry farming is possible. Seedbeds are prepared during the summer. The grain is planted in the fall and harvested the following July or August. Yields are best if a good stand is obtained in the fall. A crop is grown every 2 years. In alternate years the land is summer fallowed.

In the Sevier Valley, irrigation is necessary immediately after a crop is planted. In this part of the Area, small grains are usually seeded in March. If alfalfa is grown with grain, seeding is generally delayed until April to avoid frost damage to the alfalfa seedlings. Sugar beets are planted in April, and corn and potatoes in May. In the vicinity of Joseph, potato planting is often delayed until early in June. By that time, the whitetop, a noxious weed common in this locality, has bloomed and can be plowed under. Potatoes planted as late as this may be killed by early fall frost before they mature.

Ordinarily three crops of alfalfa hay are harvested, the first crop about the middle of June, the second early in August, and the third

about the middle of September. Immediately after the hay is cut it is raked into windrows with a side-delivery rake. After partial drying in the windrows, it is bunched with a dump rake, then stored in stackyards that are equipped with facilities for feeding livestock.

Grain is generally harvested with binders and hauled either to the stackyard for storage or directly to a threshing machine.

Most of the hay and grain is consumed by livestock and poultry within the Area.

Sugar beets are harvested in October and November. The beets are pulled by machinery, but topping and loading are still done by hand to a large extent. The beets are hauled by truck or wagon to the railroad for shipment to the refinery at Centerfield.

Silage corn is harvested early in September. A shortage of modern harvesting equipment has been a handicap. At times it is necessary to begin harvesting before all of the crop has matured.

Potatoes are harvested with mechanical diggers, picked up by hand, and hauled to grading machines. After they are graded, they may be sold immediately or stored in potato pits. Potatoes are shipped to Arizona and California as well as to local markets.

ROTATIONS AND FERTILIZERS

Crop rotation is practiced to some extent, but no regular system is followed. As a general rule, alfalfa is retained as long as possible. Because of the increasing prevalence of bacterial wilt disease, most alfalfa fields are plowed up after 4 years. Small grains or corn usually follow alfalfa, and sugar beets follow small grains.

Alfalfa is generally seeded with oats or a similar nurse crop that can be cut for hay. Sugar beets are grown for not more than 2 or 3 consecutive years because of the presence of sugar-beet nematodes in the soil.

Barnyard manure is the most generally used soil amendment. It is applied mostly where sugar beets or alfalfa are to be grown. Treble-superphosphate has been used increasingly on sugar beets, potatoes, and alfalfa.

Lime refuse from the sugar refinery at Centerfield is used by farmers in that vicinity, and it is reported to be beneficial to alfalfa and sugar beets. As these are all high-lime soils, the refuse must contain organic matter or some other needed fertilizer element.

PERMANENT PASTURES

On the Ashley and Sevier soils that border the Sevier and San Pitch Rivers there are extensive native pastures. These soils have fluctuating but usually high water tables and contain varying amounts of soluble salts or alkali. The pastures vary widely in type and quality of forage and in carrying capacity but are generally unimproved and of rather low grade. In some places attempts have been made to improve pastures by sowing better grasses and clovers, deferring grazing to encourage reseeding, and directing irrigation water so as to wash the salts from the soil.

These wet pastures, covering 22,293 acres, are distributed through most of the Sevier Valley and are adjacent to good farming areas. They afford pasture for large numbers of livestock. The acreage

has remained fairly constant for several decades. Near the larger towns in the Sevier Valley are a few improved irrigated pastures used mostly for dairy cows.

In upper Round Valley, several hundred acres of land that was formerly dry-farmed, and some newly cleared land, have been planted rather recently to crested wheatgrass, and good pastures have been established.

LIVESTOCK AND LIVESTOCK PRODUCTS

Livestock, particularly beef cattle, is a major source of farm income in the Richfield Area.

Cattle.—In 1950, Sevier County had a total of 24,975 head of cattle. Only 3,319 were dairy cows; the rest were beef cattle. Herefords are the principal beef breed. A number of purebred herds are maintained. Most of the dairy cattle are either Jerseys or Holsteins, or crosses of Jerseys or Holsteins with beef breeds.

A large proportion of the beef cattle graze on surrounding rangelands, some of which are in national forests or in the public domain. Feed is grown in the valleys to fatten stock for market or to carry the breeding stock through the winter. Fattening cattle on local feeds is common in Sevier Valley. In Round Valley, the cattle are generally sold either as feeders or stockers.

Other livestock.—At the time of the 1950 census, there were 26,770 sheep and lambs in Sevier County. Most of the range sheep are Rambouillets; some Hampshires are raised in farm flocks. A large proportion of the sheep graze in national forests and in the public domain for part of the year. The number of sheep has been drastically reduced in recent years, partly because of Federal restrictions on the use of public lands for grazing.

Poultry, particularly chickens and turkeys, and poultry products are important on some farms, but the dollar value of poultry sales in Sevier County declined almost a third between 1944 and 1949.

At the time of the 1950 census, 2,879 hogs were reported in Sevier County, a decrease of 571 from the number reported in 1945.

Work stock.—Horses are practically the only work stock used in the area, and their number is steadily declining as the use of mechanical equipment increases. The number of horses and colts reported in Sevier County decreased from 3,066 in 1945 to 2,182 in 1950. The work stock is generally of high quality and is well cared for.

AGRICULTURAL MARKETS

The principal agricultural products shipped from the Richfield Area are beef cattle, dairy products, eggs, turkeys, lambs, wool, sugar, potatoes, and vegetables. Some beef cattle and lambs are sold as feeders and shipped to Colorado or to the Corn-belt farms for fattening; others are fattened in the Area and sold in Utah or at Pacific Coast markets. Dairy products are sold in Salt Lake City and Los Angeles, and eggs and turkeys mostly in eastern markets. Potatoes are shipped to California and Arizona markets.

TYPES OF FARMS

The 1950 census reported 307 livestock farms in Sevier County. This type of farm led in number and in total value of farm products.

Field-crop farms, including vegetable farms, numbered 216 and were second to livestock farms in value of farm products sold. There were 72 poultry farms and 94 dairy farms. The total value of poultry and poultry products sold exceeded the value of dairy products.

LAND USE

Land use in the Richfield Area was mapped in detail as part of the soil survey. Data collected at that time (1944) showed the following distribution:

	Acres
Cropland:	
Irrigated	74,368
Dry-farmed	13,900
Idle land:	
Irrigated	6,753
Dry	3,278
Pasture:	
Irrigated	20,146
Range	163,886
Forest	10,919
Wasteland	31,272
Urban land	2,422
Total	326,944

Apparently no drastic shifts in land use have taken place since early settlement of the Area. Some attempts were made to farm areas not suitable for crops, and these areas have been abandoned. Some low areas once used for crops are now in pasture. In upper Round Valley, some land that had been dry-farmed has been converted to pasture. In the southern part of Sevier Valley, the acreage planted to potatoes has increased in relation to the acreage of other crops.

FARM TENURE

Most farms in the Area are owner-operated. In Sevier County only 12 percent of the farms were tenant-operated in 1930; the proportion increased to 17 percent in 1940 but dropped back to 10.7 percent by 1950. Tenancy is normally on a crop-share or livestock-share basis. Less than 3 percent of the farms in Sevier County were operated by managers in 1950.

FARM EQUIPMENT AND LABOR

Ownership of mechanical equipment increased substantially between 1945 and 1950. In the 1945 census, 261 farms in Sevier County reported 331 motortrucks; in 1950, 520 farms reported 590 trucks. In the same period, the number of tractors increased from 251 on 198 farms to 661 on 554 farms, and the number of automobiles increased from 736 on 722 farms to 1,042 on 755 farms.

Other machinery commonly used on farms in the Area includes mowing machines, hayrakes, grain drills, binders, threshers, beet drills, beet cultivators, and beet harvesters. In the southern part of Sevier Valley, potato planters and potato diggers are common.

In 1949, 666 farms in Sevier County reported expenditures for labor. Most general farm labor is hired locally, by the day, week, or month. Some transients are employed in the sugar-beet fields, generally on contract or at piecework rates.

SOIL SURVEY METHODS AND DEFINITIONS

The scientist who makes a soil survey examines soils in the field, classifies the soils in accordance with facts that he observes, and maps their boundaries on an aerial photograph or other map.

Field study.—The soil surveyor bores or digs many holes to see what the soils are like. The holes are not spaced in a regular pattern but are located according to the lay of the land. Usually they are not more than a quarter of a mile apart and sometimes they are much closer. In most soils such a boring or hole reveals several distinct layers, called horizons, which collectively are known as the soil profile. Each layer is studied to see how it differs from others in the profile and to learn the things about this soil that influence its capacity to support plant growth.

Color is usually related to the amount of organic matter. The darker the surface soil, as a rule, the more organic matter it contains. Streaks and spots of gray, yellow, and brown in the lower layers generally indicate poor drainage and poor aeration.

Texture, or the content of sand, silt, and clay, is determined by the way the soil feels when rubbed between the fingers and is later checked by laboratory analysis. Texture determines how well the soil retains moisture, plant nutrients, and fertilizer and whether it is easy or difficult to cultivate.

Structure, which is the way the individual soil particles are arranged in larger aggregates and the amount of pore space between aggregates, gives us clues to the ease or difficulty with which the soil is penetrated by plant roots and by moisture.

Consistence, or the tendency of the soil to crumble or to stick together, indicates whether it is easy or difficult to keep the soil open and porous under cultivation.

Other characteristics observed in the course of the field study and considered in classifying the soil include the following: The depth of the soil over bedrock or compact layers; the presence of gravel or stones in amounts that will interfere with cultivation; the steepness and pattern of slopes; the degree of erosion; the nature of the underlying rocks or other parent material from which the soil has developed; and the acidity or alkalinity of the soil as measured by chemical tests.

Classification.—On the basis of the characteristics observed by the survey team or determined by laboratory tests, soils are classified into phases, types, and series. The soil type is the basic classification unit. A soil type may consist of several phases. Types that resemble each other in most of their characteristics are grouped into soil series.

Soil type.—Soils similar in kind, thickness, and arrangement of soil layers are classified as one soil type.

Soil phase.—Because of differences other than those of kind, thickness, and arrangement of layers, some soil types are divided into two or more phases. Slope variations, frequency of rock outcrops, degree of erosion, depth of soil over the substratum, or natural drainage, are examples of characteristics that suggest dividing a soil type into phases.

The soil phase (or the soil type if it has not been subdivided) is the unit shown on the soil map. It is the unit that has the narrowest

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range of characteristics. Use and management practices therefore can be specified more easily for the unit than for soil series or yet broader groups that contain more variation.

Soil series.—Two or more soil types that differ in surface texture but are otherwise similar in kind, thickness, and arrangement of soil layers are normally designated as a soil series. In a given area, however, it frequently happens that a soil series is represented by only one soil type. Each series is named for a place near which the soil was first mapped.

As an example of soil classification, consider the Annabella series of the Richfield Area. This series is made up of four soil types, all but one of which are subdivided into phases, as follows:

Series	Type	Phase
Annabella	Gravelly sandy loam	0 to 2 percent slopes.
		2 to 5 percent slopes.
		5 to 15 percent slopes.
	Sandy loam	0 to 2 percent slopes.
	Stony sandy loam	2 to 5 percent slopes.
		2 to 5 percent slopes eroded.
		5 to 15 percent slopes.
	Loam	0 to 2 percent slopes.
		2 to 5 percent slopes.

Miscellaneous land types.—Fresh stream deposits or rough, stony, and severely gullied land that have little true soil are not classified into types and series but are identified by descriptive names, such as Riverwash, Rough gullied land, or Rough stony land.

Soil complex.—When two or more soils are so intricately associated in small areas that it is not feasible to show them separately on the soil map, they are mapped together and called a soil complex. This is the case for the Mellor and Manassa loams of the Richfield Area.

SOILS OF THE RICHFIELD AREA

GENERAL NATURE

Soils of the Richfield Area have certain characteristics in common with other soils of arid and semiarid regions of the western United States. They are comparatively rich in soluble minerals. They may be fairly high in total phosphorus, but this is often not available to crops in quantities sufficient to meet their needs. Many of the soils contain excessive quantities of soluble salts. Gypsum (calcium sulfate) occurs in some of the soils. Lime (calcium carbonate) is a common constituent of all soils of the Area. In only two soil series has the lime been leached from the surface soil.

For the most part, the soils have developed under an average annual rainfall of 8 to 10 inches a year. Slightly higher rainfall in one small area in Millard County has made the surface soil darker colored and higher in organic matter than the corresponding layer in soils of the arid parts of the Area.

CAPABILITY GROUPS OF SOILS

The capability grouping is an arrangement of soils according to relative suitability for crops, grazing, forestry, or wildlife. The estimate of suitability is made by several persons who know the soils

and work with them. Soils that are nearly level, well drained, free from overflow, fairly fertile, and not otherwise limited are placed in capability class I. They are widely adaptable and the user of them has many choices open to him. He can use his class I soils for crops without special practices, and he can choose one of several cropping systems; or he may use the soil for pasture or for some other purpose.

Soils are placed in class II if they are a little less widely adaptable and thus more limited than those in class I. A gently sloping soil, for example, is more difficult to irrigate than a level soil and must be managed in some way to control runoff and erosion. Other kinds of class II soils are limited and require special management because there is excess water on or in them, because they are sandy or shallow and have low moisture-holding capacity, or because they are located where climate is a limitation.

Soils are placed in capability class III if they are less adaptable or have more stringent management requirements than those in class II, and yet can be used on a long-time basis for a satisfactory cropping system. Soils that are less adaptable and therefore more limited than those in class III, but are usable for tillage part of the time or with special precautions, are in class IV.

Soils not suitable for cultivation are in classes V, VI, VII, or VIII. Class V, not used in the Richfield Area, contains the soils not subject to erosion but not suitable for usual cultivation because of standing water or some other limitation. Class VI contains the soils, many of them steep, that yield fairly good amounts of forage or of forest products, but should not as a rule be cultivated. Some of them can with safety be disturbed just enough to prepare them for orchards, tree crops, or extremely longtime pastures. Soils in class VII are more limited than those in class VI, are not suitable for any cultivation, and usually give only fair or poor yields of forage or wood products. Soils in class VIII are so severely limited that they produce little useful vegetation. They may provide good scenery, or may form parts of useful watersheds. Some have value for wildlife.

Since most of the capability classes include soils that differ from each other, it is convenient to recognize capability subclasses, which are based on the dominant kind of limitation. In the Richfield Area four subclasses are recognized: Subclass s consists of soils having permanent characteristics that limit their suitability, for example, shallowness, stoniness, or fine or coarse texture. In subclass s_1 are soils that have harmful concentrations of alkali or salt, or both. Subclass e consists of soils limited in usefulness by the risk of erosion; and subclass w is made up of soils that are limited in suitability by poor drainage.

The following lists show the capability class and subclass for each soil in the Richfield Area.

Class I.—*Safe for intensive cultivation, without special practice to control runoff or erosion, and highly productive under good management.*[1]

(An) Arapien loam, 0 to 2 percent slopes.
(Cb) Calita loam, 0 to 2 percent slopes.

[1] Normally, Class I soils are confined to slopes of 1 percent or less. In this area some of the mapping units listed under Class I contain some Class IIe, because some of the slopes range up to 4 percent.

(Ea) Ebbs loam, 0 to 2 percent slopes.
(Gd) Genola loam, 0 to 2 percent slopes.
(Gf) Genola loam, deep, over gravel, 0 to 2 percent slopes.
(Mo) Musinia sandy loam, 0 to 2 percent slopes.
(Nc) Naples loam, 0 to 2 percent slopes.
(Rm) Redfield fine sandy loam, 0 to 3 percent slopes.
(Rn) Redfield loam, 0 to 2 percent slopes.
(Ta) Taylorsville loam, 0 to 2 percent slopes.
(Wb) Welby fine sandy loam, 0 to 2 percent slopes.
(Wc) Welby loam, 1 to 4 percent slopes.

Class II.—*Suitable for tillage; slight risk of erosion, or other slight limitations.*

SUBCLASS IIs

(Al) Arapien fine sandy loam, 0 to 2 percent slopes.
(Am) Arapien fine sandy loam, 2 to 5 percent slopes.
(Ar) Arapien silty clay loam, 0 to 2 percent slopes.
(As) Arapien silty clay loam, 2 to 5 percent slopes.
(At) Ashley clay loam, 0 to 2 percent slopes.
(Bf) Bertelson sandy loam, deep, 0 to 2 percent slopes.
(Ce) Calita silty clay loam, 0 to 2 percent slopes.
(Cf) Calita silty clay loam, 2 to 5 percent slopes.
(Dh) Duggins silty clay loam, 0 to 1 percent slopes.
(Ed) Ebbs silty clay loam, 0 to 2 percent slopes.
(Ee) Ebbs silty clay loam, 2 to 5 percent slopes.
(Ga) Genola fine sandy loam, 0 to 2 percent slopes.
(Gb) Genola fine sandy loam, 2 to 5 percent slopes.
(Gh) Genola silty clay loam, 0 to 2 percent slopes.
(Gk) Genola silty clay loam, 2 to 5 percent slopes.
(Gl) Genola silty clay loam, deep, over gravel, 2 to 5 percent slopes.
(Go) Genola silty clay loam, over Taylorsville soil material, 0 to 2 percent slopes.
(Gp) Genola silty clay loam, over Welby soil material, 0 to 1 percent slopes.
(Mc) Mayfield clay loam, 0 to 2 percent slopes.
(Mk) Mayfield loam, 2 to 5 percent slopes.
(Mr) Musinia sandy loam, deep, over gravel, 0 to 2 percent slopes.
(Ms) Musinia sandy loam, deep, over gravel, 2 to 5 percent slopes.
(Mw) Musinia silty clay loam, 0 to 2 percent slopes.
(Mx) Musinia silty clay loam, deep, over gravel, 0 to 2 percent slopes.
(Ne) Naples silty clay loam, 0 to 2 percent slopes.
(Nf) Naples silty clay loam, 2 to 5 percent slopes.
(Pp) Poganeab clay loam, moderately well drained, 0 to 2 percent slopes.
(Rc) Ravola clay loam, 0 to 2 percent slopes.
(Rd) Ravola clay loam, 2 to 5 percent slopes.
(Rh) Ravola clay loam, silted, 0 to 2 percent slopes.
(Rk) Ravola clay loam, silted, 2 to 5 percent slopes.
(Rl) Ravola silty clay, silted, 0 to 2 percent slopes.
(Rp) Redfield silty clay loam, 0 to 2 percent slopes.
(Sf) Sanpete loam, deep, 0 to 3 percent slopes.
(To) Taylorsville silty clay loam, 0 to 1 percent slopes.
(Wa) Welby clay loam, 1 to 3 percent slopes.

SUBCLASS IIe

(Ao) Arapien loam, 2 to 5 percent slopes.
(Ca) Calita fine sandy loam, overwash, 2 to 3 percent slopes.
(Cc) Calita loam, 2 to 5 percent slopes.
(Cd) Calita loam, overwash, 2 to 5 percent slopes.
(Eb) Ebbs loam, 2 to 5 percent slopes.
(Ge) Genola loam, 2 to 5 percent slopes.
(Gg) Genola loam, deep, over gravel, 2 to 5 percent slopes.
(Mp) Musinia sandy loam, 2 to 5 percent slopes.
(Nd) Naples loam, 2 to 5 percent slopes.
(Ro) Redfield loam, 2 to 5 percent slopes.
(Tb) Taylorsville loam, 2 to 8 percent slopes.

Class III.—*Suitable for tillage; moderate risk of erosion, or other serious limitations.*

SUBCLASS IIIs

(Aa) Annabella gravelly sandy loam, 0 to 2 percent slopes.
(Ab) Annabella gravelly sandy loam, 2 to 5 percent slopes.
(Ad) Annabella loam, 0 to 2 percent slopes.
(Ae) Annabella loam, 2 to 5 percent slopes.
(Af) Annabella sandy loam, 0 to 2 percent slopes.
(Bb) Bertelson gravelly sandy loam, 2 to 5 percent slopes.
(Bd) Bertelson sandy loam, 0 to 2 percent slopes.
(Be) Bertelson sandy loam, 2 to 8 percent slopes.
(Bh) Billings silty clay, 0 to 3 percent slopes.
(Bk) Billings silty clay, imperfectly drained, 0 to 3 percent slopes.
(Cg) Centerfield clay loam, shallow, 0 to 2 percent slopes.
(Ch) Centerfield silty clay, 0 to 2 percent slopes.
(Ck) Christianburg clay, 0 to 1 percent slopes.
(Cl) Christianburg clay, imperfectly drained, 0 to 1 percent slopes.
(Cm) Christianburg silty clay, 0 to 2 percent slopes.
(Cn) Christianburg silty clay, 2 to 5 percent slopes.
(Co) Christianburg silty clay, imperfectly drained, 0 to 2 percent slopes.
(Dc) Denmark loam, 2 to 5 percent slopes.
(Df) Duggins silty clay, 0 to 1 percent slopes.
(Dg) Duggins silty clay, imperfectly drained, 0 to 1 percent slopes.
(Gc) Genola fine sandy loam, moderately deep and deep, over gravel, 2 to 5 percent slopes.
(He) Hoye gravelly sandy loam, 0 to 2 percent slopes.
(Hf) Hoye gravelly sandy loam, 2 to 5 percent slopes.
(Ja) Jura clay, 0 to 1 percent slopes.
(Jb) Jura clay, imperfectly drained, 0 to 1 percent slopes.
(Jd) Jura silty clay, 0 to 1 percent slopes.
(Je) Jura silty clay, imperfectly drained, 0 to 1 percent slopes.
(Mz) Musinia silty clay loam, moderately deep, over clay, 0 to 2 percent slopes.
(Na) Naples fine sandy loam, deep, over gravel, 0 to 2 percent slopes.
(Nb) Naples fine sandy loam, deep, over gravel, 2 to 5 percent slopes.
(Nh) Navajo silty clay, 0 to 2 percent slopes.
(Nk) Navajo silty clay, imperfectly drained, 0 to 1 percent slopes.
(Nl) Navajo silty clay, moderately deep, over Poganeab soil material, imperfectly drained, 0 to 1 percent slopes.
(Pc) Pavant loam, 3 to 8 percent slopes.
(Pf) Pharo loam, 2 to 5 percent slopes.
(Ph) Pharo gravelly sandy loam, 2 to 5 percent slopes.
(Pt) Poganeab silty clay, moderately well drained, 0 to 2 percent slopes.
(Ra) Ralston gravelly loam, 0 to 2 percent slopes.
(Rb) Ralston loam, 0 to 2 percent slopes.
(S) Sanpete clay loam, 2 to 5 percent slopes.
(Sa) Sanpete gravelly sandy loam, 2 to 5 percent slopes.
(Sd) Sanpete loam, 2 to 5 percent slopes.
(Sk) Sigurd clay loam, 2 to 5 percent slopes.
(Sl) Sigurd fine sandy loam, overwash, 2 to 5 percent slopes.
(Sm) Sigurd gravelly clay loam, 3 to 10 percent slopes.
(Sn) Sigurd gravelly sandy loam, 0 to 2 percent slopes.
(So) Sigurd gravelly sandy loam, 2 to 5 percent slopes.
(Sr) Sigurd loam, 2 to 5 percent slopes.
(SF) Stillman fine sandy loam, 0 to 2 percent slopes.
(SG) Stillman fine sandy loam, 2 to 5 percent slopes.

SUBCLASS IIIe

(Ap) Arapien loam, 5 to 10 percent slopes.
(Ec) Ebbs loam, eroded, 2 to 5 percent slopes.
(Gm) Genola silty clay loam, eroded, 2 to 5 percent slopes.
(Md) Mayfield clay loam, 2 to 5 percent slopes.
(Ml) Mayfield loam, 5 to 10 percent slopes.
(Re) Ravola clay loam, 5 to 10 percent slopes.

(Re) Ravola clay loam, eroded, 5 to 10 percent slopes.
(Rf) Ravola clay loam, eroded, 2 to 5 percent slopes.

SUBCLASS IIIw

(Au) Ashley clay loam, imperfectly drained, 0 to 2 percent slopes.
(Gn) Genola silty clay loam, imperfectly drained, 0 to 2 percent slopes.
(Gr) Genola silty clay loam, over Welby soil material, imperfectly drained, 0 to 1 percent slopes.
(Jc) Jura loam, overwash, 0 to 1 percent slopes.
(Mt) Musinia sandy loam, imperfectly drained, 0 to 2 percent slopes.
(My) Musinia silty clay loam, imperfectly drained, 0 to 2 percent slopes.
(Ng) Naples silty clay loam, imperfectly drained, 0 to 2 percent slopes.
(Rr) Redfield silty clay loam, imperfectly drained, 0 to 2 percent slopes.

Class IV.—*Usable for tillage, but only under special management; high risk of soil damage, or other severe limitations.*

SUBCLASS IVs

(Da) Denmark gravelly sandy loam, 2 to 5 percent slopes.
(Dd) Denmark loam, 5 to 15 percent slopes.
(Ha) Hiko Springs gravelly sandy loam, 2 to 10 percent slopes.
(Ia) Ivie gravelly sandy loam, 2 to 5 percent slopes.
(Mf) Mayfield gravelly clay loam, 2 to 5 percent slopes.
(Mg) Mayfield gravelly clay loam, eroded, 2 to 5 percent slopes.
(Mh) Mayfield gravelly loam, 2 to 5 percent slopes.
(Pa) Pavant gravelly sandy loam, 2 to 5 percent slopes.
(Pb) Pavant gravelly sandy loam, 5 to 10 percent slopes.
(SH) Stillman gravelly loamy sand, 2 to 5 percent slopes.
(SI) Stillman gravelly sandy loam, 0 to 2 percent slopes.
(SJ) Stillman gravelly sandy loam, 2 to 5 percent slopes.

SUBCLASS IVs1

(Ma) Manassa-Mellor loams, 2 to 5 percent slopes.
(Mb) Manassa-Mellor silt loams, 2 to 5 percent slopes.
(Mn) Mellor-Manassa clay loams, 0 to 3 percent slopes.
(Sy) Skumpah loam, 0 to 2 percent slopes.
(Sz) Skumpah loam, eroded, 2 to 5 percent slopes.
(SA) Skumpah loam, eroded, 0 to 2 percent slopes.
(SB) Skumpah silty clay, 0 to 2 percent slopes.
(SC) Skumpah silty clay loam, 0 to 2 percent slopes.
(SD) Skumpah silty clay loam, eroded, 0 to 2 percent slopes.

SUBCLASS IVe

(Ac) Annabella gravelly sandy loam, 5 to 15 percent slopes.
(Bc) Bertelson gravelly sandy loam, 5 to 10 percent slopes.
(Hg) Hoye gravelly sandy loam, 5 to 10 percent slopes.
(Me) Mayfield clay loam, eroded, 5 to 15 percent slopes.
(Pg) Pharo loam, 5 to 10 percent slopes.
(Pk) Pharo gravelly sandy loam, 5 to 10 percent slopes.
(Pl) Pharo gravelly sandy loam, eroded, 5 to 10 percent slopes.
(Sb) Sanpete gravelly sandy loam, 5 to 10 percent slopes.
(Se) Sanpete loam, 5 to 10 percent slopes.
(Sp) Sigurd gravelly sandy loam, 5 to 10 percent slopes.
(Sq) Sigurd gravelly sandy loam, eroded, 2 to 5 percent slopes.
(Ss) Sigurd loam, 5 to 10 percent slopes.

SUBCLASS IVw

(Aw) Ashley soils, undifferentiated, poorly drained, 0 to 2 percent slopes.
(Po) Poganeab clay, poorly drained, 0 to 1 percent slopes.
(Pr) Poganeab clay loam, poorly drained, 0 to 2 percent slopes.
(Pu) Poganeab silty clay, poorly drained, 0 to 2 percent slopes.

Class VI.—*Poorly suited to tillage because of steep slopes or unfavorable texture.*

SUBCLASS VIs

(Pd) Pavant stony sandy loam, 5 to 10 percent slopes.
(Pe) Pavant stony sandy loam, 10 to 20 percent slopes.
(Pm) Pharo stony sandy loam, 5 to 10 percent slopes.
(Pn) Pharo stony sandy loam, 10 to 20 percent slopes.
(Pw) Poganeab soils, undifferentiated, moderately well drained, 0 to 2 percent slopes.
(Px) Poganeab soils, undifferentiated, poorly drained, 0 to 1 percent slopes.

SUBCLASS VIw

(Av) Ashley silty clay, very poorly drained, 0 to 2 percent slopes.
(Bl) Billings silty clay, very poorly drained, 0 to 3 percent slopes.
(Jf) Jura silty clay, very poorly drained, 0 to 1 percent slopes.
(Nm) Navajo silty clay, very poorly drained, 0 to 1 percent slopes.
(Ps) Poganeab clay loam, very poorly drained, 0 to 2 percent slopes.
(Pv) Poganeab silty clay, very poorly drained, 0 to 1 percent slopes.

Class VII.—*Unsuitable for tillage because of stoniness and steep slopes.*

SUBCLASS VIIs

(Ag) Annabella stony sandy loam, 2 to 5 percent slopes.
(Ah) Annabella stony sandy loam, 5 to 15 percent slopes.
(Ak) Annabella stony sandy loam, eroded, 2 to 5 percent slopes.
(Bg) Bertelson stony sandy loam, 5 to 15 percent slopes.
(De) Denmark stony sandy loam, 5 to 20 percent slopes.
(Hb) Hiko Springs stony sandy loam, 2 to 5 percent slopes.
(Hc) Hiko Springs stony sandy loam, 5 to 10 percent slopes.
(Hd) Hiko Springs stony sandy loam, 10 to 20 percent slopes.
(Hh) Hoye stony sandy loam, 2 to 5 percent slopes.
(Hk) Hoye stony sandy loam, 5 to 10 percent slopes.
(Hl) Hoye stony sandy loam, 10 to 20 percent slopes.
(Ib) Ivie stony sandy loam, 4 to 7 percent slopes.
(La) Lakeshore sediments.
(Ru) Rough stony land.
(Sg) Sanpete stony sandy loam, 2 to 5 percent slopes.
(Sh) Sanpete stony sandy loam, 5 to 10 percent slopes.
(Si) Sanpete stony sandy loam, 10 to 40 percent slopes.
(Sj) Sanpete stony sandy loam, eroded, 10 to 40 percent slopes.
(St) Sigurd stony sandy loam, 2 to 5 percent slopes.
(Su) Sigurd stony sandy loam, 5 to 10 percent slopes.
(Sv) Sigurd stony sandy loam, eroded, 3 to 10 percent slopes.
(Sx) Sigurd stony sandy loam, overwash, 2 to 10 percent slopes.
(SE) Sloping to very steep land, undifferentiated.
(SK) Stillman stony loamy sand, 2 to 5 percent slopes.
(SL) Stillman stony sandy loam, 2 to 5 percent slopes.
(SM) Stillman stony sandy loam, 5 to 10 percent slopes.
(SN) Stillman stony sandy loam, eroded, 2 to 5 percent slopes.

SUBCLASS VIIe

(Db) Denmark gravelly sandy loam, 5 to 15 percent slopes.
(Mi) Mayfield gravelly loam, 5 to 10 percent slopes.
(Mm) Mayfield loam, shallow, 5 to 10 percent slopes.
(Rt) Rough gullied land.
(Sc) Sanpete gravelly sandy loam, 10 to 20 percent slopes.

Class VIII.—*Totally unsuitable for tillage.*

SUBCLASS VIIIs

(Ba) Badlands.
(Rs) Riverwash.

SOIL TYPES, PHASES, AND COMPLEXES AND MISCELLANEOUS LAND TYPES

In the following pages the soils of the Richfield Area are described in detail, and their present use and management, use suitability, and management requirements are discussed. The distribution of the soils is shown on the accompanying soil map, and the acreage and proportionate extent of each soil are given in table 3. The symbol that identifies the soil on the map follows the soil name.

To describe the location of the various soils in the Area, terms such as "upper Round Valley", "lower Round Valley", or "Sevier Valley" are used in many of the soil descriptions. These names are not on the soil map, but the parts of the area to which they refer are described, and their locations given, in the section Physiography, Relief, and Drainage.

TABLE 3.—*Approximate acreage and proportionate extent of the soils of the Richfield Area, Utah*

Soil	Acres	Percent
Annabella gravelly sandy loam, 2 to 5 percent slopes	3, 102	0. 95
Annabella gravelly sandy loam, 0 to 2 percent slopes	571	. 17
Annabella gravelly sandy loam, 5 to 15 percent slopes	535	. 16
Annabella sandy loam, 0 to 2 percent slopes	301	. 09
Annabella stony sandy loam, 5 to 15 percent slopes	3, 745	1. 14
Annabella stony sandy loam, 2 to 5 percent slopes	866	. 26
Annabella stony sandy loam, eroded, 2 to 5 percent slopes	185	. 06
Annabella loam, 0 to 2 percent slopes	790	. 24
Annabella loam, 2 to 5 percent slopes	129	. 04
Arapien fine sandy loam, 2 to 5 percent slopes	2, 763	. 84
Arapien fine sandy loam, 0 to 2 percent slopes	634	. 19
Arapien loam, 0 to 2 percent slopes	1, 147	. 35
Arapien loam, 2 to 5 percent slopes	994	. 30
Arapien loam, 5 to 10 percent slopes	275	. 08
Arapien silty clay loam, 0 to 2 percent slopes	490	. 15
Arapien silty clay loam, 2 to 5 percent slopes	321	. 10
Ashley clay loam, 0 to 2 percent slopes	186	. 06
Ashley clay loam, imperfectly drained, 0 to 2 percent slopes	135	. 04
Ashley silty clay, very poorly drained, 0 to 2 percent slopes	154	. 05
Ashley soils, undifferentiated, poorly drained, 0 to 2 percent slopes	523	. 16
Badlands	12, 041	3. 69
Bertelson sandy loam, 2 to 8 percent slopes	1, 580	. 48
Bertelson sandy loam, 0 to 2 percent slopes	922	. 28
Bertelson sandy loam, deep, 0 to 2 percent slopes	464	. 14
Bertelson gravelly sandy loam, 2 to 5 percent slopes	649	. 20
Bertelson gravelly sandy loam, 5 to 10 percent slopes	1, 477	. 45
Bertelson stony sandy loam, 5 to 15 percent slopes	948	. 29
Billings silty clay, 0 to 3 percent slopes	4, 328	1. 32
Billings silty clay, imperfectly drained, 0 to 3 percent slopes	786	. 24
Billings silty clay, very poorly drained, 0 to 3 percent slopes	194	. 06
Calita loam, 2 to 5 percent slopes	1, 592	. 49
Calita loam, 0 to 2 percent slopes	302	. 09
Calita silty clay loam, 2 to 5 percent slopes	1, 036	. 32
Calita silty clay loam, 0 to 2 percent slopes	281	. 09
Calita fine sandy loam, overwash, 2 to 3 percent slopes	237	. 07
Calita loam, overwash, 2 to 5 percent slopes	213	. 06
Centerfield silty clay, 0 to 2 percent slopes	1, 307	. 40
Centerfield clay loam, shallow, 0 to 2 percent slopes	540	. 16
Christianburg silty clay, 0 to 2 percent slopes	2, 675	. 82
Christianburg silty clay, 2 to 5 percent slopes	1, 097	. 34

TABLE 3.—*Approximate acreage and proportionate extent of the soils of the Richfield Area, Utah*—Continued

Soil	Acres	Percent
Christianburg silty clay, imperfectly drained, 0 to 2 percent slopes	530	.16
Christianburg clay, 0 to 1 percent slopes	523	.16
Christianburg clay, imperfectly drained, 0 to 1 percent slopes	145	.04
Denmark loam, 2 to 5 percent slopes	1,180	.36
Denmark loam, 5 to 15 percent slopes	212	.06
Denmark gravelly sandy loam, 2 to 5 percent slopes	4,047	1.24
Denmark gravelly sandy loam, 5 to 15 percent slopes	4,743	1.45
Denmark stony sandy loam, 5 to 20 percent slopes	8,870	2.71
Duggins silty clay loam, 0 to 1 percent slopes	145	.04
Duggins silty clay, 0 to 1 percent slopes	113	.03
Duggins silty clay, imperfectly drained, 0 to 1 percent slopes	346	.11
Ebbs loam, 0 to 2 percent slopes	389	.12
Ebbs loam, 2 to 5 percent slopes	1,520	.46
Ebbs loam, eroded, 2 to 5 percent slopes	155	.05
Ebbs silty clay loam, 0 to 2 percent slopes	936	.29
Ebbs silty clay loam, 2 to 5 percent slopes	239	.07
Genola loam, 0 to 2 percent slopes	4,175	1.28
Genola loam, 2 to 5 percent slopes	6,214	1.90
Genola loam, deep, over gravel, 2 to 5 percent slopes	333	.10
Genola loam, deep, over gravel, 0 to 2 percent slopes	107	.03
Genola silty clay loam, 0 to 2 percent slopes	4,510	1.38
Genola silty clay loam, 2 to 5 percent slopes	1,329	.41
Genola silty clay loam, eroded, 2 to 5 percent slopes	123	.04
Genola silty clay loam, imperfectly drained, 0 to 2 percent slopes	461	.14
Genola silty clay loam, over Taylorsville soil material, 0 to 2 percent slopes	223	.07
Genola silty clay loam, over Welby soil material, 0 to 1 percent slopes	563	.17
Genola silty clay loam, over Welby soil material, imperfectly drained, 0 to 1 percent slopes	499	.15
Genola silty clay loam, deep, over gravel, 2 to 5 percent slopes	323	.10
Genola fine sandy loam, 0 to 2 percent slopes	261	.08
Genola fine sandy loam, 2 to 5 percent slopes	1,728	.53
Genola fine sandy loam, moderately deep and deep, over gravel, 2 to 5 percent slopes	183	.06
Hiko Springs stony sandy loam, 5 to 10 percent slopes	4,117	1.26
Hiko Springs stony sandy loam, 10 to 20 percent slopes	940	.29
Hiko Springs stony sandy loam, 2 to 5 percent slopes	421	.13
Hiko Springs gravelly sandy loam, 2 to 10 percent slopes	435	.13
Hoye gravelly sandy loam, 2 to 5 percent slopes	794	.24
Hoye gravelly sandy loam, 0 to 2 percent slopes	479	.15
Hoye gravelly sandy loam, 5 to 10 percent slopes	849	.26
Hoye stony sandy loam, 5 to 10 percent slopes	2,022	.62
Hoye stony sandy loam 2 to 5 percent slopes	667	.20
Hoye stony sandy loam, 10 to 20 percent slopes	420	.13
Ivie stony sandy loam, 4 to 7 percent slopes	125	.04
Ivie gravelly sandy loam, 2 to 5 percent slopes	202	.06
Jura silty clay, 0 to 1 percent slopes	1,088	.33
Jura silty clay, imperfectly drained, 0 to 1 percent slopes	411	.12
Jura silty clay, very poorly drained, 0 to 1 percent slopes	147	.04
Jura clay, 0 to 1 percent slopes	202	.06
Jura clay, imperfectly drained, 0 to 1 percent slopes	228	.07
Jura loam, overwash, 0 to 1 percent slopes	95	.03
Lakeshore sediments	1,839	.56
Manassa-Mellor loams 2 to 5 percent slopes	469	.14
Manassa-Mellor silt loams, 2 to 5 percent slopes	1,308	.40
Mayfield loam, 2 to 5 percent slopes	986	.30

TABLE 3.—*Approximate acreage and proportionate extent of the soils of the Richfield Area, Utah*—Continued

Soil	Acres	Percent
Mayfield loam, 5 to 10 percent slopes	239	.07
Mayfield loam, shallow, 5 to 10 percent slopes	398	.12
Mayfield gravelly loam, 2 to 5 percent slopes	326	.10
Mayfield gravelly loam, 5 to 10 percent slopes	603	.18
Mayfield clay loam, 2 to 5 percent slopes	1,273	.39
Mayfield clay loam, 0 to 2 percent slopes	221	.07
Mayfield clay loam, eroded, 5 to 15 percent slopes	225	.07
Mayfield gravelly clay loam, 2 to 5 percent slopes	822	.25
Mayfield gravelly clay loam, eroded, 2 to 5 percent slopes	100	.03
Mellor-Manassa clay loams, 0 to 3 percent slopes	923	.28
Musinia sandy loam, 0 to 2 percent slopes	3,205	.98
Musinia sandy loam, 2 to 5 percent slopes	518	.16
Musinia sandy loam, deep, over gravel, 0 to 2 percent slopes	1,638	.50
Musinia sandy loam, deep, over gravel, 2 to 5 percent slopes	122	.04
Musinia sandy loam, imperfectly drained, 0 to 2 percent slopes	226	.07
Musinia silty clay loam, 0 to 2 percent slopes	2,305	.70
Musinia silty clay loam, imperfectly drained, 0 to 2 percent slopes	410	.13
Musinia silty clay loam, moderately deep, over clay, 0 to 2 percent slopes	207	.06
Musinia silty clay loam, deep, over gravel, 0 to 2 percent slopes	372	.11
Naples silty clay loam, 0 to 2 percent slopes	7,780	2.39
Naples silty clay loam, 2 to 5 percent slopes	288	.09
Naples silty clay loam, imperfectly drained, 0 to 2 percent slopes	424	.13
Naples loam, 0 to 2 percent slopes	3,390	1.04
Naples loam, 2 to 5 percent slopes	1,008	.31
Naples fine sandy loam, deep, over gravel, 0 to 2 percent slopes	915	.28
Naples fine sandy loam, deep, over gravel, 2 to 5 percent slopes	521	.16
Navajo silty clay, 0 to 2 percent slopes	1,141	.35
Navajo silty clay, imperfectly drained, 0 to 1 percent slopes	2,759	.84
Navajo silty clay, very poorly drained, 0 to 1 percent slopes	451	.14
Navajo silty clay, moderately deep, over Poganeab soil material, imperfectly drained, 0 to 1 percent slopes	471	.14
Pavant stony sandy loam, 5 to 10 percent slopes	2,142	.65
Pavant stony sandy loam, 10 to 20 percent slopes	1,545	.47
Pavant gravelly sandy loam, 5 to 10 percent slopes	1,816	.56
Pavant gravelly sandy loam, 2 to 5 percent slopes	491	.15
Pavant loam, 3 to 8 percent slopes	237	.07
Pharo gravelly sandy loam, 2 to 5 percent slopes	1,436	.44
Pharo gravelly sandy loam, 5 to 10 percent slopes	1,280	.39
Pharo gravelly sandy loam, eroded, 5 to 10 percent slopes	402	.12
Pharo stony sandy loam, 5 to 10 percent slopes	3,053	.93
Pharo stony sandy loam, 10 to 20 percent slopes	272	.08
Pharo loam, 2 to 5 percent slopes	649	.20
Pharo loam, 5 to 10 percent slopes	133	.04
Poganeab silty clay, moderately well drained, 0 to 2 percent slopes	815	.25
Poganeab silty clay, poorly drained, 0 to 2 percent slopes	4,280	1.31
Poganeab silty clay, very poorly drained, 0 to 1 percent slopes	4,400	1.34
Poganeab clay loam, moderately well drained, 0 to 2 percent slopes	727	.22
Poganeab clay loam, poorly drained, 0 to 2 percent slopes	1,400	.43
Poganeab clay loam, very poorly drained, 0 to 2 percent slopes	268	.08
Poganeab clay, poorly drained, 0 to 1 percent slopes	469	.14

TABLE 3.—*Approximate acreage and proportionate extent of the soils of the Richfield Area, Utah*—Continued

Soil	Acres	Percent
Poganeab soils, undifferentiated, poorly drained, 0 to 1 percent slopes	12, 352	3. 79
Poganeab soils, undifferentiated, moderately well drained, 0 to 2 percent slopes	188	. 06
Ralston loam, 0 to 2 percent slopes	965	. 29
Ralston gravelly loam, 0 to 2 percent slopes	645	. 20
Ravola clay loam, 0 to 2 percent slopes	2, 503	. 77
Ravola clay loam, 2 to 5 percent slopes	1, 522	. 46
Ravola clay loam, eroded, 2 to 5 percent slopes	550	. 17
Ravola clay loam, eroded, 5 to 10 percent slopes	433	. 13
Ravola clay loam, 5 to 10 percent slopes	109	. 03
Ravola clay loam, silted, 0 to 2 percent slopes	803	. 24
Ravola clay loam, silted, 2 to 5 percent slopes	116	. 04
Ravola silty clay, silted, 0 to 2 percent slopes	1, 269	. 39
Redfield silty clay loam, 0 to 2 percent slopes	4, 784	1. 46
Redfield silty clay loam, imperfectly drained, 0 to 2 percent slopes	632	. 19
Redfield loam, 0 to 2 percent slopes	3, 296	1. 01
Redfield loam, 2 to 5 percent slopes	103	. 03
Redfield fine sandy loam, 0 to 3 percent slopes	543	. 17
Riverwash	852	. 27
Rough gullied land	2, 368	. 72
Rough stony land	19, 282	5. 90
Sanpete loam, 2 to 5 percent slopes	1, 229	. 38
Sanpete loam, 5 to 10 percent slopes	226	. 07
Sanpete loam, deep, 0 to 3 percent slopes	640	. 20
Sanpete gravelly sandy loam, 2 to 5 percent slopes	5, 057	1. 55
Sanpete gravelly sandy loam, 5 to 10 percent slopes	7, 693	2. 35
Sanpete gravelly sandy loam, 10 to 20 percent slopes	3, 471	1. 06
Sanpete stony sandy loam, 5 to 10 percent slopes	2, 573	. 79
Sanpete stony sandy loam, 2 to 5 percent slopes	455	. 14
Sanpete stony sandy loam, 10 to 40 percent slopes	6, 239	1. 91
Sanpete stony sandy loam, eroded, 10 to 40 percent slopes	457	. 14
Sanpete clay loam, 2 to 5 percent slopes	133	. 04
Sigurd gravelly sandy loam, 2 to 5 percent slopes	4, 693	1. 43
Sigurd gravelly sandy loam, 0 to 2 percent slopes	130	. 04
Sigurd gravelly sandy loam, eroded, 2 to 5 percent slopes	508	. 16
Sigurd gravelly sandy loam, 5 to 10 percent slopes	2, 418	. 74
Sigurd stony sandy loam, 2 to 5 percent slopes	1, 315	. 40
Sigurd stony sandy loam, overwash, 2 to 10 percent slopes	1, 392	. 43
Sigurd stony sandy loam, 5 to 10 percent slopes	1, 436	. 44
Sigurd stony sandy loam, eroded, 3 to 10 percent slopes	700	. 21
Sigurd loam, 2 to 5 percent slopes	1, 426	. 44
Sigurd loam, 5 to 10 percent slopes	193	. 06
Sigurd fine sandy loam, overwash, 2 to 5 percent slopes	317	. 10
Sigurd clay loam, 2 to 5 percent slopes	118	. 04
Sigurd gravelly clay loam, 3 to 10 percent slopes	445	. 14
Skumpah loam, 0 to 2 percent slopes	1, 408	. 43
Skumpah loam, eroded, 0 to 2 percent slopes	199	. 06
Skumpah loam, eroded, 2 to 5 percent slopes	577	. 18
Skumpah silty clay loam, 0 to 2 percent slopes	282	. 09
Skumpah silty clay loam, eroded, 0 to 2 percent slopes	108	. 03
Skumpah silty clay, 0 to 2 percent slopes	392	. 12
Sloping to very steep land, undifferentiated	45, 409	13. 88
Stillman fine sandy loam, 2 to 5 percent slopes	682	. 21
Stillman fine sandy loam, 0 to 2 percent slopes	604	. 18
Stillman gravelly sandy loam, 2 to 5 percent slopes	1, 259	. 38
Stillman gravelly sandy loam, 0 to 2 percent slopes	283	. 09
Stillman stony sandy loam, 2 to 5 percent slopes	1, 774	. 54
Stillman stony sandy loam, eroded, 2 to 5 percent slopes	416	. 13

TABLE 3.—*Appropriate acreage and proportionate extent of the soils of the Richfield Area, Utah*—Continued

Soil	Acres	Percent
Stillman stony sandy loam, 5 to 10 percent slopes	1, 496	. 46
Stillman gravelly loamy sand, 2 to 5 percent slopes	278	. 08
Stillman stony loamy sand, 2 to 5 percent slopes	1, 000	. 31
Taylorsville loam, 0 to 2 percent slopes	450	. 14
Taylorsville loam, 2 to 8 percent slopes	141	. 04
Taylorsville silty clay loam, 0 to 1 percent slopes	86	. 03
Welby fine sandy loam, 0 to 2 percent slopes	165	. 05
Welby loam, 1 to 4 percent slopes	194	. 06
Welby clay loam, 1 to 3 percent slopes	355	. 11
Total	327, 117	100. 0

Annabella gravelly sandy loam, 2 to 5 percent slopes (AB).—This somewhat excessively drained soil is droughty and not well suited to general irrigation farming. It occurs on recent alluvial fans in the southern part of Sevier Valley, most prominently near Annabella and Monroe. Scattered areas occur as far north as Salina. The soil was derived mainly from mixed acid and basic igneous rocks, in some localities mixed with sedimentary rock.

Surface runoff is slow to medium, depending on slope and vegetative cover. Internal drainage is rapid. The organic-matter content is low. The native vegetation is mostly greasewood, or greasewood mixed with shadscale.

The soil is highly stratified, and the profile varies considerably from place to place. The following profile is typical:

0 to 6 inches, grayish-brown, soft, weakly calcareous gravelly loam; very weak fine granular structure; pebbles are angular and usually small.
6 to 27 inches, grayish-brown, soft, fine granular gravelly sandy loam; considerably less gravel in this layer than in the one above, but the two are otherwise very similar.
27 to 48 inches, brown, slightly hard, moderately calcareous very fine granular sandy loam; contains a small amount of fine gravel.
48 to 72 inches, light brownish-gray, soft, moderately calcareous gravelly sandy loam; contains much gravel and some stones.

Use and management.—About one-third of this soil is used for crops, and nearly two-thirds is range. Only a very small acreage is idle land, irrigated pasture, or in urban areas. Alfalfa, wheat, barley, and potatoes are the principal crops. More than 50 percent of the cropland is in alfalfa. Yields are usually only fair. All the cropland is irrigated. The dryland range is above the irrigation canals. Cropped areas generally have somewhat better soil than the ranges; they are lower on the alluvial fans, are less gravelly on the surface and are usually free of stones.

To prevent excessive losses of irrigation water, this soil should be irrigated with frequent light applications.

Annabella gravelly sandy loam, 0 to 2 percent slopes (AA).—Except for the slope gradient, this soil is very similar to Annabella gravelly sandy loam, 2 to 5 percent slopes. It occurs on the lower, more nearly level parts of the same recent alluvial fans. A few small areas have gently undulating relief. **Included in this mapping unit**

are 86 acres of gravelly loamy sand. Most of this is along the flood plain of the Sevier River, south and southeast of Elsinore; there is also an 8-acre area about 1 mile northeast of Annabella.

Nearly half of this soil is cropland; the rest is about evenly divided between range and irrigated pasture. In use, management, and yields, this phase is about the same as Annabella gravelly sandy loam, 2 to 5 percent slopes.

Annabella gravelly sandy loam, 5 to 15 percent slopes (AC).—This soil is similar to Annabella gravelly sandy loam, 2 to 5 percent slopes, except that it has stronger slopes and is generally more eroded. It occurs in the same general localities, on the higher parts of the same alluvial fans. Most of this phase is in range. Because of its moderately coarse texture and strong slope, the soil is not suited to tillage and should be used only for grazing.

Annabella sandy loam, 0 to 2 percent slopes (AF).—This soil occupies the lower, more nearly level parts of alluvial fans in the vicinity of Annabella and along the recent flood plain of the Sevier River between Elsinore and Annabella. One area in the town of Elsinore has slopes of 2 to 5 percent, and one very small area has a slope of slightly more than 5 percent. Surface runoff is slow, and internal drainage is rapid to very rapid. Water-holding capacity is moderate to low.

The surface soil varies in texture from a loamy sand to a sandy loam. Adjacent to the Sevier River, the texture is a loamy sand. The surface soil is 12 to about 18 inches in depth. The substratum consists of irregularly stratified gravelly sandy loam and gravelly loamy sand.

Mapped with this soil are two small areas adjacent to the Sevier River Canal that are imperfectly drained. In both of these areas the surface soil is a loamy fine sand and the depth to stratified gravel is greater than is usual, or about 3 feet. The water table is high only when the river is high.

About two-thirds of Annabella sandy loam is used for crops (pl. 1, *A*); the rest is mostly range.

Annabella stony sandy loam, 5 to 15 percent slopes (AH).—This soil occurs in the southern part of Sevier Valley, in association with Annabella gravelly sandy loam, 2 to 5 percent slopes, but always on higher parts of the alluvial fans. The vegetation consists of greasewood, shadscale on the higher fans, and a little black sage. Grasses are very sparse. Surface runoff is medium to rapid, and internal drainage is rapid.

The soil profile varies considerably. In general, it conforms closely to that of Annabella gravelly sandy loam, 2 to 5 percent slopes, but it has many cobbles on the surface and throughout the profile. Practically all of this phase is used for range.

Annabella stony sandy loam, 2 to 5 percent slopes (AG).—This soil differs from Annabella stony sandy loam, 5 to 15 percent slopes, chiefly in having more gentle slopes. It occurs on the lower, smoother parts of the alluvial fans. Practically all of this soil is used for range.

Annabella stony sandy loam, eroded, 2 to 5 percent slopes (AK).—This soil occurs on the large alluvial fan south of Monroe.

The creek has overflowed periodically and has cut a number of gullies. All of this soil is used for range. It affords only a small amount of browse for sheep.

Annabella loam, 0 to 2 percent slopes (AD).—This soil is more suitable for general farming than Annabella sandy loam, 0 to 2 percent slopes, but it is droughty and requires frequent light irrigations.

The soil occurs on alluvial fans in the southern part of Sevier Valley, most extensively near Monroe. Usually it is adjacent to but slightly higher than the Musinia soils. Surface drainage is slow to medium, and internal drainage is medium.

Profile description:

0 to 7 inches, grayish-brown, weakly calcareous, soft fine granular loam; contains a small amount of fine gravel.
7 to 15 inches, pale-brown, slightly hard, weakly calcareous, fine granular gritty loam; contains a moderate amount of fine gravel.
15 to 38 inches, pale-brown, weakly calcareous, comparatively clean loose gravel and sand.
38 to 46 inches, pale-brown, slightly hard, weakly calcareous loam; fine granular structure.
46 to 72 inches, pale-brown, soft, weakly calcareous gravelly sandy loam; the profile varies considerably within, and is highly stratified.

Use and management.—Nearly all of this soil is used for general farm crops, principally alfalfa, barley, wheat, and potatoes. Yields are generally somewhat better than on Annabella gravelly sandy loam, 0 to 2 percent slopes.

Annabella loam, 2 to 5 percent slopes (AE).—This soil is similar to Annabella loam, 0 to 2 percent slopes, except that it occupies stronger slopes. One small area has slopes of more than 5 percent. The soil is used almost entirely for crops.

Arapien fine sandy loam, 2 to 5 percent slopes (AM).—This soil has a light yellowish-brown to very pale brown surface soil over a marly or weakly lime-cemented subsoil and substratum. It is widely distributed on alluvial fans in the northern part of Sevier Valley and in both upper and lower Round Valley. It is associated with Genola fine sandy loam, 2 to 5 percent slopes. The parent material was derived mainly from limestone and sandstone.

Surface drainage is slow to medium, and internal drainage is medium. The native vegetation consists mainly of shadscale. Rabbitbrush and sagebrush grow in some localities.

Representative profile:

0 to 4 inches, very pale brown to light yellowish-brown, strongly calcareous, soft platy fine sandy loam.
4 to 21 inches, very pale brown to light yellowish-brown, strongly calcareous, granular fine sandy loam; slightly hard when dry and very friable when moist.
21 to 59 inches, very pale brown loam; high lime concentration; massive; hard when dry and firm when moist.
59 to 72 inches, very pale brown loamy fine sand containing some gravel; strongly calcareous, but the lime is mainly disseminated.

In some localities, the lime concentration extends to a depth of 75 inches or more. Usually the profile becomes slightly more friable and less cemented in the lower part.

Use and managment.—Most of this soil is in range or irrigated cropland, in fairly equal proportions. A very small acreage is dry-

farmed, but the soil is not well suited to this use. Where irrigation water is not available, drought-resistant grasses should be planted.

Irrigated cropland is fairly productive under good farm management. Because of the uneven topography, irrigation is somewhat difficult, and uniform application of water is practically impossible. In small local areas, mainly on low ridgetops, the surface soil is very thin and plowing has turned up the marly subsoil. These spots are comparatively unproductive. A fairly wide range of crops is produced, including alfalfa, small grains (mainly wheat and barley), sugar beets, canning peas, corn, and potatoes. Crop rotation and application of fairly large quantities of manure are necessary for continued good yields.

Arapien fine sandy loam, 0 to 2 percent slopes (AL).—Except for more gentle slopes, this soil is very similar to Arapien fine sandy loam, 2 to 5 percent slopes, with which it is associated. It occurs at slightly lower levels on the old alluvial fans. It is used as irrigated cropland, dry-farmed cropland, and range.

Arapien loam, 0 to 2 percent slopes (AN).—Except for finer texture throughout the profile, this soil is similar to Arapien fine sandy loam. It has about the same general distribution as Arapien fine sandy loam, 2 to 5 percent slopes, but is most extensive in lower Round Valley. The soil is generally well drained; however, two small areas immediately east of Gunnison have a high water table and slight to moderate concentrations of alkali.

In upper Round Valley some bodies of this soil have developed under a slightly higher rainfall than is typical and as a result have very pale brown to pale-brown surface soil.

Use and management.—The soil is used for dry cropland, for irrigated cropland, and for range. Because of its finer texture and better water-holding capacity, it is superior to Arapien fine sandy loam, 0 to 2 percent slopes, for dry farming.

Arapien loam, 2 to 5 percent slopes (AO).—Except for stronger slope, this soil is similar to Arapien loam, 0 to 2 percent slopes. It occurs in the same general localities. More than two-thirds of this soil is range; the rest is mostly dry-farmed cropland. A very small acreage is irrigated.

Arapien loam, 5 to 10 percent slopes (AP).—This soil resembles Arapien loam, 2 to 5 percent slopes, except that it occurs on stronger slopes. Because of the stronger slopes, the soil profile is not so well developed. The surface is usually thinner, and the lime horizon is not so thick or so concentrated as in the more gently sloping phases of Arapien loam.

Arapien silty clay loam, 0 to 2 percent slopes (AR).—This soil is similar to Arapien loam, 0 to 2 percent slopes, but has a finer textured surface soil. It occurs on the lower, more nearly level parts of old alluvial fans, in lower Round Valley, south and southwest of Scipio, and in Sevier Valley, mainly north of Axtell. In Round Valley it is associated with Genola silty clay loam, 0 to 2 percent slopes. There is also one area immediately west of Mayfield. One area north of Axtell is moderately to strongly alkaline and supports a thick growth of greasewood. Eighty percent of this soil is cropland.

Arapien silty clay loam, 2 to 5 percent slopes (As).—This soil is, in general, similar to Arapien silty clay loam, 0 to 2 percent slopes. The marly lime layer begins at a depth of about 15 inches and extends downward 5 to 6 feet. In one area about 1½ miles southwest of the Gunnison sugar factory, the zone of lime concentration is somewhat coarser textured and thinner. In this area the limy layer extends only to about 30 inches and is underlain by very pale brown loam or sandy loam.

This soil is used for general irrigated farming, for irrigated pasture, and, in the town of Mayfield, for home gardens.

Ashley clay loam, 0 to 2 percent slopes (At).—This is a shallow soil overlying gravel and cobblestones. It occurs in a number of small, narrow, irregularly shaped bodies on second bottoms or stream terraces along the San Pitch River just south of Gunnison in Sanpete County. It was derived principally from a mixture of sedimentary rocks, mainly limestone, sandstone, and shale. Drainage generally is somewhat excessive, but during short periods when the river is high the water table may be very close to the surface. Rabbitbrush and shadscale are the principal native vegetation.

Textural stratification of this soil varies considerably from place to place, but the following profile is representative:

0 to 10 inches, very pale brown, slightly hard, strongly calcareous, massive clay loam.
10 to 16 inches, very pale brown, slightly hard, strongly calcareous, massive loam.
16 to 29 inches, very pale brown, soft, massive gravelly sandy loam; some cobbles.
29 to 72 inches, loose gravel, cobbles, and sand.

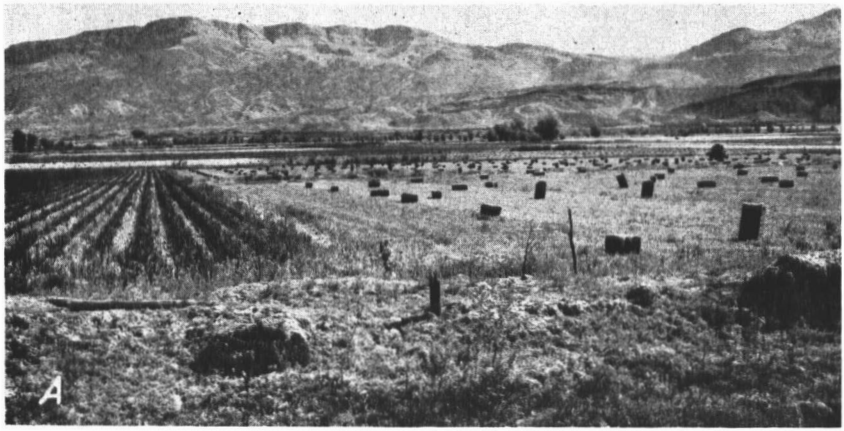
A small area about three-fourths of a mile southeast of Gunnison has a clay surface soil underlain at a depth of 9 inches by gravelly sandy loam material. Three small areas have a sandy loam surface texture.

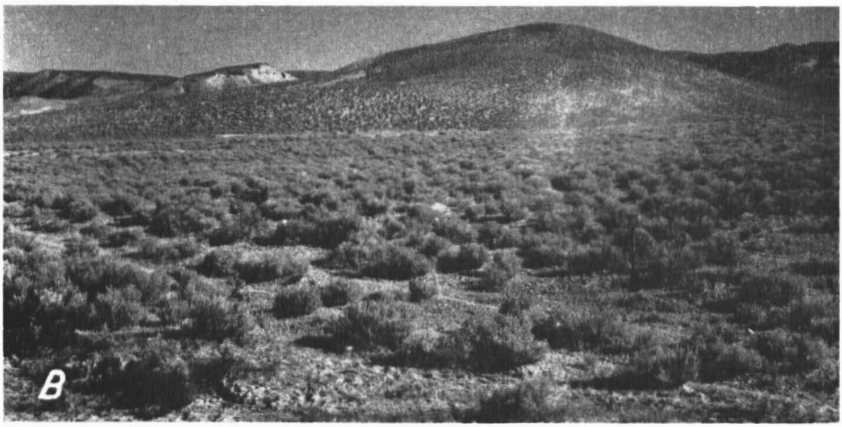
Use and management.—Nearly half of this soil is cropland, and about a fourth of it is pasture, predominantly unimproved range of very low carrying capacity. No definite system of crop rotation is practiced, and barnyard manure is applied only infrequently. Cropland is irrigated by the furrow method; pastures are irrigated by flooding. The shallowness of the soil over gravel limits its value for general farm crops. It could better be used for pasture. Drought-resistant pasture plants should be grown.

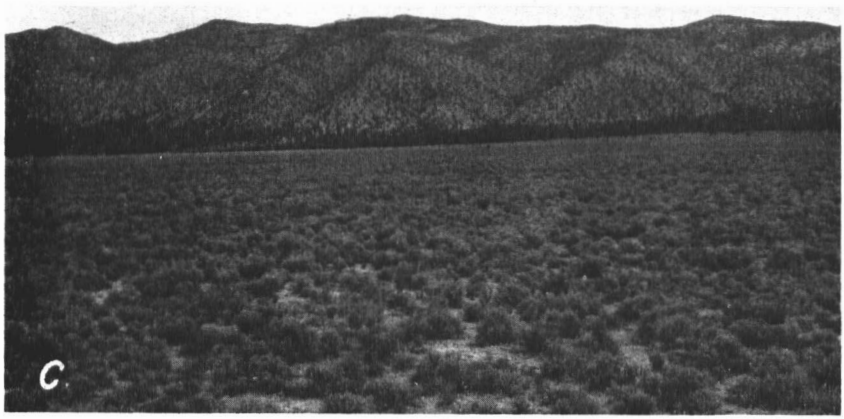
Ashley clay loam, imperfectly drained, 0 to 2 percent slopes (Au).—This soil differs from Ashley clay loam, 0 to 2 percent slopes, in having a water table within 6 feet of the surface. It occurs south of Christianburg on the first bottoms or flood plains of the San Pitch River, adjacent to the very poorly drained phase of Ashley silty clay. All of this imperfectly drained soil is used for pasture.

Ashley silty clay, very poorly drained, 0 to 2 percent slopes (Av).—This soil occurs in two low-lying areas along the flood plain of the San Pitch River. One area is just south of Christianburg and the other is about three-quarters of a mile northwest of Nine Mile Reservoir near the extreme northeastern corner of the Area. Seepage water from surrounding irrigated fields keeps the water table high.

All of this soil is used for pasture. All of it contains a moderate concentration of salt. The silty clay surface soil ranges from 10 or 12



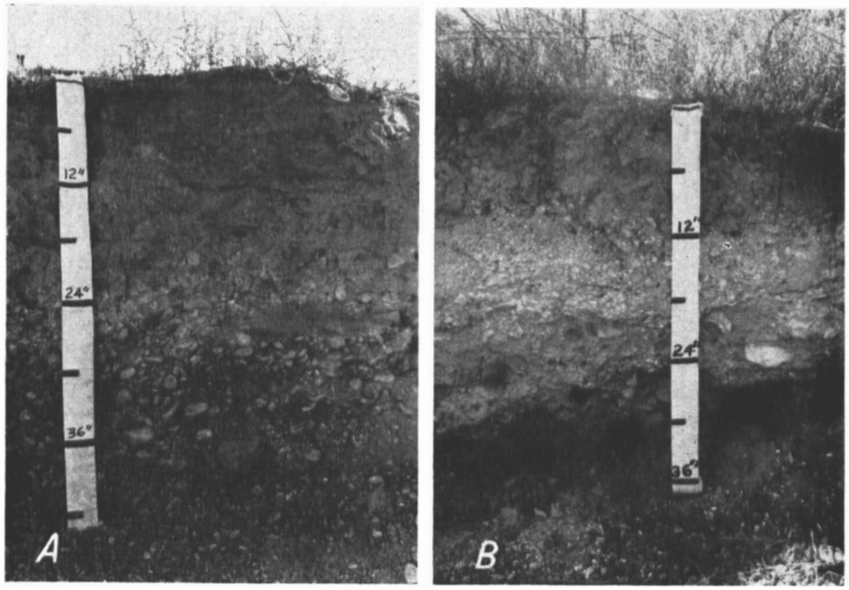




A, Potatoes and alfalfa on Annabella sandy loam, 0 to 2 percent slopes. Musinia sandy loam, 0 to 2 percent slopes, in lower end of potato field. Sevier River valley in middle distance and Sevier Plateau in background.

B, Moderate stand of shadscale on Genola loam, 2 to 5 percent slopes, about 2½ miles north of Gunnison. In background, a less dense stand of shadscale on Sloping to very steep land, undifferentiated.

C, Moderate stand of sagebrush on Genola loam, 2 to 5 percent slopes, in upper Round Valley. Dense stand of juniper on foot slopes of the Valley Mountains, and a sparser stand on the steeper slopes and shallow soils.



A, Profile of Centerfield silty clay, 0 to 2 percent slopes, in town of Centerfield. Faint lime carbonate horizon between 20 and 30 inches. Pebbles are easily dislodged.

B, Profile of Denmark loam, 2 to 5 percent slopes, about 4 miles west of Fayette. Indurated lime carbonate horizon is slowly to very slowly permeable to water. Below 30 inches is loose gravel and sand.

inches to 36 inches in depth and is underlain by clean gravel, sand, and cobbles. The vegetation consists of saltgrass, wiregrass, sedges, and other species of moderate to low quality. Pastures probably could be improved by seeding with better forage grasses and clovers.

Ashley soils, undifferentiated, poorly drained, 0 to 2 percent slopes (Aw).—These soils occur on first bottoms of the San Pitch River, south of Gunnison. They are flooded periodically. Although they are naturally droughty, the ground-water level may be high because of their topographic position. These soils are used only for grazing.

The surface textural patterns are so intricate that separation of the different textures was not attempted. In some places, the material is similar to Riverwash; in other places, medium- to coarse-textured materials overlie nearly clean river sands and gravels. Small sand and gravel pits are common. Southwest of Gunnison, where the water table is fairly high during much of the year, the vegetation is composed of grasses and a few scattered clumps of greasewood.

Badlands (Ba).—This land type consists of rough eroded beds of shale covered by little soil or none at all. The shales are varicolored; they range from light gray or olive gray to light brown and moderate brown. Most of the shales contain considerable amounts of gypsum in the form of crystals, plates, or soft mealy layers.

This land type is located on the eastern side of Sevier Valley; it extends from the vicinity of Glenwood northward to Christianburg. Shadscale grows in some localities, but much of the area is barren of vegetation. Badlands have no value as cropland and very little as range.

Bertelson sandy loam, 2 to 8 percent slopes (Be).—This soil occurs on undulating old alluvial fans, mostly in the southern part of Sevier Valley, along the eastern edge of a low ridge between Monroe and Joseph. Three small bodies, one of which has a loamy sand surface layer, are located in the extreme northern part of the Area. The parent material was derived mainly from siliceous volcanic tuff, and to a lesser extent from other mixed igneous rocks. Surface runoff is slow, and internal drainage is medium to rapid. Shadscale is practically the only native plant.

Description of a typical profile:

0 to 10 inches, pale-brown, soft, fine granular, strongly calcareous gritty sandy loam or light loam.
10 to 23 inches, very pale brown, hard, massive, weakly lime cemented clay loam; contains a moderate amount of lime-coated angular fine gravel.
23 to 39 inches, pale-brown to very pale brown, loose, single-grained, strongly calcareous gravelly loamy sand.
39 to 45 inches, very pale brown, slightly hard, strongly calcareous, granular fine sandy loam; contains a small amount of fine gravel.
45 to 72 inches, pale-brown, loose, moderately calcareous gravel and sand.

Use and management.—This soil is used for irrigated crops and dryland range.

The principal crops are alfalfa and wheat, barley, or other small grains. Some corn has been grown for silage in recent years, and potato production has become increasingly important. Sugar beets, as a rule, are not successfully grown, because of the droughtiness of

this soil and the shortage of irrigation water late in the season. On unimproved range, shadscale is the dominant vegetation.

Barnyard manure is the most common fertilizer; treble-superphosphate and ammonium sulfate recently have been used to some extent on land planted to potatoes. Plowing and seedbed preparation are usually done in spring.

Irrigation is the major management problem. The soil is droughty and the water supply is inadequate. All main ditches should be lined, to prevent loss of water and erosion. Irrigation runs should be short because the soil absorbs moisture readily. On long runs, considerable water is lost by deep percolation.

Levelling this undulating soil is likely to expose the limy layer that is generally not far below the surface. Heavy applications of manure and superphosphate have proved beneficial to crops planted on freshly exposed limy material. Perennial drought-resistant grasses should be planted in the areas where slopes are strongest.

Bertelson sandy loam, 0 to 2 percent slopes (Bd).—This soil is associated with Bertelson sandy loam, 2 to 8 percent slopes. Generally it occurs adjacent to that soil on the lower, smoother parts of old alluvial fans. Except for the difference in slope, the two soils are practically the same. This soil, however, has a slightly finer surface texture and contains less grit.

Three-fourth of this land is used for crops; most of the rest is idle.

Bertelson sandy loam, deep, 0 to 2 percent slopes (Bf).—This soil is similar to Bertelson sandy loam, 2 to 8 percent slopes, except for differences in slope and in depth of surface soil. Probably as a result of overwash from higher areas, most of this phase has 24 to 30 inches of soft granular sandy loam above the gravelly lime zone. This soil occurs in association with Bertelson sandy loam, 0 to 2 percent slopes, on the lower and more nearly level parts of the alluvial fans. It is all cropland, except for one small rather isolated area, above present irrigation canals, that is used for range. This is a somewhat better soil than Bertelson sandy loam, 0 to 2 percent slopes, and yields are slightly higher. Some small areas that have a few surface stones are included in this mapping unit.

Bertelson gravelly sandy loam, 2 to 5 percent slopes (Bb).—This soil is coarse textured and droughty and not suitable for crops. It occurs on the upper parts of alluvial fans. It is associated with Bertelson sandy loam, 2 to 8 percent slopes, which is on the lower parts of the fans. Where the native vegetation has been cleared, Russian-thistle is abundant.

This soil is about 80 percent range. The rest is about evenly divided between irrigated cropland and idle land.

Bertelson gravelly sandy loam, 5 to 10 percent slopes (Bc).—This soil is about the same as Bertelson gravelly sandy loam, 2 to 5 percent slopes, except that it has stronger slopes and in places contains more gravel and stones. In many of the areas, the surface soil has been moderately eroded. Most of this soil is used for range. A small part has been cleared of the native shadscale and now has a covering of Russian-thistle.

Bertelson stony sandy loam, 5 to 15 percent slopes (Bg).—This soil occupies strongly sloping old alluvial fans that are adjacent to ridges of siliceous volcanic tuff. It closely resembles and is associated with Bertelson gravelly sandy loam, 5 to 10 percent slopes. In many places the boundary between these two soils is indistinct. This soil, however, has many stones, both in the surface layer and throughout the profile.

This stony, droughty, strongly sloping soil is entirely unsuited to farming and is of rather low value for range. All of it is used for grazing.

Billings silty clay, 0 to 3 percent slopes (Bh).—This deep fine-textured soil is fairly well suited to the production of general farm crops under irrigation. It occurs on smooth valley flood plains near Centerfield and Mayfield. It is associated with Centerfield and Christianburg soils. Slopes rarely exceed 1 percent.

The alluvial deposits from which this soil developed have been derived from a wide range of parent rock material, including shales, limestone, sandstone, and quartzite. Drainage is generally good, though somewhat restricted in places. Surface runoff is very slow, and internal drainage is slow. The organic-matter content is low. Practically all the native vegetation has been removed, but isolated greasewood along fence lines indicates that this was an important native species.

Description of a typical profile:

0 to 5 inches, light-gray silty clay; massive, strongly calcareous; hard when dry and firm to friable when moist.
5 to 9 inches, very pale brown silty clay; hard and granular; other characteristics similar to those of the surface layer.
9 to 72 inches, very pale brown stratified layers ranging from silty clay loam to silt loam in texture; hard when dry and firm to friable when moist; massive to weakly granular; strongly calcareous.

Small local areas have moderately coarse to coarse textured material in the substratum.

Use and management.—This soil is used almost entirely for general farm crops grown under irrigation. Alfalfa is the principal crop; barley, wheat, oats, and sugar beets are grown to less extent.

Management requirements are similar to those of Christianburg silty clay, 0 to 2 percent slopes. Fall plowing is important. Barnyard manure should be applied, and good results are reported from using treble-superphosphate on alfalfa and sugar beets.

Billings silty clay, imperfectly drained, 0 to 3 percent slopes (Bk).—This soil occurs in association with the better drained Billings silty clay, 0 to 3 percent slopes, but generally at a somewhat lower level on the valley floor. Much of it is slightly to moderately alkaline. The water table is within 6 feet of the surface, usually at depths of 3 to 5 feet. Slopes are generally less than 1 percent. The profile is similar to that of Billings silty clay, 0 to 3 percent slopes. More than half of this soil is irrigated cropland; the rest is range or irrigated pasture.

Billings silty clay, very poorly drained, 0 to 3 percent slopes (Bl).—This soil is similar to the imperfectly drained phase, except that the water table is usually only 12 to 30 inches below the surface.

The soil occurs in a number of small bodies that are kept wet by seepage or overflow from canals.

Most of this soil is only slightly alkaline. The surface layer probably contains somewhat more organic matter than that of the better drained Billings soils. Practically all of this soil is used for pasture. The plant cover, mainly of wild barley, is of rather poor quality.

Calita loam, 2 to 5 percent slopes (Cc).—This deep soil is well suited to either dry-farmed or irrigated crops. It is associated mainly with the Ebbs and Pharo soils, on high-lying old alluvial fans in upper Round Valley and near Scipio. The climate in these localities is semiarid, the average annual precipitation being about 14 inches. Surface runoff is slow to medium, and internal drainage is medium. The parent rocks were limestone, sandstone, and quartzite. The native vegetation consists mainly of sagebrush and rabbitbrush; a little oakbrush and juniper grow in some places.

Typical profile of Calita loam:

0 to 7 inches, fine granular soft loam, pale brown to light brown when dry and weak brown to moderate brown when moist; weakly calcareous to noncalcareous.

7 to 18 inches, same as surface layer but moderately calcareous and lighter colored.

18 to 36 inches, pinkish-white heavy loam or clay loam, weakly lime cemented; this is the horizon in which lime has concentrated; hard when dry but friable when moist.

36 to 72 inches, very pale brown stratified loam, silt loam, and fine sandy loam; strongly calcareous; soft when dry and very friable when moist.

The layers in the profile vary somewhat in thickness. The lime zone begins at depths of 10 to 12 inches in places, and, in a very few spots, at 7 to 8 inches. In most cultivated areas the surface soil is moderately calcareous.

Use and management.—Eighty percent of this soil is dry-farmed cropland; the rest is mostly range. Winter wheat is the important crop. A small acreage is in rye. Grain is grown only every other year. In alternate years, the soil is summer fallowed, that is, the grain stubble is plowed under, either in the fall after the grain is harvested or the following spring, and the soil is cultivated enough to keep it free of weeds and to prepare a favorable seedbed. The summer fallowing is necessary to store moisture and to build up nitrate reserves. Wheat is seeded in the fall, from early September to November. The exact time of seeding depends to some extent on the amount of moisture in the surface soil. Wheat yields are estimated at 20 to 25 bushels an acre. No definite yield data are available. Apparently, good dry-farming methods are practiced. There is no evidence that any fertilizer is used. Nitrogen fertilizers might be beneficial.

Calita loam, 0 to 2 percent slopes (Cb).—This soil is associated with Calita loam, 2 to 5 percent slopes, and differs from it only in slope. It occupies the lower and more nearly level parts of the alluvial fans. It is about evenly divided into dry-farmed cropland and range.

Calita silty clay loam, 2 to 5 percent slopes (Cf).—Except for texture, this soil is like Calita loam, 2 to 5 percent slopes. The parent material was derived from sandstone, limestone, quartzite, and probably also from shale. The soil occurs most extensively on the west side of upper Round Valley, south of Scipio Lake. It is usually asso-

ciated with Calita loam, 2 to 5 percent slopes, in a lower position on the alluvial fans. This soil is about two-thirds dry-farmed cropland and about one-third range. It is used and managed in the same way as Calita loam, 2 to 5 percent slopes.

Calita silty clay loam, 0 to 2 percent slopes (CE).—This soil differs from Calita silty clay loam, 2 to 5 percent slopes, only in having more gentle slopes. All of it occurs on the west side of upper Round Valley adjacent to areas of Calita loam, 0 to 2 percent slopes, but in lower positions on the alluvial fans. This soil is used for range and dry-farmed crops.

Calita fine sandy loam, overwash, 2 to 3 percent slopes (CA).—From Calita loam, 2 to 5 percent slopes, this soil differs mainly in having a recent overwash of very pale brown to light yellowish brown fine sandy loam. This layer of overwash varies from a fraction of an inch to about 10 inches in thickness. Because of the unequal distribution of the overwash material, fallow fields present a distinct color pattern of grays and browns. All of this soil occurs in upper Round Valley, in association with other Calita soils. It is used mostly for range. The vegetation is mainly a heavy growth of sagebrush and rabbitbrush. This soil could be put to better use by clearing the brush and planting crested wheatgrass or dry-farmed wheat.

Calita loam, overwash, 2 to 5 percent slopes (CD).—This soil is similar to the overwashed Calita fine sandy loam, but it differs in surface texture and has somewhat greater range in slope. Both soils occur in the southern part of upper Round Valley. Most of this soil is dry-farmed.

Centerfield silty clay, 0 to 2 percent slopes (CH).—This moderately deep soil was derived from limestone, sandstone, and shale and overlies a porous gravelly substratum (pl. 2, *A*). It occurs adjacent to Christianburg silty clay, 0 to 2 percent slopes, on a nearly level old valley flood plain in the northeastern part of the Area near Centerfield. The soil has been cleared of its native vegetation, which was predominantly shadscale mixed with some rabbitbrush and sagebrush. Surface runoff is slow to very slow, and internal drainage is medium to slow.

Typical profile:

0 to 3 inches, light brownish-gray, slightly hard, moderately calcareous light clay or silty clay; fine granular structure.
3 to 8 inches, pale-brown silty clay or clay; tends to break into large blocks which, in turn, break easily to granules; moderately calcareous, and the lime disseminated.
8 to 19 inches, pale-brown, hard, strongly calcareous clay that breaks into subangular blocks; contains a small amount of small gravel.
19 to 29 inches, layer of moderate lime concentration; very pale brown, hard, massive gravelly sandy loam; weakly lime cemented; gravel and cobbles are coated with lime on the under side.
29 to 72 inches, very pale brown, loose, single-grained mixed sand, gravel, and cobbles; depth to this horizon varies from place to place but is always more than 24 inches.

Use and management.—Nearly all this soil is used for general farm crops, principally alfalfa and small grains. Yields are only moderately good. The usual practice is to grow alfalfa as long as possible, then to sow barley for 2 or 3 years, and then to reseed to alfalfa.

After 4 or 5 years, alfalfa stands are so much reduced by bacterial wilt that they must be plowed under and another crop seeded.

The available supply of barnyard manure, which is generally rather meager, is applied during the the winter and early in spring. Spring plowing is a general practice.

Because it is fine textured and low in organic matter, this soil is difficult to handle. Its condition could be improved by plowing up alfalfa stands after 4 or 5 years, by plowing in the fall wherever possible, and by growing green-manure crops occasionally to increase the organic-matter content.

Centerfield clay loam, shallow, 0 to 2 percent slopes (Cg).—This soil is similar to Centerfield silty clay, except that the surface layer is thinner and of a different texture. The lime carbonate layer ordinarily lies at depths between 10 and 12 inches, and the relatively clean gravel and sand at a depth of 18 inches.

This soil occurs on the same nearly level old valley flood plain as Centerfield silty clay, 0 to 2 percent slopes, with which it gradually merges. Most of it is within the town of Centerfield.

In a number of places, the surface soil has been removed and gravel pits have been dug. Two small areas in the fairly large tract of this soil immediately west of the town of Centerfield have gravelly surface soil.

Almost all of this soil is used for general farming and for home gardens. Because its surface soil is coarser textured and shallow over the porous gravelly substratum, this soil is more droughty than Centerfield silty clay, 0 to 2 percent slopes, and produces lower yields.

Continuous use of this soil is dependent upon good farm management. Fertilizer requirements are moderate to high, and frequent light irrigations are needed.

Christianburg silty clay, 0 to 2 percent slopes (Cm).—This is a deep, fine-textured soil derived from light-gray or light olive-gray calcareous shales and, to some extent, from limestone and sandstone. It occupies flood plains on the lower parts of alluvial fans, principally on the eastern side of Sevier Valley, between Glenwood in Sevier County and Christianburg in Sanpete County.

Surface relief is generally smooth, but a few areas are slightly undulating. Surface runoff is slow to very slow, depending on slope and cover. Internal drainage is slow. Slight to moderate concentrations of salt are common. The native vegetation consists mainly of greasewood.

Typical profile:

0 to 7 inches, light-gray, strongly calcareous, hard, blocky silty clay that breaks under moderate pressure to coarse granules.

7 to 72 inches, light-gray, hard, massive clay; strongly calcareous and has fine veins of gypsum.

Use and management.—More than 80 percent of this soil is in crops. The rest is range, irrigated pasture, or idle land. Alfalfa is the most extensive crop. Wheat, barley, oats, corn for silage, and sugar beets are also grown. This soil is difficult to till because of its fine texture and low supply of organic matter. Fall plowing is practically essential for good seedbed preparation. It is also important to work the soil in spring at the time when the moisture content is favorable.

Tilth can be improved and the supply of organic matter can be increased by including a green-manure crop in the rotation. Barnyard manure should be applied if it is available. Because permeability is slow, a small head of irrigation water should be used, and the water should be allowed to run long enough to penetrate thoroughly.

Christianburg silty clay, 2 to 5 percent slopes (CN).—This soil occurs in close association with Christianburg silty clay, 0 to 2 percent slopes, but usually is in slightly higher positions. Mapped with this soil are two small areas that are severely eroded; one is about 3½ miles east of Aurora, and another about 2 miles southwest of Christianburg. This soil may erode if it is improperly irrigated. Irrigation furrows should follow the contour as closely as possible, to prevent erosion and at the same time assure good penetration of irrigation water. Roughly a third of this soil is in range, a third is in crops, and a third is idle.

Christianburg silty clay, imperfectly drained, 0 to 2 percent slopes (Co).—This soil has a profile similar to that of Christianburg silty clay, 0 to 2 percent slopes, but it has developed drainage deficiencies since irrigation was begun. It occupies the lower and more nearly level parts of the flood plains, adjacent to but slightly lower than the better drained Christianburg silty clay, 0 to 2 percent slopes. About half of this soil is irrigated cropland; the rest is irrigated pasture or dryland range.

Christianburg clay, 0 to 1 percent slopes (CK).—This soil occupies nearly level valley flood plains in Sevier Valley about 1½ miles west of Centerfield. It was derived principally from shale and limestone, possibly mixed with some igneous material carried in by the Sevier River. Surface runoff is slow to very slow, and internal drainage is slow but apparently adequate. The water table is more than 6 feet below the surface. Practically all of the native vegetation has been removed. Greasewood, which still grows along the fence lines, probably was the principal native species.

Typical profile:

0 to 5 inches, light-gray, hard, fine blocky, strongly calcareous clay.
5 to 24 inches, light-gray, hard, subangular blocky, strongly calcareous clay.
24 to 72 inches, light-gray, hard, massive, strongly calcareous clay.

The salt content in the profile ranges from slight to moderate.

Use and management.—This soil is used entirely for general farm crops grown under irrigation. Alfalfa, sugar beets, and small grains are the main crops. Alfalfa occupies about 75 percent of the total acreage. Barley is the most extensively grown small grain.

Management requirements are similar to those given for Christianburg silty clay, 0 to 2 percent slopes. Yields are generally lower.

Christianburg clay, imperfectly drained, 0 to 1 percent slopes (CL).—This soil is similar to Christianburg clay, 0 to 1 percent slopes, except that its water table is normally only 3 to 4 feet below the surface. It is associated with level areas of Christianburg clay, 0 to 1 percent slopes, but occurs at slightly lower levels. The lower parts merge with the Poganeab clays or Poganeab silty clays.

Nearly all of this soil is used for general farm crops, principally alfalfa, wheat, and barley. Yields are slightly lower than on the better drained Christianburg clay, 0 to 1 percent slopes.

Denmark loam, 2 to 5 percent slopes (Dc).—This shallow soil has a lime hardpan and a porous gravelly substratum. It occurs on old alluvial fans, mainly in the northern part of Sevier Valley, but also in small areas in lower Round Valley. The parent rocks are limestone, sandstone, shale, and quartzite. Surface drainage is medium.

Because the surface layer above the hardpan is thin (pl. 2, *B*), the soil is droughty. The surface soil is moderately permeable. Water applied to the surface either moves very slowly through the hardpan, or it moves horizontally until it reaches crevices in the hardpan. The native vegetation is mainly sagebrush and some bunchgrasses.

Typical profile:

0 to 14 inches, very pale brown, moderately to strongly calcareous, fine granular loam; slightly hard when dry and very friable when moist.
14 to 34 inches, white strongly lime cemented hardpan containing gravel; plant roots apparently seldom penetrate this hardpan.
34 to 72 inches, very pale brown, strongly calcareous, loose gravelly sand or gravel and sand; pebbles are well rounded and many are lime coated.

The depth of the soil above the hardpan varies from about 12 to 30 inches. The hardpan varies in thickness from about 4 to 24 inches.

Use and management.—More than half of this soil is irrigated cropland; the rest is mostly range. Alfalfa is the principal crop; small grains, potatoes, corn, and canning peas are also grown. Yields are fair. Numerous small dried spots in the fields show that there is some difficulty in distributing irrigation water evenly. The variable depth of the surface soil contributes to this problem.

Continued use of this soil for irrigated crops may be practical if it is carefully managed to prevent erosion and to check the decline in fertility. It is not advisable to convert the range areas to irrigated cropland, at least so long as soils more suitable for crops are available.

Denmark loam, 5 to 15 percent slopes (Dd).—Except for the difference in slopes, this soil is similar to Denmark loam, 2 to 5 percent slopes. It occurs both in lower Round Valley and on high-lying alluvial fans in the central part of Sevier Valley, near Axtell. This soil is not suitable for crops and should be seeded to permanent pasture. All of it is used for range, except for 8 acres in lower Round Valley that is planted to dry-farmed rye.

Denmark gravelly sandy loam, 2 to 5 percent slopes (Da).—This soil resembles Denmark loam, 2 to 5 percent slopes, except that the surface soil is very pale brown to light yellowish brown gravelly sandy loam and contains scattered stones. This layer is from 8 to 16 inches deep; about 12 inches is the average depth. The hardpan is very similar to the hardpan under Denmark loam, 2 to 5 percent slopes, except that, in most places, it contains more gravel and cobbles.

This soil is associated with Denmark loam, 2 to 5 percent slopes, but is more extensive and more widely distributed. It occurs on the higher parts of alluvial fans in lower Round Valley and in the central and northern parts of Sevier Valley. It is used almost entirely for range. The native vegetation is a scrubby growth of sagebrush that affords meager grazing.

Mapped with this soil are 81 acres of Denmark gravelly clay loam, located immediately north of the town of Mayfield on a terrace north of Twelve Mile Creek.

Denmark gravelly sandy loam, 5 to 15 percent slopes (DB).—This soil occupies high old alluvial fans. It is most extensive in lower Round Valley but also occurs in the central part of Sevier Valley. In general, it is more eroded than the gravelly phase on slopes of 2 to 5 percent. It is subject to some wind erosion. The vegetation consists of scattered junipers. In lower Round Valley some attempts have been made to dry-farm this soil.

Mapped with this soil are two small areas east of Fayette that have a loamy sand surface soil that is free of gravel.

Denmark stony sandy loam, 5 to 20 percent slopes (DE).—This soil occupies moderately steep old alluvial fans adjacent to rough mountain areas. It is extensive in lower Round Valley and also occurs in the Sevier Valley in the extreme northern part of Sevier County. Most of it has been moderately eroded. The native vegetation is mostly sagebrush, mixed with a little bunchgrass and scattered junipers. Surface runoff is medium to rapid, but internal drainage through the hardpan is very slow.

The surface soil, to a depth of about 8 inches, is a light yellowish brown to a very pale brown stony sandy loam. Underlying this is a lime-cemented hardpan that extends to an average depth of 36 inches. The hardpan contains substantial quantities of cobbles and gravel and is underlain by porous gravelly and stony material of undetermined depth. Practically all of this soil is used for spring and fall range.

Duggins silty clay loam, 0 to 1 percent slopes (DH).—This deep fine-textured soil occurs on the lower parts of alluvial fans and valley flood plains, normally in association with Genola soils. It occurs mainly south of Scipio in lower Round Valley.

Typical profile:

0 to 7 inches, very pale brown silty clay loam; very weakly developed fine to medium granular structure; friable to firm; moderately to strongly calcareous; very low in organic matter.

7 to 72 inches, very pale brown to pale yellow silty clay; massive; very firm; strongly calcareous; faintly mottled or veined with gypsum below about 30 inches.

This soil is used for irrigated crops and for range.

Duggins silty clay, 0 to 1 percent slopes (DF).—This soil is similar to Genola silty clay loam, 0 to 2 percent slopes, but is finer textured throughout. It occupies a nearly level valley plain about 3½ miles southwest of Gunnison and is adjacent to Genola silty clay loam, 0 to 2 percent slopes, but at a slightly lower level. The soil is used for crops. Yields are nearly equal to those obtained from Genola silty clay loam, 0 to 2 percent slopes.

Duggins silty clay, imperfectly drained, 0 to 1 percent slopes (DG).—This soil is closely associated with the better drained Duggins silty clay, 0 to 1 percent slopes, but usually occupies a lower position. The water table is usually about 4 feet from the surface but it fluctuates somewhat during the growing season. The soil is used for crops and irrigated pasture.

Ebbs loam, 0 to 2 percent slopes (EA).—This medium-textured deep soil occupies nearly level recent alluvial fans on the west side of upper Round Valley and in lower Round Valley southwest of Scipio.

It is similar to Naples loam, 0 to 2 percent slopes, in most profile characteristics but has a darker surface color because it contains more organic matter. The parent material was derived mainly from sandstone, limestone, conglomerate, and quartzite. Drainage is good, and there is no indication of salt or alkali accumulations. The native vegetation is mainly sagebrush and bunchgrasses; oakbrush grows in some higher lying areas.

Following is a description of a typical profile:

0 to 7 inches, pale-brown to light-brown, slightly hard, strongly calcareous, medium to fine granular loam; when moist this layer is weak brown to moderate brown, and friable.
7 to 28 inches, very pale brown, slightly hard, strongly calcareous loam that breaks readily to fine granules.
28 to 72 inches, similar to the horizon above but slightly lighter in color, lower in organic matter, and somewhat softer in consistence.

The layers vary a little in thickness. In some areas there are a few threadlike lime veins at depths of 16 to 26 inches. Included with this soil is about 12 acres that has a fine sandy loam surface soil.

Use and management.—About a third of this soil is used for dry-farmed winter wheat, and about two-thirds for general farm crops grown under irrigation. Dry-farmed winter wheat yields about 20 bushels an acre. Dry-farming practices are the same as those described for the Calita soils: One year of winter wheat is followed by one year of summer fallow. The irrigated land generally has an inadequate water supply. Alfalfa and small grains are the major crops. Stands of alfalfa are generally continued for many years. Little if any fertilizer is used.

Ebbs loam, 2 to 5 percent slopes (Eb).—This soil differs from Ebbs loam, 0 to 2 percent slopes, only in slope. It is practically all in the extreme southern part of upper Round Valley. About 80 percent is used for dry farming; most of the rest is range.

Ebbs loam, eroded, 2 to 5 percent slopes (Ec).—This soil is characterized by alternating bands, or strata, of light yellowish brown and pale brown. It occurs only as a narrow strip on each side of Round Valley Creek. The strip begins about 2 miles north of Scipio Lake and extends northward 3 or 4 miles to the southern margin of lower Round Valley. The creek was originally very small, but erosion has deepened and widened the channel. It is now 10 to 15 feet deep and 20 to 30 feet wide and has nearly vertical banks.

All of this soil is in range. Because of its position and the erosion hazard, this is the only use for which it is suitable.

Ebbs silty clay loam, 0 to 2 percent slopes (Ed).—This soil is finer textured throughout the profile than Ebbs loam, 0 to 2 percent slopes. It occupies smooth alluvial fans and valley flood plains on the west side of both upper and lower Round Valley. The soil material was derived from a mixture of rocks, mainly sandstone, limestone, and quartzite. Sagebrush, rabbitbrush, and bunchgrasses are the native vegetation. Drainage is generally good, but in irrigated areas west of Scipio there is some indication of restricted drainage.

About two-thirds of this phase is irrigated cropland; the rest, except for a very small acreage in range, is dry-farmed. Under good management, this soil should produce high yields of all suitable crops.

Ebbs silty clay loam, 2 to 5 percent slopes (Ee).—Except for the difference in slope, this soil is practically identical to Ebbs silty clay loam, 0 to 2 percent slopes. It occurs mainly in the southern part of upper Round Valley. There is also one small area of 6 acres south of Scipio Lake. This soil is used principally for dryland winter wheat.

Genola loam, 0 to 2 percent slopes (Gd).—This deep well-drained soil is one of the better agricultural soils of the Area. It occurs on nearly level recent alluvial fans and flood plains, in both upper and lower Round Valley and in the northern part of Sevier Valley, mainly north of the Sanpete-Sevier county line. It is associated with other Genola soils and with Sigurd soils. The Sigurd soils are coarser and more porous and are located above the Genola soils on the higher parts of the fans. The parent material is alluvium derived from a mixture of rock, mostly sandstone, limestone, and quartzite.

Virgin areas usually support a thick growth of sagebrush; however, in some areas shadscale is the only vegetation and in other places scattered greasewood is mixed with the shadscale. Russian-thistle and cheatgrass are abundant in areas that have been cleared of native vegetation and are now idle.

Following is a description of a profile that is uniform in texture to a depth of 6 feet. This profile is common, but stratified layers are probably more extensive.

0 to 4 inches, very pale brown slightly hard fine granular loam; moderately to strongly calcareous.
4 to 72 inches, very pale brown, strongly calcareous, slightly hard loam that breaks down readily to fine granules.

Use and management.—Nearly half of this soil is range, a substantial part is irrigated cropland, and smaller acreages are in dry-farmed crops or are idle. The soil is not well suited to dry-farming, because the average annual rainfall of 8 to 12 inches is not adequate. The dry-farmed areas are nearly all on the east side of lower Round Valley. Management requirements for dry-farming are the same as for Calita loam, 0 to 2 percent slopes, but rye is grown instead of wheat because of the lower rainfall. Average yields of rye are about 7 bushels an acre.

Under irrigation, the soil is well suited to a wide range of crops. Alfalfa is the principal crop; small grains, sugar beets, corn, potatoes, and canning peas are also commonly grown. Good yields are obtained where good management is practiced. The Sevier Valley has adequate irrigation water in most years, but in lower Round Valley water supplies are generally not adequate late in summer. Consequently, late-maturing crops such as sugar beets are not grown in Round Valley, and alfalfa yields are fair but not so good as on the same soil in Sevier Valley.

The soil is low in organic matter. It responds well to applications of barnyard manure. Green-manure crops should also be beneficial, but apparently they are not grown.

Genola loam, 2 to 5 percent slopes (Ge).—This soil is like Genola loam, 0 to 2 percent slopes, except for the slope gradient. It occurs extensively in both the upper and lower parts of Round Valley (pl. 1, *B*) and in the Sanpete County part of Sevier Valley (pl. 1, *C*). The soil is used principally for range and for dry-farmed crops. There are also substantial acreages of irrigated cropland and idle dry land.

Yields are about equal to those obtained on Genola loam, 0 to 2 percent slopes, but the erosion hazard under irrigation is more serious on this more sloping phase. Terracing or leveling can be accomplished without damage to the soil or decrease in productivity.

Genola loam, deep, over gravel, 2 to 5 percent slopes (GG).—This deep soil overlies a gravelly porous substratum. In many places it grades into Genola loam, 2 to 5 percent slopes, with which it is closely associated. The boundary between the two soils is, in many cases, arbitrary. The soil profile above the gravelly substratum is similar to that of Genola loam, 0 to 2 percent slopes. This soil is widely distributed in the northern part of Sevier Valley. Nearly all of it is used for range.

Genola loam, deep, over gravel, 0 to 2 percent slopes (GF).—This soil is very much like Genola loam, deep, over gravel, 2 to 5 percent slopes. Its total area is small. Nearly all of it is used for range.

Genola silty clay loam, 0 to 2 percent slopes (GH).—This soil is associated with Genola loam, 0 to 2 percent slopes, but usually occurs lower on the alluvial fans. It is widely distributed in the Sanpete County part of Sevier Valley and in lower Round Valley. It resembles Genola loam, 0 to 2 percent slopes, except in texture, but it is superior in water-holding capacity and in productivity. On some areas of this soil, the sagebrush is so thick that it prevents the growth of other plants.

Use and management.—Three-fourths of this soil is used for general farm crops grown under irrigation. Substantial acreages are in range and in urban areas. High-quality cabbage, cauliflower, and celery (pl. 3, *A*) are grown in a rather small area southwest of Gunnison. Yields are high. In the lower Round Valley, the supply of irrigation water is not adequate; consequently, yields are lower and late-season crops such as sugar beets cannot be grown.

Genola silty clay loam, 2 to 5 percent slopes (GK).—This soil occurs in association with Genola silty clay loam, 0 to 2 percent slopes, but is usually higher on the alluvial fans. Nearly all of it is located in the northern part of Sevier Valley near the Sanpete-Sevier County line. It is used principally for irrigated crops and range.

Genola silty clay loam, eroded, 2 to 5 percent slopes (GM).—This soil, very limited in extent, is all located about 3 miles west of Centerfield, immediately west of the Sevier River flood plain. A number of deep V-shaped gullies have developed as a result of erosion caused mainly by flow of waste irrigation water from higher lying fields. This soil is nearly all in range. It has a high salt content and supports a fairly thick growth of greasewood.

Genola silty clay loam, imperfectly drained, 0 to 2 percent slopes (GN).—This soil occupies low areas adjacent to the well-drained phases of Genola silty clay loam. The water table is within 6 feet of the surface during most of the growing season. There is a slight to moderate concentration of alkali. The soil is used for irrigated crops, for range, and for irrigated pasture.

Genola silty clay loam, over Taylorsville soil material, 0 to 2 percent slopes (GO).—This soil overlies an old soil that has a moderately well developed lime horizon and a tight clay substratum. The

silty clay loam surface layer is from 6 to 24 inches thick. All of this soil is located in lower Round Valley about 1 mile west of Scipio. It is limited in extent. Nearly all of it is used for crops.

Genola silty clay loam, over Welby soil material, 0 to 1 percent slopes (GF).—This soil consists of about 24 inches of light yellowish-brown silty clay loam, overlying an older soil that is similar to the Welby soils. All of it is in lower Round Valley north of Scipio. It forms a long narrow belt adjacent to a large area of Genola soils. The native vegetation is mainly rabbitbrush and sagebrush. Drainage is good but may be temporarily restricted because of excessive irrigation on higher lying land.

Use and management.—This soil is divided fairly equally into irrigated cropland, dry cropland, range, and idle dry land. Yields are much lower than on Genola silty clay loam, 0 to 2 percent slopes.

Genola silty clay loam, over Welby soil material, imperfectly drained, 0 to 1 percent slopes (GR).—This soil resembles Genola silty clay loam, over Welby soil material, 0 to 1 percent slopes, except that the water table is within 6 feet of the surface during the growing season. It occurs immediately west of and adjacent to the town of Scipio, in lower Round Valley. Slight to moderate concentrations of salt have accumulated in a few small areas. Nearly all of this soil is used for irrigated crops.

Genola silty clay loam, deep, over gravel, 2 to 5 percent slopes (GL).—This soil usually occurs adjacent to Genola silty clay loam, 2 to 5 percent slopes, but always at a higher level on the fan or flood plain. Because of its finer texture and greater average depth to stratified gravel and sands, it is superior to the other Genola soils that have gravelly substrata.

Use and management.—Approximately two-thirds of this soil is used for irrigated crops. The rest, above the level of the irrigation systems, is range or idle dry land. Alfalfa, barley, and wheat are the principal crops. Yields of these crops are generally nearly as good as on Genola silty clay loam, 2 to 5 percent slopes.

Genola fine sandy loam, 0 to 2 percent slopes (GA).—Areas of this soil are scattered along the alluvial fans, mainly in the northern part of Sevier Valley. Nearly all of it is in range.

The profile is very much like that of Genola loam, 0 to 2 percent slopes, but the surface soil is a fine sandy loam and the subsoil is usually slightly coarser textured and stratified.

This soil is not suited to dry-farming, and it requires careful management under irrigation. The general practices suggested for Genola loam, 0 to 2 percent slopes, apply to this soil.

Genola fine sandy loam, 2 to 5 percent slopes (GB).—This soil is much more extensive and more widely distributed than Genola fine sandy loam, 0 to 2 percent slopes. It is located in the northern part of Sevier Valley and in lower Round Valley. It differs from Genola fine sandy loam, 0 to 2 percent slopes, principally in slope. A few small areas having scattered stones on the surface are indicated on the map by stone symbols.

The soil is used mainly for range, to some extent for dry-farming, and to a minor extent for irrigated crops.

Genola fine sandy loam, moderately deep and deep, over gravel, 2 to 5 percent slopes (Gc).—This soil occurs in widely separated small areas in the northern part of Sevier Valley, principally near Gunnison and Fayette. The surface soil is 24 to 60 inches deep over the gravelly porous substratum. Usually this soil grades into Genola fine sandy loam, 2 to 5 percent slopes; boundary lines between the two soils are somewhat arbitrary. Sagebrush is the dominant vegetation; shadscale and rabbitbrush are also common.

Use and management.—Most of this soil is used for range. It is not suitable for dry-farming. A small area is irrigated and is fairly good for crops.

Hiko Springs stony sandy loam, 5 to 10 percent slopes (Hc).—This stony soil occurs in the southern part of Sevier Valley, on old alluvial fans or river terraces that are adjacent to steep, rough mountains underlain by igneous rock. It is most extensive on the high fans on the west side of the valley, between Elsinore and Joseph. Surface drainage is medium to rapid, and internal drainage is rapid. The parent material was derived from igneous rock mixed with black rhyolite. The native vegetation is a scrubby growth of shadscale, scattered greasewood, and bunchgrasses.

Profile description:

0 to 6 inches, light-gray, strongly calcareous, slightly hard, fine granular stony sandy loam.
6 to 16 inches, very pale brown stony sandy loam; weakly lime cemented.
16 to 25 inches, very pale brown, loose, single-grained gravelly loamy sand.
25 to 41 inches, light-gray stony loamy sand; weakly lime-cemented.
41 to 72 inches, very pale brown, loose, very porous, moderately calcareous mixture of stones, gravel, and sand.

Use and management.—This soil is used entirely for range. The carrying capacity is low.

Hiko Springs stony sandy loam, 10 to 20 percent slopes (Hd).—This soil resembles Hiko Springs stony sandy loam, 5 to 10 percent slopes, but has steeper slopes and is stonier, especially on the surface. It occurs adjacent to the rough igneous mountains, in the same general localities as the more gently sloping phases. This soil is not so good for grazing as the more gently sloping and less stony Hiko Springs soils.

Hiko Springs stony sandy loam, 2 to 5 percent slopes (Hb).—This soil occurs in the same general locality as the other soils of this series. It is adjacent to but lower than Hiko Springs stony sandy loam, 5 to 10 percent slopes. The profile characteristics of these two soils are practically the same. This soil is used as rangeland.

Hiko Springs gravelly sandy loam, 2 to 10 percent slopes (Ha).—This soil occurs in the extreme southern part of the Area, mainly in Long Valley southeast of Cove. It is similar to Hiko Springs stony sandy loam, 5 to 10 percent slopes, but has only a few scattered surface stones that do not interfere seriously with clearing or with tillage. The native vegetation is mainly shadscale and sagebrush. This soil is fairly suitable for crops. As range, its present carrying capacity is low, but it could be improved.

Hoye gravelly sandy loam, 2 to 5 percent slopes (Hf).—This soil occurs on old alluvial fans in the extreme southern part of the Area,

south and southwest of Monroe. It is associated with Musinia, Annabella, and Bertelson soils. The parent material was derived from mixed basic and acidic igneous rocks. Surface and internal drainage are medium. The native vegetation is mostly small rabbitbrush (commonly called yellowbrush) and shadscale. Yellowbrush is common where overgrazing has killed the shadscale.

Typical profile:

0 to 4 inches, grayish-brown, noncalcareous, slightly hard, fine granular gravelly sandy loam or gravelly loam.
4 to 10 inches, brown gravelly sandy loam; noncalcareous; slightly hard.
10 to 16 inches, pale-brown gravelly sandy loam; moderately calcareous, hard, massive; contains a few yellowish-gray flecks of lime carbonate.
16 to 25 inches, pink gravelly loam; high lime carbonate concentration; hard; massive to weakly cemented.
25 to 72 inches, pale-brown gravelly loamy fine sand; loose and very porous; moderately calcareous.

Mapped with this soil is a 35-acre area that is free of gravel to a depth of 40 inches.

Use and management.—More than half of this soil is dry-land range; a substantial acreage is irrigated cropland, used mainly for alfalfa. The supply of irrigation water is not adequate; consequently, yields are generally low. Most of the range is overgrazed and has low carrying capacity.

Hoye gravelly sandy loam, 0 to 2 percent slopes (HE).—Except that it is nearly level, this soil is essentially the same as Hoye gravelly sandy loam, 2 to 5 percent slopes. It occurs in the same general locality as the other Hoye soils, usually in a lower position on the alluvial fans. This soil is about 80 percent range and 20 percent irrigated cropland.

Hoye gravelly sandy loam, 5 to 10 percent slopes (HG).—This soil occurs in the extreme southeastern part of the Area, in the same general locality as Hoye gravelly sandy loam, 2 to 5 percent slopes, but higher on the alluvial fans. It is somewhat more eroded than the gently sloping soil, and the top layer is thinner and contains a larger proportion of gravel and stones. Slopes exceed 10 percent in some small areas. Practically all of this soil is range of low carrying capacity.

Hoye stony sandy loam, 5 to 10 percent slopes (HK).—This soil occurs on high fans in the extreme southern part of the Area. It is similar to Hoye gravelly sandy loam, 5 to 10 percent slopes, but has many igneous stones throughout the profile. Shadscale is the principal vegetation. All of this soil is used for range.

Hoye stony sandy loam, 2 to 5 percent slopes (HH).—Except for more gentle slopes, this soil is very similar to Hoye stony sandy loam, 5 to 10 percent slopes. It usually occurs adjacent to the more strongly sloping soil, but it is slightly lower on the alluvial fan.

Hoye stony sandy loam, 10 to 20 percent slopes (HL).—This soil is similar to Hoye stony sandy loam, 5 to 10 percent slopes, except that moderate erosion has removed part of the finer soil material, and more stone is exposed.

Ivie stony sandy loam, 4 to 7 percent slopes (IB).—This soil occupies high recent alluvial fans at the foot of the Pavant Mountains on

the west side of upper Round Valley, not far from Maple Creek. The surface is covered with gravel, cobblestones, and boulders. Cultivation would be very difficult. Limestone, sandstone, and quartzite are the parent materials. The surface soil is pale brown to light brown, and the substratum is lighter colored. The substratum is a porous mass of gravel, stones, and some fine soil material that has no definite compaction. All of this soil is used for range. The dominant vegetation is sagebrush and rabbitbrush.

Ivie gravelly sandy loam, 2 to 5 percent slopes (IA).—This soil occurs on high alluvial fans in upper Round Valley. It is composed of gravelly alluvium carried by small intermittent streams and usually contains a scattering of angular stones. The native vegetation is mainly sagebrush and bunchgrasses. This soil is very similar to Stillman gravelly sandy loam, 2 to 5 percent slopes, but has a darker surface soil that contains much more organic matter. Between 8 and 16 inches, the soil is slightly lighter in color and somewhat more compact. The substratum below about 16 inches is very stony but contains considerable fine soil material.

The soil is used for dry-farming and for grazing. Yields are low. A substantial proportion is idle dry land.

Jura silty clay, 0 to 1 percent slopes (JD).—This soil occupies nearly level low positions in three localities: Upper Round Valley just south of the Scipio Lake, Sevier Valley about 1 mile north of Monroe, and a small area in the northern part of Sevier Valley. It has developed from fine-textured mixed rock sediments. In the southern part of Sevier Valley, the parent material consisted of various igneous and sedimentary rocks; in upper Round Valley and northern Sevier Valley, the soil was derived largely from limestone, shale, sandstone, and quartzite.

Natural drainage is moderately good. Surface runoff is very slow, and internal drainage is slow. The soil warms up slowly in the spring; consequently, crops are somewhat later than on surrounding soils of coarser texture and stronger slope. In upper Round Valley, the native vegetation is a thick growth of rabbitbrush. In Sevier Valley, all of this soil is in crops, but a few clumps of greasewood grow in imperfectly drained spots. Whitetop, a common noxious weed, has invaded much of the area.

Thickness and character of the profile layers vary somewhat, but the following description is representative:

0 to 7 inches, gray to grayish-brown, hard, blocky silty clay; moderately calcareous; lime well disseminated; relatively large supply of organic matter; entirely free of gravel and stones; contains little or no soluble salts.

7 to 22 inches, grayish-brown, very hard, blocky, calcareous silty clay; very similar to the surface layer but slightly lighter colored and slightly to moderately stained by organic matter.

22 to 72 inches, grayish-brown to brown massive silty clay; only slightly calcareous; in places somewhat coarser textured below a depth of 56 inches.

Use and management.—In upper Round Valley, this soil is used for range. In the southern Sevier Valley it is cropland, and a small area in the northern Sevier Valley is pasture. Alfalfa hay and small grains, mainly oats or barley, are the principal crops. Yields are only fair because in spring the soil is wet and warms slowly. The soil is

generally plowed in the fall, because it is extremely difficult to prepare an adequate seedbed in the spring. No systematic crop rotation is practiced. Ordinarily, alfalfa is grown for as long as yields are satisfactory; then small grains are planted for 2 or 3 years. Irrigating is done by the furrow method commonly used in the Area.

Jura silty clay, imperfectly drained, 0 to 1 percent slopes (JE).—This soil occurs in one body north of Monroe. It is adjacent to the better drained Jura silty clay but is in a somewhat lower position, and is more nearly level. Although drainage has been improved by an open drain, the water table is not more than 6 feet below the surface. There is some salt accumulation. All of this soil is used for crops, principally alfalfa, barley, or oats. Yields are slightly lower than on the better drained Jura silty clay.

Jura silty clay, very poorly drained, 0 to 1 percent slopes (JF).—In this soil, the water table is ordinarily about 1 foot below the surface, and in wet weather it is often at the surface. Otherwise, the soil is similar to the imperfectly drained Jura silty clay. Two bodies of this soil are located in the northeastern part of the Area, one north of Mayfield, and the other northwest of Mayfield, adjacent to Twelve Mile Creek. One small area occurs about 2 miles north of Monroe. The soil has slight to moderate concentrations of soluble salts. It is used for pasture, but on the large body north of Mayfield, a crop of meadow hay is cut each year.

Jura clay, 0 to 1 percent slopes (JA).—This soil is very much like the Jura silty clays but it is more plastic when wet and forms much larger cracks upon drying. It is plastic to a depth of 6 feet or more. The soil occurs in association with the Jura silty clays, in depressions or on the lower parts of alluvial fans in the Sevier Valley north of Monroe. It is only slightly calcareous; the subsoil frequently does not contain enough lime to react with hydrochloric acid. The parent material is a mixture of igneous and sedimentary rocks.

All of this soil is used for alfalfa and small grains, mainly barley. Yields are only fair—about equal to or slightly less than the yields on Jura silty clay, 0 to 1 percent slopes.

Jura clay, imperfectly drained, 0 to 1 percent slopes (JB).—This soil is almost identical to Jura clay, 0 to 1 percent slopes, except that the water table is within 6 feet of the surface. It occurs in association with the very poorly drained Jura silty clay. Practically all of this soil is used for crops, mainly alfalfa, barley, and oats. Yields are about the same as are obtained on the imperfectly drained Jura silty clay.

Jura loam, overwash, 0 to 1 percent slopes (JC).—This soil consists of Jura silty clay on which a 2- to 8-inch layer of weak-brown calcareous loam or fine sandy loam has been deposited. The overwash material is of recent origin and has been washed from the surrounding hills. This phase occurs in upper Round Valley along Ivie Creek. The areas bordering the creek are imperfectly drained. The native vegetation is a mixed growth of grasses and brush. All of this soil is used for range.

Lakeshore sediments (LA).—This land type occurs between Gunnison and the northern boundary of the Area. It consists of narrow,

nearly continuous, eroded strips on both sides of the valley at the level of the highest shoreline of Lake Bonneville, which covered a large part of western Utah in recent geologic history. This material is free of gravel and stones. Within short distances textures vary from incoherent sands to clay loams and clays. The topography is generally strongly rolling. This land type is associated with the Genola soils and is similar to them in color. Some spots that contain considerable soluble salt and alkali closely resemble Manassa soils. Sandy areas are affected by wind erosion. Practically all of this land type is range of low quality. Scattered shadscale is the dominant vegetation.

Manassa-Mellor loams, 2 to 5 percent slopes (MA).—This complex consists of Manassa loam interspersed with areas of Mellor loam. It occupies the lower parts of alluvial fans and the flood plains of streams in the northern part of Sevier Valley and in upper Round Valley. It is usually associated with Genola soils. The parent material was a mixture of sandstone, limestone, shale, and quartzite. The native vegetation includes greasewood, shadscale, and white sage.

Profile description of Manassa loam:

0 to 3 inches, pale-brown to light yellowish-brown slightly hard, platy, vesicular loam; strongly calcareous; low in organic matter.
3 to 7 inches, pale-brown, slightly hard, strongly calcareous granular silt loam.
7 to 50 inches, very pale brown, strongly calcareous, massive, hard silty clay loam; very slowly permeable; material is strongly alkaline, and the soil particles are greatly dispersed.
50 to 72 inches, very pale brown to light yellowish brown silty clay loam; similar to the layer above, but only slightly hard.

The Mellor loam in this complex is easily recognized by the light-gray color of the surface soil, and it has a profile much like that described for Mellor clay loam in the complex of Mellor-Manassa clay loams, 0 to 3 percent slopes.

This complex is not suitable for crops and can be used only for range. Only alkali-tolerant plants will grow. Reclamation would be difficult and expensive.

Manassa-Mellor silt loams, 2 to 5 percent slopes (MB).—This complex closely resembles Manassa-Mellor loams, except that the surface soil is dominantly silt loam rather than loam.

This complex occurs in association with Manassa-Mellor loams. Practically all of it is used for range.

Mayfield loam, 2 to 5 percent slopes (MK).—This soil occupies recent alluvial fans on the east side of Sevier Valley between Sigurd and Mayfield. It occurs in relatively small bodies adjacent to raw shale hills. It has developed from light-gray or olive-gray shale and sandstone. Slopes are smooth to slightly undulating. The native vegetation consists of rabbitbrush, shadscale, sagebrush, and galleta. Runoff is medium, and drainage channels are only moderately well defined. Internal drainage is medium.

The following profile is representative:

0 to 6 inches, pale-brown medium to fine granular loam; moderately to strongly calcareous; slightly hard; low in organic matter.
6 to 34 inches, very pale brown to light yellowish-brown, hard, massive clay loam; strongly calcareous.
34 to 72 inches, very pale brown to weak-yellow stratified loam and sandy loam; slightly hard; contains a network of threadlike gypsum and scattered raw shale fragments.

There is some variation in depth to the porous shaly substratum and in the proportion of shale fragments. The surface soil in places is light reddish brown.

Use and management.—Most of this soil is used for grazing. A comparatively small acreage is in crops, mainly alfalfa hay. Crops can be grown only where irrigation water is available. Yields are fair but could undoubtedly be improved by using a suitable crop rotation. Because the soil is low in organic matter, the rotation should include a green-manure crop. Suggested rotation: First year, white sweetclover seeded with barley; second year, sweetclover, used for pasture during spring and early summer, allowed to grow up during late summer and early fall, then plowed under for green manure; third year, a row crop, preferably corn; and fourth year, alfalfa seeded with barley as a companion crop. Barnyard manure, if available, should be applied before alfalfa is planted. Irrigation water should be used with special care to avoid erosion.

Mayfield loam, 5 to 10 percent slopes (Ml).—This soil occurs in the same general localities as the more gently sloping phase of Mayfield loam. It has been moderately eroded. It is used mostly for range.

Mayfield loam, shallow, 5 to 10 percent slopes (Mm).—This soil occurs in association with Mayfield loam, 5 to 10 percent slopes, but is normally higher on the alluvial fans. It resembles Mayfield loam, 5 to 10 percent slopes, in the upper 12 to 15 inches. The substratum, however, is porous and contains many angular raw shale fragments; consequently, the soil is droughty and unsuitable for irrigation farming. Nearly all of it is used for range.

Mayfield gravelly loam, 2 to 5 percent slopes (Mh).—This porous gravelly soil occurs on recent alluvial fans, adjacent to raw gypsiferous shale hills. It is usually associated with other Mayfield loam soils but is higher on the alluvial fans. It is found in the same general localities as Mayfield loam, 2 to 5 percent slopes, mainly on the east side of Sevier Valley from the vicinity of Sigurd to north of Mayfield. Relief is smooth to gently undulating. The parent material was derived from gypsiferous light-gray, very pale brown, and light olive-gray shales, mixed with some sandstone. Runoff is medium, and internal drainage is rapid. The native vegetation consists of shadscale, rabbitbrush, sagebrush, and a little galleta.

Profile description:

0 to 6 inches, light-gray fine granular gravelly or shaly loam; strongly calcareous; slightly hard; low in organic matter.

6 to 72 inches, light-gray very gravelly loam; contains slightly less organic matter than the top layer and is therefore slightly lighter colored; usually contains a larger percentage of angular shale fragments or fine-grained sandstone fragments that are very hard when dry and very firm when moist; loam in this layer is slightly hard when dry, friable when moist.

This soil is stratified and, consequently, textures are varied. The proportion of shale fragments to fine soil material varies from place to place.

Mayfield gravelly loam is used for range. It is not suitable for crops and is of rather low value for grazing.

Mayfield gravelly loam, 5 to 10 percent slopes (Mı).—Except for stronger slopes, this soil is similar to Mayfield gravelly loam, 2 to 5 percent slopes. It occurs in the same general localities, usually higher on the fans. The soil is droughty and therefore not suited to irrigated farming. Nearly all of it is used for range.

Mayfield clay loam, 2 to 5 percent slopes (Md).—This soil occupies the lower parts of smooth to gently undulating alluvial fans. It occurs in the same general localities as the other Mayfield soils, and it is most extensive south of Christianburg and on the west side of the small valley where Mayfield is located. The profile is very much like that of Mayfield loam, 2 to 5 percent slopes, except that the topsoil is finer textured and the subsoil is normally somewhat finer. The parent material was derived mainly from light-gray to very pale brown gypsiferous shales, mixed with some sandstone. The native vegetation is mostly shadscale, rabbitbrush, and scattered greasewood.

Mapped with this unit are two small areas that are poorly drained. One is about half a mile east of Christianburg near the flood plain of the San Pitch River; it has a clay surface texture. The second is about one mile southeast of Christianburg, below the irrigation canal.

About two-thirds of this soil is range; most of the remaining third is cropland. Most of the range areas are above the irrigation canals. Alfalfa and small grains are the important crops. Good yields are obtained under good farm management. Management practices suggested for Mayfield loam, 2 to 5 percent slopes, apply to this soil.

Mayfield clay loam, 0 to 2 percent slopes (Mc).—This soil occurs on recent low stream terraces on either side of that part of Twelve Mile Creek running from near Mayfield to the San Pitch River, and along the San Pitch River, near Gunnison. The topography is slightly undulating in a few places, and in one small area the slope is slightly more than 5 percent. The topsoil and the upper substratum are the same as those of Ravola clay loam. The deeper substratum, between 3 and 6 feet below the surface, is either gravelly or very sandy and has very little water-holding capacity. Drainage is good. The soil was derived mainly from shale, limestone, and sandstone.

Practically all of this soil is irrigated and used for crops, of which alfalfa and small grains are the most important.

Mayfield clay loam, eroded, 5 to 15 percent slopes (Me).—This badly gullied soil has little agricultural value. It is nearly all located along the lower drainage of Lost Creek about a mile and a half above the junction of Lost Creek and the Sevier River. Relief is undulating to rolling. All of this soil is used for range. The grazing value is extremely low. It is practically impossible to control erosion because the soil is adjacent to steep raw shale hills.

Mayfield gravelly clay loam, 2 to 5 percent slopes (Mf).—Like Mayfield gravelly loam, 2 to 5 percent slopes, this porous, gravelly or shaly soil occurs on outwash fans adjacent to raw, gypsiferous shale hills. It is located mainly on the east side of Sevier Valley between Salina and Sigurd. In a few places slopes exceed 5 percent. Because of its finer texture, this soil is somewhat better than Mayfield gravelly loam, 2 to 5 percent slopes, but it is nevertheless a poor soil. Nearly half of it is range. A substantial acreage is idle irrigated land that

has been abandoned because it could not be farmed successfully. This idle acreage undoubtedly could be better used if it were seeded to ryegrass, crested wheatgrass, or other drought resistant grasses.

Mayfield gravelly clay loam, eroded, 2 to 5 percent slopes (Mg).—This soil is very much like Mayfield clay loam, eroded, 5 to 15 percent slopes. It occurs in the general vicinity of Lost Creek, south of Salina. Networks of gullies have developed in some areas; consequently, the soil is of little value, even for grazing.

Mellor-Manassa clay loams, 0 to 3 percent slopes (Mn).—This complex consists of areas of Mellor clay loam that surround patches of Manassa clay loam. It occupies generally smooth valley flood plains in the upper Round Valley. The soil was derived from a mixture of rock, principally sandstone, shale, limestone, and quartzite. The native vegetation is mostly shadscale, white sage, and scattered, scrubby greasewood. The surface soils erode easily, and small slick spots are common on both soils of the complex. Internal drainage is very slow, especially through the subsoils, and there are moderate to strong concentrations of soluble salts in most places.

Profile description of Mellor clay loam:

0 to 4 inches, light-gray slightly hard, platy, vesicular clay loam; strongly calcareous; low in organic matter.
4 to 12 inches, pale-brown silty clay with a hard, well-developed columnar structure; columns are colloid stained; when soil is crumbled, color changes to very pale brown; in places a lime zone occurs at the bottom of the columns.
12 to 54 inches, very pale brown, slightly hard, massive silt loam; strongly calcareous.
54 to 72 inches, very pale brown fine sandy loam; soft; strongly calcareous.

Manassa clay loam is similar to Manassa loam (see description of Manassa-Mellor loams), except for surface texture.

This complex is almost entirely used for range. The carrying capacity is low.

Musinia sandy loam, 0 to 2 percent slopes (Mo).—This deep, recent alluvial soil occurs in the southern part of Sevier Valley, most extensively around Annabella and Monroe. The parent material was derived mainly from mixed igneous rock. Natural drainage is good and internal drainage is medium. The soil is free of harmful salts. The native vegetation is mainly shadscale, rabbitbrush, and greasewood.

Profile description:

0 to 8 inches, grayish-brown, soft, fine granular sandy loam; moderately calcareous; fairly high in organic matter.
8 to 23 inches, grayish-brown, slightly hard, heavy loam; strongly calcareous; breaks easily into granules; moderate organic-matter content.
23 to 32 inches, light brownish-gray slightly hard loam; strongly calcareous; massive to weakly granular.
32 to 72 inches, pinkish-gray, soft, massive sandy loam; moderately calcareous.

Use and management.—About three-fourths of this soil is used for crops. The rest is about half in range and half in urban areas. Nearly all of the range is above present irrigation canals. Alfalfa, barley, wheat, potatoes, sugar beets, and corn silage are the important crops. Yields are good. Crop rotation is practiced to some extent, though

not systematically. Barnyard manure and phosphorus fertilizers are used, especially on fields planted to sugar beets or potatoes.

Musinia sandy loam, 2 to 5 percent slopes (Mp).—This soil has the same general profile characteristics as Musinia sandy loam, 0 to 2 percent slopes. It occurs in the same areas but usually higher on the alluvial fans. It is closely associated with gravelly porous soils of the Annabella series. Included is a very small area, about 1 mile east of Monroe, that has a slope of about 10 percent and is badly eroded. A large proportion of this soil is above present irrigation canals and cannot be used for crops.

Musinia sandy loam, deep, over gravel, 0 to 2 percent slopes (Mr).—This soil resembles Musinia sandy loam, 0 to 2 percent slopes, except that the substratum below 30 inches is either sandy or gravelly. This soil is most extensive near the town of Joseph, in the extreme southern part of the Area. It also occurs in the Monroe-Annabella region. Most of this soil is cropped. It requires more water than Musinia sandy loam, 0 to 2 percent slopes. Yields are slightly lower and less uniform.

Musinia sandy loam, deep, over gravel, 2 to 5 percent slopes (Ms).—Except for stronger slopes, this soil is the same as Musinia sandy loam, deep, over gravel, 0 to 2 percent slopes. Nearly all of this soil is cropland.

Musinia sandy loam, imperfectly drained, 0 to 2 percent slopes (Mt).—This soil occurs mainly on the first bottoms along the Sevier River, in the southwestern part of the Area. It resembles Musinia sandy loam, except that the water table is within 6 feet of the surface. The water table fluctuates considerably, and when the streams are high, the soil may be flooded. This soil is best used as permanent pasture. A small acreage is in crops, but yields are generally poor.

Musinia silty clay loam, 0 to 2 percent slopes (Mw).—This moderately fine textured recent alluvial soil occurs on smooth outwash fans, in association with Musinia sandy loam but slightly lower on the fans. It is widely distributed in the southern part of tht Area. The parent material was derived from mixed igneous rocks and a small amount of shale and sandstone. The soil is well drained and free from harmful accumulations of salts or alkali. Most of the native vegetation has been cleared; what remains is principally shadscale, rabbitbrush, and greasewood.

Profile description:

0 to 16 inches, grayish-brown, slightly hard, fine granular silty clay loam; moderately calcareous; fairly high in organic matter.
16 to 34 inches, grayish-brown to brown, slightly hard, medium to fine granular clay loam; moderately calcareous.
34 to 72 inches, pale-brown to light-brown silty clay loam; slightly hard; massive; moderately calcareous.

Use and management.—This soil is almost entirely irrigated and used for general farm crops, principally alfalfa, wheat, barley, sugar beets, and corn silage. Under good management, excellent yields of alfalfa, sugar beets, and corn silage are obtained. Yields average somewhat better than those reported for the Musinia sandy loam soils.

Musinia silty clay loam, imperfectly drained, 0 to 2 percent slopes (My).—This soil occurs mainly northeast of Joseph, north of

Annabella, and west of Glenwood. Usually it is adjacent to but slightly lower than the better drained Musinia silty clay loam. The drainage difficulties have developed since irrigation was introduced. The water table, ordinarily about 4 or 5 feet below the surface, fluctuates somewhat and is highest during the irrigation season. In two small areas west of Glenwood, the water table is generally about a foot from the surface. As yet, the profile has not been materially altered as a result of the imperfect drainage. The soil is generally free of harmful salt or alkali accumulations, though there are slight to moderate amounts in some places.

This soil is used mainly for crops, of which alfalfa and small grains are the most important.

Musinia silty clay loam, moderately deep, over clay, 0 to 2 percent slopes (Mz).—This soil differs from the typical Musinia silty clay loam in having a light clay substratum beginning at a depth of about 30 inches. It occurs northwest of Monroe and northeast of Joseph. Northwest of Monroe, it is associated with Jura silty clay. All of this soil is used for crops. It is apparently about as productive as Musinia silty clay loam, 0 to 2 percent slopes. Because of its fine-textured substratum, the soil is slowly permeable and may become poorly drained if excessively irrigated.

Musinia silty clay loam, deep, over gravel, 0 to 2 percent slopes (Mx).—This soil has a gravelly substratum beginning at a depth of about 36 inches. Otherwise, it is like Musinia silty clay loam, 0 to 2 percent slopes. It occurs on smooth alluvial fans, west of Glenwood and Monroe. It is related to Annabella loam but has a thicker layer of fine-textured soil over the gravelly substratum. Mapped with this soil is about 100 acres, located a mile northwest of Monroe, that has silty clay surface soil.

All of this soil is used for crops. Yields are generally good, but water requirements are somewhat higher than for the Musinia silty clay loam, 0 to 2 percent slopes.

Naples silty clay loam, 0 to 2 percent slopes (Ne).—This is one of the best agricultural soils of the Area. It occupies smooth recent alluvial fans and flood plains between Richfield and Elsinore, on the west side of Sevier Valley, and between Sigurd and Redmond. The parent material was derived from quartzites, light-brown sandstones and shales, and some igneous rock. The soil is well drained and generally free from harmful concentrations of salts. Most of the native vegetation has been cleared. Vegetation along fence lines and on the few remaining uncleared areas indicates that shadscale, greasewood, rabbitbrush, and sagebrush were the dominant plants.

Profile description:

0 to 9 inches, light-brown to pink fine granular silty clay loam; slightly hard; strongly calcareous; content of organic matter is moderate.
9 to 29 inches, light-brown to pink, massive loam; calcareous; slightly hard.
29 to 72 inches, light-brown to pink, soft to slightly hard, massive loam; strongly calcareous; stratified in places.

Use and management.—Practically all of this soil is used for crops, principally alfalfa, small grains, sugar beets, corn, and potatoes. Average yields are high under good management. Large quantities of manure are used to maintain productivity. A common rotation in-

cludes the following: Alfalfa for 4 or 5 years; barley, wheat, or corn for 1 year; sugar beets or potatoes for 1 or 2 years; then alfalfa seeded with a companion crop of barley, wheat, or oats. Because the spring weather is usually dry and windy, crops are generally irrigated immediately after they are seeded.

Naples silty clay loam, 2 to 5 percent slopes (NF).—This soil is similar to Naples silty clay loam, 0 to 2 percent slopes, and usually occurs adjacent to it but higher on the valley plain. It is used for irrigated crops and range.

Naples silty clay loam, imperfectly drained, 0 to 2 percent slopes (NG).—This soil occurs on the lower and more nearly level parts of the valley plain. It is usually adjacent to but slightly above areas of Poganeab soils, and below extensive areas of better drained Naples soils. It resembles Naples silty clay loam, 0 to 2 percent slopes, except that the water table is within 6 feet of the surface. The water level varies from place to place and fluctuates during the year, but it is highest during the summer irrigation period. The imperfect drainage is the result of seepage from higher irrigated areas and from the unlined irrigation canals. The area has been irrigated for only a short time, and the soil profile has not been materially altered.

This soil is used principally for crops, but a substantial acreage is in range. Yields are somewhat lower than on the better drained Naples silty clay loam, 0 to 2 percent slopes.

Naples loam, 0 to 2 percent slopes (NC).—This soil occurs on smooth recent alluvial fans, in the same general localities as Naples silty clay loam, 0 to 2 percent slopes, but nearly always at a slightly higher elevation. The parent material was derived mainly from quartzite and sandstone. This is a well-drained soil, free of harmful salts and alkali. The native vegetation consists mainly of sagebrush, shadscale, and rabbitbrush.

The profile is similar to that of Naples silty clay loam, 0 to 2 percent slopes, except for the loam surface soil. The substratum is either stratified medium-textured material, or loam of fairly uniform texture. Stillman soils, which have a coarse gravelly substratum, usually occur adjacent to the Naples loam but higher on the alluvial fan. The boundaries between Stillman and Naples soils are often indistinct.

This soil is used almost entirely for general farm crops, under irrigation. Yields correspond closely to yields from Naples silty clay loam, 0 to 2 percent slopes, and management practices are about the same.

Naples loam, 2 to 5 percent slopes (ND).—This soil usually is adjacent to areas of Naples loam, 0 to 2 percent slopes, but higher on the fans. It is about half range and half irrigated cropland. Most of the range is above present irrigation canals.

Naples fine sandy loam, deep, over gravel, 0 to 2 percent slopes (NA).—This soil is similar to Stillman fine sandy loam, 0 to 2 percent slopes, except that the soil is deeper over the porous gravelly substratum. The soil is about 36 inches deep, on the average. It occupies smooth alluvial fans, adjacent to but slightly above Naples loam.

Naples fine sandy loam, deep, over gravel, 2 to 5 percent slopes (NB).—Except for stronger slopes, this soil is very similar to Naples fine sandy loam, deep, over gravel, 0 to 2 percent slopes.

Navajo silty clay, 0 to 2 percent slopes (NH).—This deep, fine-textured, recent alluvial soil occupies low, nearly level parts of the valley west of the Sevier River flood plains. It is closely associated with Naples silty clay loams in some parts of the Area and with Redfield silty clay loams in other places. It is widely distributed in the Sevier Valley between Central and Redmond. The parent material was derived from quartzite and mixed sedimentary rocks, principally shale and sandstone. Most of the native vegetation has been removed. On the few uncleared areas, greasewood, rabbitbrush, and shadscale are the common plants. Surface runoff is very slow, and internal drainage is slow to very slow.

Profile description:

0 to 10 inches, light-brown to light reddish-brown coarse granular silty clay; slightly hard; strongly calcareous; low in organic matter.
10 to 18 inches, light-brown to light reddish-brown clay or silty clay; strongly calcareous, weak prismatic structure that breaks into hard blocks.
18 to 28 inches, light-brown to light reddish-brown clay; strongly calcareous; hard blocky structure.
28 to 72 inches, light-brown to light reddish-brown clay; strongly calcareous; massive; hard; plastic when wet.

Use and management.—Almost all of this soil is irrigated cropland. Alfalfa is the main crop; small grains, sugar beets, and corn are also grown. Yields are fair to good, depending upon the level of farm management. If possible, this soil should be plowed in the fall. Spring plowing generally results in a coarse, cloddy surface on which crops are likely to be uneven. Irrigation must be carefully timed, to allow for fairly deep penetration but to avoid overirrigation. The following general rotation is suggested for this soil: Alfalfa for 3 or 4 years; barley for 1 year; a row crop such as corn or sugar beets for 1 year; then alfalfa seeded with barley as a companion crop.

Navajo silty clay, imperfectly drained, 0 to 1 percent slopes (NK).—This soil is practically the same as Navajo silty clay, 0 to 2 percent slopes, but has a high water table and slight to moderate concentrations of soluble salts. The imperfect drainage is, to a large extent, the result of seepage from higher irrigated fields and from canals. This soil is associated with Navajo silty clay, 0 to 2 percent slopes, but usually occupies flat areas or depressions. If often occurs adjacent to but slightly above poorly drained Poganeab soils. The major part of this soil is cropland, but a substantial acreage is irrigated pasture. Because of the salt in the soil, and the fluctuating water table which often drowns out the deeper roots, yields are lower than those obtained from the better drained Navajo silty clay. Improved drainage facilities are needed. Where the soil is salt-free, red clover should replace alfalfa in the crop rotation. Salt-tolerant pasture plants should be planted in the areas affected by salts. Farmers can obtain from the county agricultural agent or from the Utah State Experiment Station information on pasture mixtures recommended for salt-affected areas.

Navajo silty clay, very poorly drained, 0 to 1 percent slopes (Nm).—This soil usually occurs adjacent to the imperfectly drained phase of Navajo silty clay but at a slightly lower level. It occurs in three widely separated areas—east of Richfield, southwest of Redmond Lake, and about 1½ miles north of Axtell. The ground-water level is within 1 foot of the surface during much of the growing season. All of this soil is used for irrigated pasture. The area near Richfield is free of salts and apparently produces a heavy crop of good-quality forage. In the other two areas, which are affected by salts, saltgrass is an important pasture plant.

Navajo silty clay, moderately deep, over Poganeab soil material, imperfectly drained, 0 to 1 percent slopes (Nl).—This soil is similar to imperfectly drained Navajo silty clay except that it has, beginning at about 24 inches, light brownish-gray substrata that vary in texture from loam to silty clay and are moderately to very slowly permeable. The soil occurs on the smooth valley floor adjacent to a broad area of poorly drained Poganeab soils, about 1½ miles southeast of Richfield. The soil has a slight concentration of salts in most places. About 80 percent is irrigated pasture, and the rest is cropland.

Pavant stony sandy loam, 5 to 10 percent slopes (Pd).—This soil occurs on old alluvial fans, mainly in upper Round Valley and the southwestern part of lower Round Valley. Surface relief is undulating to gently rolling. The soil is associated with Pharo stony sandy loam, 5 to 10 percent slopes. The parent rocks were mainly sandstone, limestone, and quartzite. The native vegetation is principally juniper, sagebrush, scattered grasses, and weeds. The average annual rainfall is about 14 inches. Surface drainage is medium to rapid, but internal drainage is very slow because of the lime-cemented hardpan. Because this stony soil is shallow above the hardpan, it is droughty.

Profile description:

0 to 10 inches, light brownish-gray, soft, fine granular, stony sandy loam; moderately calcareous; contains many pebbles and stones; moderate organic-matter content.

10 to 42 inches, very pale brown strongly lime-cemented or indurated hardpan; very slowly permeable to water; impenetrable to plant roots; gravel and cobblestones are cemented into the hardpan.

42 to 72 inches, very pale brown, hard, massive, gravelly sandy loam; contains many cobblestones; moderate concentration of lime carbonate but very little cementation.

Use and management.—More than two-thirds of this soil is used for range. A substantial acreage has a thick growth of juniper trees, which, when they reach proper size, are cut and used extensively for fence posts. The grazing value of the range areas is generally low, but it is higher than that of similar soils in drier environments.

Pavant stony sandy loam, 10 to 20 percent slopes (Pe).—This soil is similar to and usually is associated with Pavant stony sandy loam, 5 to 10 percent slopes. It occupies higher positions on steep old alluvial fans. These fans are adjacent to the steep rugged mountains that supplied the parent material from which the soil developed. The surface soil has been moderately eroded on much of this phase. Practically all of this soil is used for grazing. It is of slightly less

value for grazing than Pavant stony sandy loam, 5 to 10 percent slopes.

Pavant gravelly sandy loam, 5 to 10 percent slopes (PB).—This soil is similar to Pavant stony sandy loam, 5 to 10 percent slopes, except in the content of stones. It contains a few scattered stones, but not enough to interfere seriously with clearing. It occurs along both sides of upper Round Valley and in the southern and southwestern parts of lower Round Valley.

Use and management.—This soil is generally unsuited for anything but grazing, and is practically all used for range. It is better grazing land than Pavant stony sandy loam, 5 to 10 percent slopes, and could be reseeded to desirable forage plants.

Pavant gravelly sandy loam, 2 to 5 percent slopes (PA).—Except for the difference in slope, this soil is practically the same as Pavant gravelly sandy loam, 5 to 10 percent slopes. It occurs in the same general localities as the other Pavant soils. Most of this soil is range.

Pavant loam, 3 to 8 percent slopes (PC).—This soil occupies the lower parts of the old Pavant fans. It occurs in a number of rather small bodies, principally in upper Round Valley. The surface soil, to a depth of 14 inches, is a pale-brown, moderately calcareous, slightly hard, fine granular loam. It is practically free of gravel but in places may contain a few hardpan fragments. Underlying the surface soil and extending to an average depth of 40 inches is a yellowish-white, strongly lime-cemented hardpan. Below the hardpan and continuing to a depth of 72 inches or more is very pale brown, loose, strongly calcareous, gravelly loamy sand. The soil is used principally for range.

Pharo gravelly sandy loam, 2 to 5 percent slopes (PH).—This soil occurs on old, high alluvial fans on the east and west sides of upper Round Valley and in the southern and southwestern parts of lower Round Valley. The topography is undulating to gently rolling. The soil is associated with Pavant gravelly sandy loam, 2 to 5 percent slopes, and resembles that soil except that it has less lime in the subsoil. The lime-cemented layer is very friable when moist and is at least moderately permeable. The parent rocks were mainly quartzite, limestone, and sandstone. The native vegetation is sagebrush, bunchgrasses, and, in a few places, scattered juniper trees. The average annual rainfall is 14 to 16 inches. Surface drainage and internal drainage are medium.

Profile description:

0 to 5 inches, grayish-brown, soft, gravelly sandy loam; moderately calcareous; slightly platy; breaks to fine granules; organic-matter content is moderate.

5 to 12 inches, light brownish-gray, soft, fine granular, gravelly sandy loam; strongly calcareous.

12 to 36 inches, very pale brown, weakly lime cemented, gravelly sandy loam; hard when dry but friable to very friable when moist.

36 to 72 inches, very pale brown stratified, loose gravelly loamy sand, mixed in places with clean gravel and sand; strongly calcareous.

The amount of gravel and the thickness of the lime zone vary. In some places the surface layer is very weakly calcareous to noncalcareous.

Use and management.—This soil is used mainly for range. It is fairly well suited for grazing and can be readily cleared and seeded to a drought-resistant grass such as crested wheatgrass. Around 20 percent is in dry-farmed crops. The soil is not particularly well suited to farming but is good enough to warrant its continued use as cropland.

Pharo gravelly sandy loam, 5 to 10 percent slopes (PK).—This soil is practically the same as Pharo gravelly sandy loam, 2 to 5 percent slopes. It is usually adjacent to the gently sloping soil, but on the higher, steeper parts of old alluvial fans. Relief is generally undulating to rolling. The soil is about 90 percent range and 10 percent cropland. Because of the steeper slopes, this soil is not so good for crops or grazing as Pharo gravelly sandy loam, 2 to 5 percent slopes.

Pharo gravelly sandy loam, eroded, 5 to 10 percent slopes (PL).—This soil occurs mainly in the extreme southeastern part of upper Round Valley, in a small area almost completely surrounded by rough mountains. Small gullies have developed to such extent as to alter the soil profile and reduce productivity. The area has apparently been used as a bedding ground for sheep. Much of the natural vegetation has been killed.

All of this soil is used for range. Its grazing value is about half that of Pharo gravelly sandy loam, 2 to 5 percent slopes.

Pharo stony sandy loam, 5 to 10 percent slopes (PM).—This soil is similar to Pharo gravelly sandy loam, 5 to 10 percent slopes, except that it has numerous stones on and near the surface and more stones and gravel in the subsoil. The native vegetation is mainly sagebrush, oakbrush, juniper, and some bunchgrasses. This soil occurs in the same general localities as Pharo gravelly sandy loam, 5 to 10 percent slopes, but is usually nearer, and often adjacent to, the mountains. It is used almost entirely for range. The junipers that grow thickly in some areas make good-quality posts.

Pharo stony sandy loam, 10 to 20 percent slopes (PN).—Except for steeper slopes, this soil is similar to Pharo stony sandy loam, 5 to 10 percent slopes. It occurs near the base of the Pavant Mountains along the western edge of upper Round Valley. It supports a fairly thick cover composed principally of oakbrush, sagebrush, and juniper. The land is used for range.

Pharo loam, 2 to 5 percent slopes (PF).—Except for finer texture, this soil is similar to Pharo gravelly sandy loam, 2 to 5 percent slopes. It is closely associated with the Calita loams on old alluvial fans on the west side of upper Round Valley.

Use and management.—This soil is used for dry-farming and for range. Yields are somewhat lower than those obtained on the Calita loams. The rangelands should be cleared of native vegetation and seeded to crested wheatgrass or similar forage plants.

Pharo loam, 5 to 10 percent slopes (PG).—Except for stronger slopes, this soil is similar to Pharo loam, 2 to 5 percent slopes. It is located in upper Round Valley, west and north of Scipio Lake. The soil is used for both dry-farming and for range.

Poganeab silty clay, moderately well drained, 0 to 2 percent slopes (Pt).—This soil has developed from recent alluvial material. It occurs mainly on moderately well drained first bottoms of the Sevier River, generally some distance back from the present river channel. It is widely distributed in rather small tracts in Sevier and Sanpete Counties. The topography is generally smooth, except for occasional meander scars and oxbows of the river. The parent material was derived from a wide variety of igneous and sedimentary rocks. Surface drainage is generally very slow, and internal drainage is slow. The ground-water level fluctuates; it is highest in summer when the river is at flood stage. The native vegetation is mainly alkali-tolerant species such as saltgrass, alkali sacaton, greasewood, shadscale, and, where the salt concentration is strong, samphire and pickleweed.

There is considerable variation in the thickness, texture, color, and arrangement of the layers in the soil profile.

Profile description of one exposure of this soil:

0 to 3 inches, gray, strongly calcareous, slightly hard, granular silty clay.
3 to 33 inches, very pale brown massive clay; strongly calcareous; hard when dry, plastic when wet; contains a few gypsum crystals.
33 to 50 inches, very pale brown clay loam or silty clay loam; strongly calcareous; massive; hard when dry and friable when moist.
50 to 72 inches, gray clay or silty clay, mottled with white; strongly calcareous; hard; massive; organic colloidal staining gives the soil a dark-gray color.

Slight to strong concentrations of salt, alkali, or both, are common.

Use and management.—This soil is used for crops and for grazing. Yields are low to fair. Alfalfa and the small grains (oats, barley, and wheat) are the major crops. No systematic crop rotation is practiced. Alfalfa is kept as long as possible and is followed by grain for 2 or 3 years; then alfalfa is planted again. Irrigated improved pastures appear to do well on this soil.

To increase yields, the following management plan is suggested: Plant a recommended pasture mixture, and leave the land in pasture for 6 to 8 years. Follow with corn or sugar beets, which utilize the increased fertility and produce high yields. Small grains do well following the cultivated crop but are likely to lodge if planted the first year following pasture. Following the small-grain crop, sow alfalfa or red clover, with or without a companion crop. Where the soil is free of weeds, red clover can be seeded alone.

Fall plowing is important; it is almost impossible to prepare a good seedbed on this soil if it is plowed in the spring. Pastures usually respond to applications of fertilizer. Up to 10 tons of barnyard manure every 2 years and 200 pounds of treble-superphosphate every 2 or 3 years are suggested.

Poganeab silty clay, poorly drained, 0 to 2 percent slopes (Pu).—This soil is widely distributed along the Sevier River bottoms between Annabella and the Sevier Bridge Reservoir. It differs from the moderately well drained phase in having a higher water table throughout the year. Otherwise, the two soils have the same general profile characteristics. The soil is used for crops, irrigated pasture, and range. Yields average slightly lower than on the moderately well drained phase.

This soil needs artificial drainage. In many areas leveling and better irrigation facilities are needed. Management practices sug-

gested for the moderately well drained Poganeab silty clay apply to this soil as well.

Poganeab silty clay, very poorly drained, 0 to 1 percent slopes (Pv).—This soil is associated with the poorly drained Poganeab silty clay. It has a permanently high water table that is often within 1 foot of the surface. Some areas are naturally wet, and other areas are constantly irrigated during the growing season to maintain a high water table. The native growth consists of sedges, wiregrass, wild barleygrass (also known as squirreltail and foxtail), and similar water-tolerant plants. The soil is used to grow meadow hay and for pasture.

Poganeab clay loam, moderately well drained, 0 to 2 percent slopes (Pr).—This nearly level to gently undulating deep soil occurs on moderately well drained river flood plains. North of Redmond is a fairly large area that is above the flood plain. Internal drainage is medium; surface drainage is slow to very slow. An area of this soil east of Richfield has been artificially drained. Slight to moderate accumulations of salts are usual. The profile corresponds in a general way to that of the moderately well drained Poganeab silty clay, but the surface is clay loam and the subsoil is generally more stratified and permeable.

This soil is used for crops and for grazing. The management practices suggested for Poganeab silty clay, moderately well drained, apply to this soil as well.

Poganeab clay loam, poorly drained, 0 to 2 percent slopes (Pr).—This soil is widely distributed along the Sevier River bottoms in both Sevier and Sanpete Counties. The topography is nearly level to undulating and is marked by occasional river-meander scars. The ground-water level is high. Large areas need artificial drainage. Leveling is also needed, so the land can be evenly irrigated to leach out salts.

Poganeab clay loam, very poorly drained, 0 to 2 percent slopes (Ps).—This soil occurs principally northwest of Glenwood, in an area where springs and ponds are common. It is used for meadow hay and for pasture.

Poganeab clay, poorly drained, 0 to 1 percent slopes (Po).—This soil is similar to Poganeab silty clay, poorly drained, but is finer textured and has no textural stratification to a depth of 6 feet or more. It is nearly all located east of the Sevier River, about 2 miles west of Centerfield, in low, nearly level areas. It is all affected by moderate to strong concentrations of salts. Attempts to lower the water table by installing open drains have been only partially successful. All of this soil is used for pasture.

Poganeab soils, undifferentiated, poorly drained, 0 to 1 percent slopes (Px).—These undifferentiated soils along the Sevier River include many old ox-bows and meander scars that were formerly a a part of the river channel. The unit is almost continuous on each side of the river from Annabella to the Sevier Bridge Reservoir. Surface textures vary from sands to clays, and strata below the surface vary in color, texture, and degree of compaction within short distances. The subsoils in most places are moderately permeable,

but because of the low position of the unit, and its proximity to the river channel, the water table is always within 6 feet of the surface—probably about 3 feet on the average. The water level fluctuates with the depth of water in the river. When the river is high, the area is subject to flooding. These soils are used principally for pasture. The vegetation is mainly salt-tolerant plants, such as saltgrass and alkali sacaton. Sedges and wiregrass thrive in wetter spots that are free from salts.

Poganeab soils, undifferentiated, moderately well drained, 0 to 2 percent slopes (Pw).—These undifferentiated soils are similar to the poorly drained undifferentiated Poganeab soils except that the water table is approximately 6 feet below the surface. The unit occupies nearly level to very gently undulating river flood plains. All of this land is used for pasture.

Ralston loam, 0 to 2 percent slopes (Rb).—This shallow soil overlies beds of clean gravel and sand. It occurs on a broad, low river terrace in the southern part of Sevier Valley about 1½ miles south of the town of Elsinore. It has about 1-percent slope toward the northeast. The parent material was derived from mixed igneous and sedimentary rock, the igneous material predominating. Drainage is somewhat excessive. All of the native vegetation has been cleared off, except for a little rabbitbrush and shadscale along fence lines.

Included in this unit are two bodies, one on the east and the other on the west side of the main area of Ralston loam, where the surface soil is deeper and the gravelly substratum begins at a depth of about 36 inches.

Profile description of Ralston loam, 0 to 2 percent slopes:

0 to 6 inches, pale-brown, slightly hard, medium to fine granular loam; strongly calcareous; low in organic matter.

6 to 14 inches, pale-brown, hard, massive loam; strongly calcareous and low in organic matter; contains a very little fine gravel; combined thickness of this layer and the one above varies from 12 to 18 inches.

14 to 25 inches, very pale brown very gravelly sandy loam; hard; massive; weakly cemented by calcium cabonate; organic-matter content very low; percentage of gravel is high; a screen analysis showed 73 percent of the particles in this layer to be larger than 2 mm. in size.

25 to 72 inches, light-gray and gray moderately calcareous loose gravel and sand; gravel content is very high; 89 percent of the soil mass is composed of particles more than 2 mm. in size; soil is free of detrimental salts.

Use and management.—Practically all of this soil is used for crops. Alfalfa, barley, wheat, potatoes, and corn for ensilage are commonly grown.

Plowing is usually done in spring, and the seedbed is prepared immediately after plowing. What barnyard manure is available is spread during the winter. There is no systematic crop rotation.

Because the surface soil is shallow and the substratum extremely porous, irrigations should be light and frequent, to prevent excessive loss of irrigation water by deep percolation. With short runs and a large head of water, the soil can be irrigated without much loss of water.

Ralston gravelly loam, 0 to 2 percent slopes (Ra).—This soil is similar to Ralston loam, 0 to 2 percent slopes, but has a gravelly surface soil (pl. 4, *A*) and is somewhat more droughty. It occurs adjacent to

areas of Ralston loam, and the boundaries separating the two are often indistinct. Two small areas are included that have a scattering of cobblestones. This soil occurs in the same general locality as Ralston loam.

Use and management.—This soil is practically all used for general farm crops. Crops are about the same as are grown on Ralston loam, and general management practices for the two soils are the same. Yields, however, are slightly less on this Ralston gravelly loam.

Ravola clay loam, 0 to 2 percent slopes (Rc).—This deep moderately fine textured soil occurs on nearly level recent alluvial fans in several widely separated areas. The most extensive area is near Axtell in Sanpete County; there are smaller areas south and north of Mayfield in the northeastern part of the Area. A few small bodies are slightly undulating. The parent material was derived mostly from gypsiferous shale, mixed with a little limestone and sandstone. The soil is well drained and its water-holding capacity is good. Most of it is now free from harmful accumulations of salt, but the presence of greasewood and rabbitbrush, along fence lines in the small uncultivated areas, indicates that under virgin conditions the soil contained slight to moderate salt accumulations.

The soil profile varies somewhat from place to place but has the following general characteristics:

0 to 6 inches, very pale brown to pale-brown medium to fine granular clay loam; slightly hard; strongly calcareous; low in organic matter.
6 to 16 inches, pale-brown, hard, massive silty clay loam; strongly calcareous.
16 to 31 inches, very pale brown, hard, massive sandy clay loam; strongly calcareous.
31 to 72 inches, very pale brown, massive, stratified loam and light clay loam; strongly calcareous.

The soil color ranges from yellowish white to very pale brown or pale brown. The subsoil may have gypsum veining. It is free from gravel and stones.

Use and management.—This soil is well adapted to and is used mainly for general irrigated farm crops. It is productive, but the water supply is generally inadequate. The soil is usually kept in alfalfa as long as possible, then planted to wheat or barley for 2 or 3 years. The available barnyard manure is usually applied to sugar beets. The manure is applied during the winter and early spring months, after which the soil is plowed and the seedbed prepared.

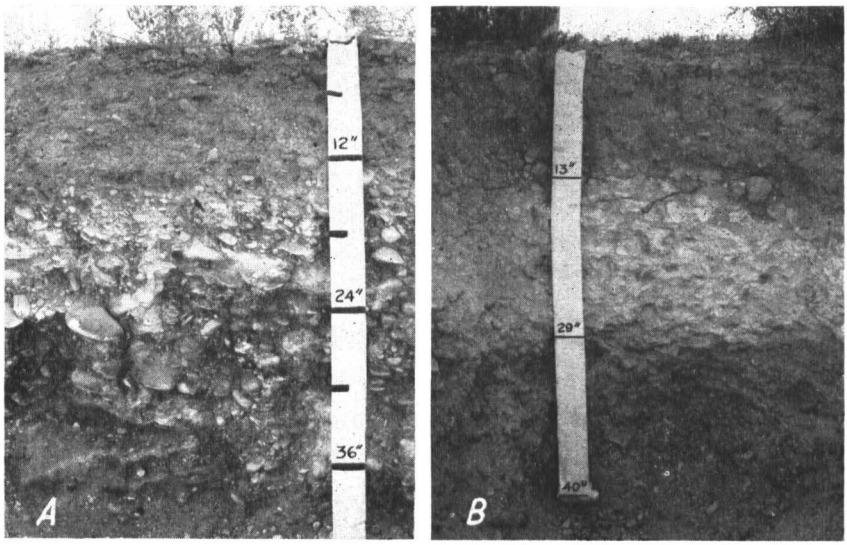
Ravola clay loam, 2 to 5 percent slopes (Rd).—This soil is very similar to Ravola clay loam, 0 to 2 percent slopes, except that it has stronger slopes and is more widely distributed. It is used to some extent for crops.

Ravola clay loam, eroded, 2 to 5 percent slopes (Re).—This soil generally occurs adjacent to raw shale hills. Partly as a result of runoff from the hills, deep gullies have developed and have rendered the soil nearly useless for farming. Practically all of the soil is used for range.

Ravola clay loam, eroded, 5 to 10 percent slopes (Rg).—This soil is similar to Ravola clay loam, eroded, 2 to 5 percent slopes, except that it has stronger slopes. All of this phase is used for range.

A, Cabbage, celery, and sugar beets on Genola silty clay loam, 0 to 2 percent slopes, about 4 miles west of Gunnison. White areas on alluvial fan are covered with dense stand of cheatgrass. Shadscale on steeper parts of fan and on foot slopes of the Valley Mountains. Scattered juniper trees on the higher parts of the mountains.

B, Hereford cattle feeding in field of alfalfa on Redfield silty clay loam, 0 to 2 percent slopes. Sevier Plateau in background.



A, Profile of Ralston gravelly loam, 0 to 2 percent slopes, about 2½ miles west of Monroe. White carbonate of lime is mainly on the lower sides of pebbles and cobblestones. Pebbles are easily dislodged, or already loose. Surface soil much less gravelly than typical.

B, Profile of Sanpete gravelly sandy loam, 2 to 5 percent slopes. Lime carbonate horizon is moderately cemented.

Ravola clay loam, 5 to 10 percent slopes (RE).—This soil is similar to Ravola clay loam, 0 to 2 percent slopes, except that it is more strongly sloping and is moderately eroded. It is all used for range.

Ravola clay loam, silted, 0 to 2 percent slopes (RH).—This soil has developed from material recently deposited by turbid irrigation or flood waters from Salina Creek. The substratum is highly stratified and has a greater range in texture than the typical Ravola clay loam. Soil color also varies more widely. In many places, there are rather distinct pale-yellow and moderate-brown mottlings, probably caused by the raw varicolored sandstone and shale parent material, rather than by poor drainage.

Use and management.—This soil is nearly all used for crops, principally alfalfa, barley, wheat, and sugar beets. It is a good soil for gardens and lawns in the town of Salina. Yields are generally high. A good supply of barnyard manure from the beef-feeding centers near Salina is available for use on this soil.

Ravola clay loam, silted, 2 to 5 percent slopes (RK).—Except for stronger slopes, this soil is similar to Ravola clay loam, silted, 0 to 2 percent slopes. It is located southeast of Salina. Most of it is irrigated cropland.

Ravola silty clay, silted, 0 to 2 percent slopes (RL).—This soil is similar to silted Ravola clay loam except for surface texture. It occurs adjacent to the silted clay loam, but lower on the alluvial plain. It is nearly all irrigated cropland.

Redfield silty clay loam, 0 to 2 percent slopes (RP).—This deep soil occurs on very gently sloping recent alluvial flood plains in the Sevier County portion of the Area. Nearly all of it is in a compact area near Sigurd. It is associated with Redfield loams but is usually at a slightly lower elevation. This soil closely resembles Naples silty clay loam, 0 to 2 percent slopes, the soils being separated primarily on the basis of color. The parent material was derived from mixed sedimentary rock, mainly light reddish-brown shales and sandstones. Drainage is good. A large percentage of this soil is free from harmful accumulations of salts. However, scattered small spots contain salts, and virgin areas generally have slight to moderate concentrations. The native vegetation is mainly greasewood and shadscale.

Profile description:

0 to 9 inches, light reddish-brown slightly hard, fine granular silty clay loam; strongly calcareous.
9 to 18 inches, light reddish-brown medium granular clay loam; strongly calcareous; slightly hard.
18 to 24 inches, light reddish-brown, loose, massive loamy sand; strongly calcareous.
24 to 72 inches, light reddish-brown massive clay loam or silty clay loam; slighty hard; strongly calcareous.

Use and management.—Most of this soil is used for crops, principally alfalfa (pl. 3, *B*) small grains, and sugar beets. In general, this soil is well managed. It is well fertilized with barnyard manure and treble-superphosphate, and crops are regularly rotated. Yields are uniformly high.

Redfield silty clay loam, imperfectly drained, 0 to 2 percent slopes (RR).—This soil occupies depressions adjacent to areas of well-

drained Redfield silty clay loam, 0 to 2 percent slopes. It resembles Redfield silty clay loam, except that the ground-water level is within 6 feet of the surface. The water level fluctuates but averages between 3½ feet and 4 feet from the surface. In most places drainage could be improved by installing open drains. Practically all of this soil is used for crops.

Redfield loam, 0 to 2 percent slopes (RN).—This soil occupies very gently sloping recent alluvial fans. It has about the same general distribution as Redfield silty clay loam, 0 to 2 percent slopes. Scattered spots are affected by salt accumulations.

This soil is similar to Redfield silty clay loam, 0 to 2 percent slopes, except in having a loam surface soil and a stratified subsoil that is also normally of loam texture.

When irrigated, this soil is well suited to general farm crops. Yields of most crops are about the same as on Redfield silty clay loam; potato yields are better.

Redfield loam, 2 to 5 percent slopes (RO).—This soil occurs in small bodies west of Sigurd and north of Richfield. It is occasionally flooded as a result of summer cloudbursts. Except for stronger slopes, it is similar to Redfield loam, 0 to 2 percent slopes.

Redfield fine sandy loam, 0 to 3 percent slopes (RM).—This soil is similar to Redfield loam, 0 to 2 percent slopes, but has a fine sandy loam surface soil. It occupies gently undulating recent alluvial fans in the same general localities as other Redfield soils. It is closely associated with Redfield loam, 0 to 2 percent slopes, but in a higher position on the alluvial fans. It is also associated with Stillman soils, which occur still higher on the fans. Most of the acreage is irrigated cropland, but this soil is not so good as other Redfield soils for irrigated farming, because water and fertilizer requirements are higher.

Riverwash (RS).—This land type consists of recent deposits of undifferentiated sand, gravel, and cobblestones that occur adjacent to stream channels, principally those of the larger streams. It occurs as long narrow bodies adjoining the channel of the Sevier River in the southern part of the Area. It also occurs along Twelve Mile Creek and in a few small, widely scattered bodies along the larger intermittent stream channels. In most places this land is devoid of vegetation; however, there is some growth, mainly willows, along Twelve Mile Creek. The land is of very low value for grazing.

Rough gullied land (RT).—This land type is widely distributed throughout the Area. Its agricultural value has been practically destroyed by deep gullies caused by breaks in irrigation canals, waste irrigation water, and floodwaters from summer storms. The gullies usually occur singly and are most prevalent in deep soils derived from recent alluvium, especially in the Billings, Ravola, and Skumpah soils, which contain some salt or alkali. These areas are of low value for grazing, but they may provide drainage for surrounding areas.

Rough stony land (RU).—This land type consists of steep escarpments and rough broken areas of consolidated rock having little or no soil cover. It occurs in the mountains bordering Sevier Valley It is most extensive in the central portion of the Area, between Richfield

and Aurora, on the west side of the valley. Here, it is composed of bright-colored sandstone and shale cliffs, hundreds of feet high. Farther north, the cliffs are composed of duller gray, yellowish-gray, and yellowish-brown limestone and quartzite. In the southern part of the Area, the rock is mainly dark basic and acid igneous. This land type has practically no agricultural value.

Sanpete loam, 2 to 5 percent slopes (SD).—This shallow soil has developed on undulating old alluvial fans in the central and northern part of Sevier Valley and in lower Round Valley. It is associated with Denmark and Sigurd soils. Parent materials were derived mainly from sandstone, shale, quartzite, and limestone. The vegetation consists mainly of shadscale and sagebrush, with some cheatgrass and Russian-thistle. The average annual rainfall is about 8 or 9 inches. Surface drainage and internal drainage are medium.

Profile description:

0 to 5 inches, pale-brown to light yellowish-brown, fine granular, light loam; strongly calcareous; slightly hard; organic-matter content is low.
5 to 12 inches, very pale brown and light yellowish-brown massive loam or sandy loam; strongly calcareous; lime is mostly disseminated but some appears as mottlings or as veins.
12 to 21 inches, very pale brown, weakly lime cemented gritty loam; hard when dry but easily crumbled and friable when moist.
21 to 39 inches, very pale brown, hard, massive, weakly lime cemented gravelly sandy loam.
39 to 72 inches, very pale brown to light-brown, loose, massive gravelly loamy sand.

Use and management.—This soil is used mainly for range and for irrigated crops. Yields are fair. Alfalfa is the principal crop; barley and wheat are also important. A small acreage is used for potatoes and corn. The soil is too droughty for sugar beets. This soil is not adapted to dry-farming. The range areas could be improved if they were seeded to crested wheatgrass. Most of the range is out of reach of present irrigation facilities.

Sanpete loam, 5 to 10 percent slopes (SE).—Except for stronger slopes, this soil is similar to Sanpete loam, 2 to 5 percent slopes. It occurs in the Sanpete County part of Sevier Valley and in lower Round Valley. This soil is not suitable for irrigated crops; it should be seeded to permanent pasture plants to keep the surface from eroding.

Sanpete loam, deep, 0 to 3 percent slopes (SF).—This soil occupies the lower portion of the alluvial fans, where the slope flattens out. It occurs on both sides of Sevier Valley around Redmond, often in a transition zone between Sanpete loams and Naples silty clay loams. In most places, it is covered by an overwash of more recent material. The layer of lime carbonate concentration is about 30 to 36 inches below the surface. This soil is used mostly for range.

Sanpete gravelly sandy loam, 2 to 5 percent slopes (SA).—This soil occurs on gently undulating old alluvial fans. It is most extensive on the west side of Sevier Valley, between Aurora and the Sevier-Sanpete County line. It also occurs in other parts of Sevier Valley and in lower Round Valley. Soil profile characteristics are similar to those of Sanpete loam, 2 to 5 percent slopes, but the surface soil is gravelly, and gravel and rock occur in greater abundance throughout

the profile (pl. 4, *B*). In several areas shown on the map by stone symbols, stones are scattered on the surface.

This soil is used mainly for range and for irrigated crops. Alfalfa, barley, and wheat, are the principal crops. Yields are generally fair to poor. The gravel and stones are a handicap in tillage, and irrigation water requirements are high.

Sanpete gravelly sandy loam, 5 to 10 percent slopes (SB).—Except for stronger slopes, this soil is practically the same as Sanpete gravelly sandy loam, 2 to 5 percent slopes. The top layer is somewhat thinner in places. Most of it is in Sevier Valley in the northern part of Sevier County, and in lower Round Valley. The soil is used mainly for range; only a small acreage is cropland. An area of 79 acres, about 2 miles east of Centerfield, has been severely affected by gully erosion, which has greatly reduced its value for grazing.

Sanpete gravelly sandy loam, 10 to 20 percent slopes (SC).—This soil is very similar to Sanpete gravelly sandy loam, 5 to 10 percent slopes, but has steeper slopes and has been affected by erosion. It occurs mainly in Sevier County, on high fans adjacent to the mountains. All of this soil is used for range.

Sanpete stony sandy loam, 5 to 10 percent slopes (SH).—This shallow, stony, nonarable soil occurs on old alluvial fans, adjacent to rough mountainous areas, mainly along the outer margin of Sevier Valley in the central and northern parts. The parent material was derived mainly from quartzite, sandstone, and limestone. Surface drainage is medium, and internal drainage is rapid. The native vegetation is composed mainly of shadscale, sagebrush, and some bunchgrasses. The soil profile corresponds quite closely to that of Sanpete gravelly sandy loam, 5 to 10 percent slopes, except that it has numerous stones in the surface soil and a larger proportion of stones and gravel in the subsoil. Because of the stones, this soil is not suitable as cropland and has rather low value as range. Reseeding would be difficult or practically impossible.

Sanpete stony sandy loam, 2 to 5 percent slopes (SG).—Except for gentler slopes, this soil is similar to Sanpete stony sandy loam, 5 to 10 percent slopes. It usually occurs adjacent to the more sloping soil, but it is lower on the alluvial fans.

Sanpete stony sandy loam, 10 to 40 percent slopes (SI).—This moderately steep to steep soil resembles Sanpete stony sandy loam, 5 to 10 percent slopes, except that it has stronger slopes and is moderately eroded. Because it is steeper, there is more runoff; consequently, this soil is drier and supports less vegetation.

Sanpete stony sandy loam, eroded, 10 to 40 percent slopes (SJ).—This soil is similar to Sanpete stony sandy loam, 10 to 40 percent slopes, but it is severely eroded. It occurs mainly in the Sanpete County part of the Area, where overgrazing by sheep has been common in the past. Grazing value is low.

Sanpete clay loam, 2 to 5 percent slopes (S).—This soil occupies gently sloping old alluvial fans in widely separated areas, all in the Sanpete County part of the Area. It usually occurs adjacent to Sanpete loam. The profiles of the two soils are very similar, except for

surface texture. Included with this soil is a small, poorly drained area that lies just below an irrigation canal about 2 miles south and slightly west of Mayfield.

Sigurd gravelly sandy loam, 2 to 5 percent slopes (So).—This soil occurs on high alluvial fans and along intermittent stream channels. It is widely distributed in the central and northern parts of Sevier Valley and in the upper and lower parts of Round Valley. The topography is gently undulating. The soil is associated with Denmark gravelly sandy loams, and Sanpete gravelly sandy loams, but is of more recent origin and has little or no textural development. The parent material was derived mainly from sandstone, limestone, conglomerate, and quartzite. In a few areas there is some admixture of igneous material. Surface drainage is medium, and internal drainage is rapid. The native vegetation is mainly shadscale.

Profiles vary considerably in stratification from place to place but are generally gravelly and porous. The following profile description is fairly typical:

0 to 8 inches, pale-brown to light yellowish-brown fine granular gravelly sandy loam; strongly calcareous; soft; low in organic matter.
8 to 18 inches, very pale brown gravelly sandy loam; slightly compact but contains little or no indication of lime carbonate segregation.
18 to 72 inches, very pale brown gravelly sandy loam or gravelly loamy sand; loose and porous.

Use and management.—Small acreages are irrigated, but the soil is very droughty and is poorly suited to crops. The gravel and occasional stones interfere with tillage. Most of the soil is range. Its carrying capacity is low.

Sigurd gravelly sandy loam, 0 to 2 percent slopes (Sn).—Except for gentler slopes, this soil is similar to Sigurd gravelly sandy loam, 2 to 5 percent slopes.

Sigurd gravelly sandy loam, eroded, 2 to 5 percent slopes (Sq).—This soil is similar to and has about the same general distribution as Sigurd gravelly sandy loam, 2 to 5 percent slopes. It has been seriously affected by gully erosion and is subject to flooding during brief periods of high stream flow.

Sigurd gravelly sandy loam, 5 to 10 percent slopes (Sp).—This soil is widely distributed in the same general localities as Sigurd gravelly sandy loam, 2 to 5 per cent slopes. It is similar to Sigurd gravely sandy loam, 2 to 5 percent slopes, but contains a higher percentage of gravel. Over much of the area, the surface soil has been moderately eroded. Because of the steeper slopes and the higher gravel content, the soil is very droughty. It is not desirable for range, nor suitable for crops.

Sigurd stony sandy loam, 2 to 5 percent slopes (St).—This soil usually occurs adjacent to steep mountains, at the mouths of hollows or canyons traversed by intermittent stream channels. It is widely distributed in the central and northern parts of Sevier Valley, and throughout Round Valley. It resembles Sigurd gravelly sandy loam, 2 to 5 percent, except that it contains numerous stones. The parent material was derived mainly from mixed sedimentary rocks; near Salina it contains some igneous rock material, as well. Surface drain-

age is slow to medium, and internal drainage is very rapid. All of this soil is used for range. The carrying capacity is low.

Sigurd stony sandy loam, overwash, 2 to 10 percent slopes (Sx).—This soil consists of stones and other debris recently deposited by intermittent streams. It occurs in rather small, widely distributed areas. Stones and boulders cover so much of the surface that there is very little vegetation; and on the more recent deposits there is practically none.

Sigurd stony sandy loam, 5 to 10 percent slopes (Su).—This soil is similar to Sigurd stony sandy loam, 2 to 5 percent slopes, except that it has more boulders and stones on the surface. It has about the same general distribution as Sigurd stony sandy loam, 2 to 5 percent slopes. As range, it has very low carrying capacity.

Sigurd stony sandy loam, eroded, 3 to 10 percent slopes (Sv).—This soil is similar to Sigurd stony sandy loam, 2 to 5 percent slopes, and has about the same distribution, but it has been affected by severe gully erosion. Its grazing value is very low because the gullied areas have no vegetation.

Sigurd loam, 2 to 5 percent slopes (Sr).—This soil closely resembles Genola loam, deep, over gravel, 2 to 5 percent slopes, except that the gravel-free soil over the porous gravelly substratum averages only 18 inches in depth, compared to 36 inches in the Genola loam. The parent material was derived mainly from sandstone, limestone, and quartzite. Surface drainage and internal drainage are medium. Shadscale, sagebrush, and rabbitbrush are the dominant vegetation. This soil occurs near intermittent stream channels but usually not immediately adjacent to the channels. It has a fairly wide distribution on both sides of the central and northern Sevier Valley. Included with this unit are two areas totaling 69 acres that have been severely affected by gully erosion. One area is about 2 miles southeast of Centerfield, and the other is about 2 miles northeast of Gunnison.

Profile description:

0 to 5 inches, pale-brown fine granular loam; moderately to strongly calcareous; slightly hard; low in organic matter.
5 to 14 inches, very pale brown, hard, massive, heavy loam; strongly calcareous.
14 to 44 inches, very pale brown, very stony and gravelly, light sandy loam; medium granular; strongly calcareous; slightly hard.
44 to 72 inches, very pale brown gravelly fine sandy loam; strongly calcareous; slightly hard; massive.

Stratification of the substratum varies considerably from place to place, but the substratum is porous and very rapidly permeable everywhere.

Use and management.—This soil is used mainly for irrigated crops and for range; a small acreage is dry-farmed. The soil is arable but not particularly suitable for crops. Water and fertilizer requirements are high.

Sigurd loam, 5 to 10 percent slopes (Ss).—This soil resembles Sigurd loam, 2 to 5 percent slopes, but has stronger slopes and has been moderately eroded. It occurs in widely separated parts of the Area. Most of it is used for range.

Sigurd fine sandy loam, overwash, 2 to 5 percent slopes (SL).—This soil occurs in rather small bodies in the Sanpete County portion of Sevier Valley. It is very similar to Sigurd loam, 2 to 5 percent slopes, except for a 3- to 6-inch layer of fine sandy loam overwash that has been recently deposited on the original loam surface. The overwash has been eroded from adjacent higher areas of Sanpete or Denmark soils.

Sigurd clay loam, 2 to 5 percent slopes (SK).—Except for surface texture, this soil is practically the same as Sigurd loam, 2 to 5 percent slopes. Most of it is in the northern part of Sevier Valley, in Sanpete County.

Sigurd gravelly clay loam, 3 to 10 percent slopes (SM).—Except for stronger slopes and a gravelly clay loam surface layer, this soil is similar to Sigurd gravelly sandy loam, 2 to 5 percent slopes. It occurs in the central and northern parts of Sevier Valley, adjacent to areas of Sigurd gravelly sandy loam, but lower on the alluvial fans.

Skumpah loam, 0 to 2 percent slopes (SY).—This well-drained soil occurs on a very gently sloping large alluvial fan on the east side of Sevier Valley, northeast of the town of Redmond. The subsoil contains rather strong concentrations of salt and gypsum. The parent material was derived from sandstone, limestone, and shale. Sandstone and shale deposits in the vicinity contain considerable gypsum and other more soluble salts. Shadscale is practically the only native vegetation, but some Russian-thistle and other annual weeds have invaded parts of the area in recent years.

Profile description:

0 to 4 inches, very pale brown, soft, laminated and vesicular fine sandy loam or light loam; strongly calcareous; low in organic matter; free of gravel and stones.
4 to 6 inches, light-brown, slightly hard, granular silty clay loam; strongly calcareous.
6 to 10 inches, light-brown, slightly hard silty clay loam; strongly calcareous; distinct fine blocky structure that breaks down into smaller aggregates; slightly saline.
10 to 72 inches, very pale brown, slightly hard loam to fine sandy loam having a threadlike network of gypsum and some lime; free of gravel and stones; strongly saline.

Use and management.—This soil is used principally for range. A small acreage of irrigated cropland is used for alfalfa and small grains. Yields are low, and the supply of irrigation water is limited. When irrigated, the soil settles and forms sinkholes, and the resulting uneven surface is difficult to manage. Although the rainfall is very light, it might be possible to improve the carrying capacity of the rangeland by seeding drought-resistant grasses, such as crested wheatgrass.

Skumpah loam, eroded, 0 to 2 percent slopes (SA).—This soil occurs in the same general locality as other Skumpah soils. Apparently, floods have carried away practically all of the surface soil. Gullies are 1 to 2 feet deep and from 3 to 6 feet across. In places there are accumulations of wind-deposited material about 12 inches thick.

Skumpah loam, eroded, 2 to 5 percent slopes (SZ).—This soil occurs mainly southeast of the main body of Skumpah loam, 0 to 2 percent slopes, and extends along the narrow valley of an intermittent

stream. It resembles Skumpah loam, 0 to 2 percent slopes, except that it has stronger slopes and is moderately to severely eroded. The soil is naturally erosive, and the vegetation is sparse; consequently, erosion is active, especially during flash summer rainstorms. In some places this soil is badly gullied, and in others it is moderately sheet eroded. It is nonarable and of low value for grazing.

Skumpah silty clay loam, 0 to 2 percent slopes (SC).—This soil occurs on the lower parts of alluvial fans in the same general locality as Skumpah loam, 0 to 2 percent slopes, which it joins on the west side. The parent material was derived from the same source as that of Skumpah loam but may have contained a higher percentage of material derived from shale. Drainage is adequate at present but might become restricted under irrigation. The native vegetation is mainly greasewood, mixed with a little shadscale.

Profile description:

0 to 4 inches, pale-brown, soft, laminated silty clay loam; strongly calcareous; low in organic matter.
4 to 11 inches, very pale brown, hard, subangular blocky loam to silty clay loam; strongly calcareous; low in organic matter; moderately saline.
11 to 46 inches, very pale brown, hard, subangular blocky silty clay loam; strongly calcareous; considerable segregated gypsum; strongly saline.
46 to 72 inches, very pale brown stratified loam and clay loam; strongly saline; contains some segregated gypsum.

Use and management.—Most of this soil still has its native vegetation. It is used to a limited extent for grazing. It is probably less suitable than Skumpah loam for either cropland or range, because it contains more salt, especially near the surface, and the salt would be harder to remove because of the finer texture.

Skumpah silty clay loam, eroded, 0 to 2 percent slopes (SD).—This mapping unit is composed of areas of Skumpah silty clay loam, 0 to 2 percent slopes, that have been severely eroded and are crisscrossed by gullies 5 to 10 feet deep. It occurs 1 mile northeast of Redmond, immediately east of the Sevier River. It is used entirely for range. The vegetation consists mainly of a scrubby growth of greasewood.

Skumpah silty clay, 0 to 2 percent slopes (SB).—This soil is of little agricultural value. It occurs in association with Poganeab soils on a slightly undulating low terrace of the Sevier River. One area of this soil is about 1 mile east of Redmond, another about 2 miles farther north near the Sanpete-Sevier County line, and a third about 1½ miles southwest of Axtell. It was derived from mixed sedimentary alluvium in which reddish-brown shale predominated. Drainage is restricted. Consequently, the soil is strongly saline. The native vegetation is greasewood and samphire.

Profile description:

0 to 6 inches, light-brown strongly calcareous silty clay; soft crumb structure; low in organic matter.
6 to 44 inches, light reddish-brown, hard, prismatic, fine-textured clay; strongly calcareous.
44 to 52 inches, very pale brown mottled clay, stratified with thin layers of sand; massive; strongly calcareous.
52 to 72 inches, very pale brown, hard, massive clay; strongly calcareous.

The entire profile is free of gravel and stones.

Use of management.—This soil is mostly range, which is probably its best use. Its value for either range or crops is extremely low. It is doubtful that reclamation would be worthwhile.

Sloping to very steep land, undifferentiated (SE).—This land type is composed of mountains and hills that have a thin covering of soil ranging in texture from sandy loam to clay loam. It is closely associated with Rough stony land. Slopes are generally steeply rolling and range from 5 to more than 20 percent. Rock outcrops are common but not extensive. The underlying consolidated bedrock is made up of limestone, sandstone, shale, quartzite, conglomerate, and a number of other acid or basic igneous rocks. The vegetation is mostly juniper, pinyon, oakbrush, and sagebrush in Round Valley, and juniper, sagebrush, and shadscale in Sevier Valley. This land can be used only for range, and the carrying capacity is very low.

Stillman fine sandy loam, 2 to 5 percent slopes (SG).—This shallow soil over a gravelly porous substratum occurs on recent alluvial fans adjacent to intermittent stream channels. It is all in Sevier County and is most extensive on the west side of the Sevier Valley between Richfield and Aurora. The parent material was derived mainly from light-brown and pale reddish-brown sandstone, limestone, and shale. Surface drainage is slow to medium, and internal drainage is rapid. The native vegetation consists of shadscale, sagebrush, rabbitbrush, and some scattered bunchgrass.

Profile description:

0 to 7 inches, light reddish-brown granular fine sandy loam; moderately to strongly calcareous; soft; low in organic matter.
7 to 16 inches, light reddish-brown, weakly granular fine sandy loam; moderately to strongly calcareous; slightly hard when dry; very friable when moist.
16 to 72 inches, light reddish-brown sand and rounded gravel; moderately calcareous; loose and porous.

Use and management.—About 80 percent of this soil is irrigated cropland; the rest is range. Alfalfa, barley, and wheat are the principal crops. Water and fertilizer requirements are high. Only under good farm management can good yields be expected.

Stillman fine sandy loam, 0 to 2 percent slopes (SF).—This soil occupies smooth parts of the alluvial fans. It occurs in the same general localities as Stillman fine sandy loam, 2 to 5 percent slopes, and has the same profile characteristics. About two-thirds of this soil is cropland; the rest is range.

Stillman gravelly sandy loam, 2 to 5 percent slopes (SJ).—This soil occupies gently undulating alluvial fans on the west side of Sevier Valley between Elsinore and the Sanpete-Sevier County line. The parent material was derived mainly from light reddish-brown sandstone mixed with a little limestone and shale. Surface drainage is medium, and internal drainage is very rapid. The native vegetation is shadscale, rabbitbrush, and sagebrush.

Profile description:

0 to 8 inches, light reddish-brown, soft, fine granular, gravelly sandy loam containing a few scattered stones; moderately to strongly calcareous; low in organic matter.
8 to 72 inches, light reddish-brown, loose, single-grained, slightly loamy gravelly sand; moderately to strongly calcareous.

Use and management.—This soil is used mostly for range. Although it is poorly suited to crops, a smaller acreage is irrigated and used to grow alfalfa. Probably it could best be used for permanent pasture. Where irrigation water is available, good drought-resistant pastures could easily be established.

Stillman gravelly sandy loam, 0 to 2 percent slopes (SI).—This soil occupies smooth, nearly level parts of the alluvial fans. The profile is similar to that of Stillman gravelly sandy loam, 2 to 5 percent slopes, except that the gravelly sandy loam surface soil is about 15 inches thick in most places. This soil is used principally for crops.

Stillman stony sandy loam, 2 to 5 percent slopes (SL).—This soil occurs on recent alluvial fans adjacent to steep, rough, sandstone mountains, usually where the steep channels of intermittent streams have cut deeply into the mountains. All of it is in Sevier County, mainly on the west side of Sevier Valley between Aurora and Elsinore. It is similar to Stillman gravelly sandy loam, 2 to 5 percent slopes, except that it contains a large percentage of stones throughout the profile. Because of its extreme stoniness, this soil is nonarable. It can be used only for range. The carrying capacity is very low.

Stillman stony sandy loam, eroded, 2 to 5 percent slopes (SN).—This soil occurs in a gullied area about 1 mile northwest of Vermillion. It is near the mouth of a rugged canyon and is subject to occasional severe floods.

Stillman stony sandy loam, 5 to 10 percent slopes (SM).—Except for stronger slopes, this soil is similar to Stillman stony sandy loam, 2 to 5 percent slopes. The native vegetation is dominantly shadscale and sagebrush; some bunchgrass grows on the higher areas. The soil is used for spring and fall range. Its carrying capacity is low.

Stillman gravelly loamy sand, 2 to 5 percent slopes (SH).—This soil is similar to Stillman gravelly sandy loam, 2 to 5 percent slopes, except that the texture of the top layer is coarser. It occurs in the same general localities as Stillman gravelly sandy loam. Most of it is used for range.

Stillman stony loamy sand, 2 to 5 percent slopes (SK).—This soil resembles Stillman stony sandy loam but has a coarser surface texture. It is very porous and droughty. Shadscale and snakeweed are the most common native plants.

Taylorsville loam, 0 to 2 percent slopes (TA).—This deep soil has developed on low lake terraces, principally on the west side of lower Round Valley. One small body occurs in upper Round Valley, just north of Scipio Lake. It is similar to and is associated with Welby clay loam and Welby loam but has a fine-textured, slowly permeable substratum. The average annual precipitation is about 14 inches. Surface runoff and internal drainage are slow. The parent material was derived mainly from limestone, sandstone, shale, and quartzite. Sagebrush and rabbitbrush are the dominant native plants.

Profile description:

0 to 6 inches, light brownish-gray granular loam; strongly calcareous; slightly hard; moderate content of organic matter.

6 to 16 inches, light-gray loam; strongly calcareous; hard; weak blocky structure.

16 to 33 inches, very pale brown hard clay loam; high in lime carbonate; weakly lime cemented when dry; breaks to irregular fragments.
33 to 44 inches, very pale brown silt loam; strongly calcareous; hard and blocky; contains some lime nodules.
44 to 72 inches, very pale brown hard clay mottled with lime carbonate.

Use and management.—This soil is used for dry-farming, for general irrigated farming, and for range. Winter wheat or rye are the main dry-farmed crops; on irrigated land, alfalfa, barley, and spring wheat, are the principal crops. Crop yields are generally low because of a shortage of irrigation water.

Taylorsville loam, 2 to 8 percent slopes (TB).—This soil occurs in lower Round Valley. The steeper part is the narrow face of a lake terrace. The soil is generally similar to Taylorsville loam, 0 to 2 percent slopes, except that the surface soil is lighter colored and shallower over the finer textured lime carbonate zone. Consequently this soil is less productive than Taylorsville loam, 0 to 2 percent slopes. It is used mainly for dry-farming; a small acreage on the terrace face is range.

Taylorsville silty clay loam, 0 to 1 percent slopes (TC).—This soil is similar to Taylorsville loam, 0 to 2 percent slopes, except that the top layer is a silty clay loam instead of loam. It is associated with Taylorsville loam, 0 to 2 percent slopes. The soil is used for dry-farming. Included with this unit is an imperfectly drained area in the southern end of upper Round Valley that has been covered with a recent overwash of pale-brown to light yellowish-brown silty clay loam material. This area is used for pasture.

Welby fine sandy loam, 0 to 2 percent slopes (WB).—This soil occurs on a low terrace on the west side of lower Round Valley. It is similar to and is associated with the Taylorsville soils. The soil material was derived from a mixture of limestone, sandstone, shale, and quartzite. The average annual rainfall is about 14 inches. Surface runoff is slow, and internal drainage is medium. The native vegetation is mainly sagebrush and rabbitbrush.

Profile description:

0 to 4 inches, light brownish-gray, soft, granular fine sandy loam; strongly calcareous; organic-matter content is moderate.
4 to 12 inches, very pale brown loam; strongly calcareous; slightly hard; massive.
12 to 53 inches, white silty clay loam, high in lime carbonate; hard; granular.
53 to 72 inches, very pale brown fine sandy loam; strongly calcareous; slightly hard.

Textural stratification of the soil varies.

Use and management.—This soil is generally fertile and well suited to irrigation farming and dry-farming. Dry-farming is more extensively practiced. Yields are about the same as are obtained from the Calita soils.

Welby loam, 1 to 4 percent slopes (WC).—This soil is similar to Welby fine sandy loam except for its loam surface texture and slightly wider range of slopes. It is somewhat more widely distributed than Welby fine sandy loam; it occurs in several small bodies in upper and lower Round Valley. It is used for dry-farming, for irrigation farming, and for range. It is somewhat better than the fine sandy loam

for general irrigation farming, and probably for dry-farming as well, because it has better water-holding capacity.

Welby clay loam, 1 to 3 percent slopes (WA).—This soil occurs in Round Valley, usually adjacent to bodies of Welby loam but in somewhat lower positions. Surface drainage is slow to medium, depending on slope, and internal drainage is medium. The native vegetation is mainly a thick growth of rabbitbrush and sagebrush.

Profile description:

0 to 5 inches, light brownish-gray granular clay loam; strongly calcareous; slightly hard; organic-matter content is moderate.
5 to 16 inches, light brownish-gray clay loam; strongly calcareous; hard; subangular blocky structure.
16 to 23 inches, white silty clay loam, high in lime carbonate; hard; blocky.
23 to 35 inches, very pale brown silt loam, high in lime; hard; blocky.
35 to 38 inches, light-gray silty clay mottled with segregated lime.
38 to 48 inches, very pale brown silt loam; strongly calcareous; hard; fine blocky structure.
48 to 72 inches, very pale brown fine sandy loam; strongly calcareous; slightly hard; massive.

Included with this mapping unit are 55 acres in upper Round Valley that have a recent overwash of very pale-brown to light yellowish-brown clay loam. The overwash has been transported from steep land outside the surveyed area. It is from 4 to 12 inches thick. Dry-farmed winter wheat is grown in this area. Elsewhere, Welby clay loam is used for irrigated crops, dry-farmed crops, and for range. If properly managed, it is highly productive.

EXPECTABLE CROP YIELDS

Table 4 shows the average yields per acre that can be expected from the principal crops of the Area, when they are grown under adequate irrigation. It also shows average pasture yields, with and without irrigation. The figures in parentheses, based on information furnished by farmers, are average yields obtained under good management where the supply of irrigation water is adequate. The figures not in parentheses are estimates of yields that can be obtained by good management, under irrigation. These estimates were made because records of actual yields were not available.

The yield estimates are for nonsaline soils. Yields are somewhat less on slightly saline soils and appreciably less for moderately saline soils. Normally, the strongly saline soils are nonarable and support only the most salt-tolerant plants.

Crop yields on saline soils vary considerably, depending on soil texture, irrigation practices, and the crop grown. Keeping the soil wet reduces the toxic effect of the salt. Consequently, better yields can be obtained from a clayey soil than a sandy soil, because the clayey soil holds more moisture.

Plants have widely different tolerance for salt. Slightly and moderately saline soils, if kept well moistened, produce good pastures of strawberry clover, alsike clover, sweetclover, sourclover, redtop, perennial ryegrass, Reed canarygrass, and meadow fescue. Shadscale grows on moderately to strongly saline soil and on dry nonsaline soils. Saltgrass and alkali sacaton are important salt-tolerant grasses. Grasses, greasewood, and pickleweed grow on strongly saline soil.

TABLE 4.—*Long-term average acre yields to be expected from principal crops grown under good management and adequate irrigation on soils of the Richfield Area, Utah*

[Yields in parentheses based on information furnished by farmers; soil scientists derived other yields by comparing a given soil with a similar soil for which yield information was available; dashes indicate crop ordinarily is not grown on the soil or that the soil is not suited to crops]

Soil type	Alfalfa	Wheat	Barley	Sugar beets	Potatoes	Corn silage	Pasture	
							Irrigated	Range or dryland
	Tons	*Bu.*	*Bu.*	*Tons*	*Bu.*	*Tons*	*Cow-acre-days* [1]	*Cow-acre-days* [1]
Annabella gravelly sandy loam, 2 to 5 percent slopes	(2.5)	(30)	(40)		225		140	10
Annabella gravelly sandy loam, 0 to 2 percent slopes	2.5	30	40		225		150	11
Annabella gravelly sandy loam, 5 to 15 percent slopes							125	9
Annabella sandy loam, 0 to 2 percent slopes	2.5	30	40		225		140	10
Annabella stony sandy loam, 5 to 15 percent slopes								7
Annabella stony sandy loam, 2 to 5 percent slopes								7
Annabella stony sandy loam, eroded, 2 to 5 percent slopes								6
Annabella loam, 0 to 2 percent slopes	3.0	35	45	10	250	10	160	11
Annabella loam, 2 to 5 percent slopes	3.0	35	45	10	250	10	150	10
Arapien fine sandy loam, 2 to 5 percent slopes	3.0	35	45	10	250	12	200	13
Arapien fine sandy loam, 0 to 2 percent slopes	3.0	35	45	10	250	12	200	13
Arapien loam, 0 to 2 percent slopes	3.5	40	55	12	250	14	225	13
Arapien loam, 2 to 5 percent slopes	3.0	35	45	10	225	10	215	12
Arapien loam, 5 to 10 percent slopes							160	11
Arapien silty clay loam, 0 to 2 percent slopes	3.5	40	55	12	250	14	225	13
Arapien silty clay loam, 2 to 5 percent slopes	3.0	35	45	10	225	10	215	12
Ashley clay loam, 0 to 2 percent slopes	2.5	30	40		225	10	125	12
Ashley clay loam, imperfectly drained, 0 to 2 percent slopes							125	60

[1] Number of days that 1 acre will provide grazing for 1 cow without damaging the pasture stand.

TABLE 4.—*Long-term average acre yields to be expected from principal crops grown under good management and adequate irrigation on soils of the Richfield Area, Utah*—Continued

Soil type	Alfalfa	Wheat	Barley	Sugar beets	Potatoes	Corn silage	Pasture	
							Irrigated	Range or dryland
	Tons	*Bu.*	*Bu.*	*Tons*	*Bu.*	*Tons*	*Cow-acre-days* [1]	*Cow-acre-days* [1]
Ashley silty clay, very poorly drained, 0 to 2 percent slopes							125	60
Ashley soils, undifferentiated, poorly drained, 0 to 2 percent slopes							75	40
Badlands								1
Bertelson sandy loam, 2 to 8 percent slopes	(2.5)	(30)	(35)		(280)	(10)	150	10
Bertelson sandy loam, 0 to 2 percent slopes	2.5	30	35		250	10	160	11
Bertelson sandy loam, deep, 0 to 2 percent slopes	3.0	35	40	10	300	12	170	11
Bertelson gravelly sandy loam, 2 to 5 percent slopes	2.5	30	35		250	10	140	8
Bertelson gravelly sandy loam, 5 to 10 percent slopes							130	7
Bertelson stony sandy loam, 5 to 15 percent slopes								6
Billings silty clay, 0 to 3 percent slopes	3.0	45	60	12		15	200	12
Billings silty clay, imperfectly drained, 0 to 3 percent slopes	2.5	30	40	10		10	185	30
Billings silty clay, very poorly drained, 0 to 3 percent slopes								50
Calita loam, 2 to 5 percent slopes	4.0	45	75	15	300	16	250	18
Calita loam, 0 to 2 percent slopes	4.0	50	80	17	300	17	250	18
Calita silty clay loam, 2 to 5 percent slopes	4.0	45	75	15	250	16	250	18
Calita silty clay loam, 0 to 2 percent slopes	4.0	50	80	17	275	17	250	18
Calita fine sandy loam, overwash, 2 to 3 percent slopes	4.0	45	65	14	275	14	225	22
Calita loam, overwash, 2 to 5 percent slopes	4.0	45	65	14	275	14	260	22
Centerfield silty clay, 0 to 2 percent slopes	3.0	40	50	12		16	125	12
Centerfield clay loam, shallow, 0 to 2 percent slopes	2.5	30	40	10		10	85	10
Christianburg silty clay, 0 to 2 percent slopes	(3.0)	(40)	(60)	(14)		12	150	12
Christianburg silty clay, 2 to 5 percent slopes	3.0	35	55	12		10	50	10

Christianburg silty clay, imperfectly drained, 0 to 2 percent slopes	2.5	30	40	10		10	50	18
Christianburg clay, 0 to 1 percent slopes	2.5	30	40	10		10	80	8
Christianburg clay, imperfectly drained, 0 to 1 percent slopes	2.5	30	40	10		10	45	16
Denmark loam, 2 to 5 percent slopes	2.0	25	30		150	8	160	9
Denmark loam, 5 to 15 percent slopes							135	7
Denmark gravelly sandy loam, 2 to 5 percent slopes							125	7
Denmark gravelly sandy loam, 5 to 15 percent slopes								6
Denmark stony sandy loam, 5 to 20 percent slopes								7
Duggins silty clay loam, 0 to 1 percent slopes	4.0	45	75	14	250	16	220	15
Duggins silty clay, 0 to 1 percent slopes	3.5	40	70	12		14	200	10
Duggins silty clay, imperfectly drained, 0 to 1 percent slopes	3.0	35	60	10		12	175	35
Ebbs loam, 0 to 2 percent slopes	4.0	50	80	17	300	18	250	18
Ebbs loam, 2 to 5 percent slopes	4.0	45	75	15	300	16	240	16
Ebbs loam, eroded, 2 to 5 percent slopes								8
Ebbs silty clay loam, 0 to 2 percent slopes	4.0	50	80	17	250	18	250	18
Ebbs silty clay loam, 2 to 5 percent slopes	4.0	45	75	15	250	16	240	16
Genola loam, 0 to 2 percent slopes	4.0	50	80	15	300	18	225	14
Genola loam, 2 to 5 percent slopes	4.0	50	75	14	275	18	225	14
Genola loam, deep, over gravel, 2 to 5 percent slopes	3.5	40	70	12	275	10	200	12
Genola loam, deep, over gravel, 0 to 2 percent slopes	3.5	40	70	12	275	10	200	12
Genola silty clay loam, 0 to 2 percent slopes	(4.0)	50	80	(15)	300	18	225	14
Genola silty clay loam, 2 to 5 percent slopes	4.0	45	75	14	250	16	225	14
Genola silty clay loam, eroded, 2 to 5 percent slopes								7
Genola silty clay loam, imperfectly drained, 0 to 2 percent slopes	3.5	40	70	14	200	14	200	40
Genola silty clay loam, over Taylorsville soil material, 0 to 2 percent slopes	4.0	45	75	14	250	16	225	15
Genola silty clay loam, over Welby soil material, 0 to 1 percent slopes	4.0	45	75	14	250	16	225	15
Genola silty clay loam, over Welby soil material, imperfectly drained, 0 to 1 percent slopes	3.5	40	70	14	200	14	200	40
Genola silty clay loam, deep, over gravel, 2 to 5 percent slopes	3.5	40	70	12	250	10	200	12
Genola fine sandy loam, 0 to 2 percent slopes	4.0	45	70	12	300	15	215	12
Genola fine sandy loam, 2 to 5 percent slopes	3.5	40	65	12	300	14	210	11
Genola fine sandy loam, moderately deep and deep, over gravel, 2 to 5 percent slopes	3.5	40	70	12	275	10	175	12

[1] Number of days that 1 acre will provide grazing for 1 cow without damaging the pasture stand.

TABLE 4.—*Long-term average acre yields to be expected from principal crops grown under good management and adequate irrigation on soils of the Richfield Area, Utah*—Continued

Soil type	Alfalfa	Wheat	Barley	Sugar beets	Potatoes	Corn silage	Pasture	
							Irrigated	Range or dryland
	Tons	*Bu.*	*Bu.*	*Tons*	*Bu.*	*Tons*	*Cow-acre-days* [1]	*Cow-acre-days* [1]
Hiko Springs stony sandy loam, 5 to 10 percent slopes								7
Hiko Springs stony sandy loam, 10 to 20 percent slopes								6
Hiko Springs stony sandy loam, 2 to 5 percent slopes								7
Hiko Springs gravelly sandy loam, 2 to 10 percent slopes	2.0	25	30		150	8	125	8
Hoye gravelly sandy loam, 2 to 5 percent slopes	2.0	25	30		150	6	150	8
Hoye gravelly sandy loam, 0 to 2 percent slopes	2.0	25	30		150	8	160	9
Hoye gravelly sandy loam, 5 to 10 percent slopes							140	7
Hoye stony sandy loam, 5 to 10 percent slopes								7
Hoye stony sandy loam, 2 to 5 percent slopes								7
Hoye stony sandy loam, 10 to 20 percent slopes								6
Ivie stony sandy loam, 4 to 7 percent slopes								7
Ivie gravelly sandy loam, 2 to 5 percent slopes	2.5	30	40		200	10	100	9
Jura silty clay, 0 to 1 percent slopes	3.0	35	59	12		12	200	18
Jura silty clay, imperfectly drained, 0 to 1 percent slopes	3.0	30	45	12		10	150	25
Jura silty clay, very poorly drained, 0 to 1 percent slopes								60
Jura clay, 0 to 1 percent slopes	3.0	30	45	10		10	185	16
Jura clay, imperfectly drained, 0 to 1 percent slopes	3.0	30	45	10		10	140	20
Jura loam, overwash, 0 to 1 percent slopes							185	40
Lakeshore sediments								4
Manassa-Mellor loams, 2 to 5 percent slopes							40	8
Manassa-Mellor silt loams, 2 to 5 percent slopes							40	8
Mayfield loam, 2 to 5 percent slopes	3.0	35	60		250	12	200	9
Mayfield loam, 5 to 10 percent slopes							125	7
Mayfield loam, shallow, 5 to 10 percent slopes	2.5	30	40		225	10	160	8
Mayfield gravelly loam, 2 to 5 percent slopes							140	8

Mayfield gravelly loam, 5 to 10 percent slopes							120	7
Mayfield clay loam, 2 to 5 percent slopes	3.0	35	60		250	12	200	9
Mayfield clay loam, 0 to 2 percent slopes	3.0	30	55		225	10	175	8
Mayfield clay loam, eroded, 5 to 15 percent slopes								5
Mayfield gravelly clay loam, 2 to 5 percent slopes	2.5	25	40		200	10	140	8
Mayfield gravelly clay loam, eroded, 2 to 5 percent slopes								5
Mellor-Manassa clay loams, 0 to 3 percent slopes							40	8
Musinia sandy loam, 0 to 2 percent slopes	(4.0)	(50)	(65)	(15)	(300)	(15)	225	15
Musinia sandy loam, 2 to 5 percent slopes	4.0	50	65	14	275	14	225	15
Musinia sandy loam, deep, over gravel, 0 to 2 percent slopes	3.5	40	60	12	250	12	200	12
Musinia sandy loam, deep, over gravel, 2 to 5 percent slopes	3.5	40	60	12	250	12	200	12
Musinia sandy loam, imperfectly drained, 0 to 2 percent slopes	3.5	40	60	12	175	12	185	40
Musinia silty clay loam, 0 to 2 percent slopes	4.5	50	85	17	300	18	250	18
Musinia silty clay loam, imperfectly drained, 0 to 2 percent slopes	3.5	40	65	12	175	14	185	40
Musinia silty clay loam, moderately deep, over clay, 0 to 2 percent slopes	4.0	50	65	14	200	15	225	16
Musinia silty clay loam, deep, over gravel, 0. to 2 percent slopes	3.5	40	60	12	250	12	225	16
Naples silty clay loam, 0 to 2 percent slopes	(4.5)	(55)	(94)	(18)	300	(20)	250	13
Naples silty clay loam, 2 to 5 percent slopes	4.5	55	80	16	275	18	240	12
Naples silty clay loam, imperfectly drained, 0 to 2 percent slopes	3.5	40	65	12	175	14	200	30
Naples loam, 0 to 2 percent slopes	4.5	50	85	18	300	18	250	13
Naples loam, 2 to 5 percent slopes	4.5	50	80	17	275	16	240	12
Naples fine sandy loam, deep, over gravel, 0 to 2 percent slopes	3.5	40	55	10	250	14	200	10
Naples fine sandy loam, deep, over gravel, 2 to 5 percent slopes	3.5	40	55	10	250	14	200	9
Navajo silty clay, 0 to 2 percent slopes	4.0	50	75	14		14	200	16
Navajo silty clay, imperfectly drained, 0 to 1 percent slopes	3.5	45	65	14		12	75	20
Navajo silty clay, very poorly drained, 0 to 1 percent slopes								40
Navajo silty clay, moderately deep, over Poganeab soil material, imperfectly drained, 0 to 1 percent slopes	2.5	30	40	10		10	75	20

[1] Number of days that 1 acre will provide grazing for 1 cow without damaging the pasture stand.

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TABLE 4.—*Long-term average acre yields to be expected from principal crops grown under good management and adequate irrigation on soils of the Richfield Area, Utah*—Continued

Soil type	Alfalfa	Wheat	Barley	Sugar beets	Potatoes	Corn silage	Pasture	
							Irrigated	Range or dryland
	Tons	*Bu.*	*Bu.*	*Tons*	*Bu.*	*Tons*	*Cow-acre-days* [1]	*Cow-acre-days* [1]
Pavant stony sandy loam, 5 to 10 percent slopes								9
Pavant stony sandy loam, 10 to 20 percent slopes								8
Pavant gravelly sandy loam, 5 to 10 percent slopes							150	10
Pavant gravelly sandy loam, 2 to 5 percent slopes							160	10
Pavant loam, 3 to 8 percent slopes	2.0	25	30		150	8	160	10
Pharo gravelly sandy loam, 2 to 5 percent slopes	2.0	20	35			7	150	10
Pharo gravelly sandy loam, 5 to 10 percent slopes	2.0	20	25			7	150	10
Pharo gravelly sandy loam, eroded, 5 to 10 percent slopes								6
Pharo stony sandy loam, 5 to 10 percent slopes								9
Pharo stony sandy loam, 10 to 20 percent slopes								8
Pharo loam, 2 to 5 percent slopes	2.0	25	30		150	8	160	10
Pharo loam, 5 to 10 percent slopes								
Poganeab silty clay, moderately well drained, 0 to 2 percent slopes	3.5	35	60	14		12	170	15
Poganeab silty clay, poorly drained, 0 to 2 percent slopes		25	45	12		10	120	40
Poganeab silty clay, very poorly drained, 0 to 1 percent slopes								60
Poganeab clay loam, moderately well drained, 0 to 2 percent slopes	3.5	35	60	15	250	12	200	15
Poganeab clay loam, poorly drained, 0 to 2 percent slopes	3.0	30	50	12	200	10	160	40
Poganeab clay loam, very poorly drained, 0 to 2 percent slopes								60
Poganeab clay, poorly drained, 0 to 1 percent slopes							100	30
Poganeab soils, undifferentiated, poorly drained, 0 to 1 percent slopes							120	40

Poganeab soils, undifferentiated, moderately well drained, 0 to 2 percent slopes							160	20
Ralston loam, 0 to 2 percent slopes	(2.5)	(35)	(35)		(200)	10	150	10
Ralston gravelly loam, 0 to 2 percent slopes	2.0	30	35		175	12	100	9
Ravola clay loam, 0 to 2 percent slopes	(4.0)	(50)	(60)	15	300	15	250	13
Ravola clay loam, 2 to 5 percent slopes	4.0	50	60	15	275	14	240	12
Ravola clay loam, eroded, 2 to 5 percent slopes								6
Ravola clay loam, eroded, 5 to 10 percent slopes								5
Ravola clay loam, 5 to 10 percent slopes							175	11
Ravola clay loam, silted, 0 to 2 percent slopes	4.5	55	90	18	300	20	250	13
Ravola clay loam, silted, 2 to 5 percent slopes	4.0	50	80	16	275	18	240	12
Ravola silty clay, silted, 0 to 2 percent slopes	4.5	50	80	16		18	225	14
Redfield silty clay loam, 0 to 2 percent slopes	(4.5)	(50)	(85)	(17)	300	18	250	13
Redfield silty clay loam, imperfectly drained, 0 to 2 percent slopes	3.5	40	65	12	175	14	200	30
Redfield loam, 0 to 2 percent slopes	4.5	50	85	18	300	18	250	13
Redfield loam, 2 to 5 percent slopes	4.0	45	65	14	250	14	225	12
Redfield fine sandy loam, 0 to 3 percent slopes	4.5	50	70	15	300	16	225	12
Riverwash								1
Rough gullied land								3
Rough stony land								1
Sanpete loam, 2 to 5 percent slopes	2.5	30	35		150	8	160	9
Sanpete loam, 5 to 10 percent slopes							125	7
Sanpete loam, deep, 0 to 3 percent slopes	3.0	35	45		250	10	175	9
Sanpete gravelly sandy loam, 2 to 5 percent slopes	2.0	24	30		150	8	125	7
Sanpete gravelly sandy loam, 5 to 10 percent slopes	2.0	25	30		150	8	115	7
Sanpete gravelly sandy loam, 10 to 20 percent slopes								5
Sanpete stony sandy loam, 5 to 10 percent slopes								7
Sanpete stony sandy loam, 2 to 5 percent slopes								7
Sanpete stony sandy loam, 10 to 40 percent slopes								7
Sanpete stony sandy loam, eroded, 10 to 40 percent slopes								6
Sanpete clay loam, 2 to 5 percent slopes	2.5	30	35		150	8	160	9
Sigurd gravelly sandy loam, 2 to 5 percent slopes	2.0	25	30		150	8	140	8
Sigurd gravelly sandy loam, 0 to 2 percent slopes	2.0	25	30		150	8	150	8
Sigurd gravelly sandy loam, eroded, 2 to 5 percent slopes								5
Sigurd gravelly sandy loam, 5 to 10 percent slopes							125	7
Sigurd stony sandy loam, 2 to 5 percent slopes								7
Sigurd stony sandy loam, eroded, 3 to 10 percent slopes								5
Sigurd stony sandy loam, overwash, 2 to 10 percent slopes								6
Sigurd stony sandy loam, 5 to 10 percent slopes								7

[1] Number of days that 1 acre will provide grazing for 1 cow without damaging the pasture stand.

TABLE 4.—*Long-term average acre yields to be expected from principal crops grown under good management and adequate irrigation on soils of the Richfield Area, Utah*—Continued

Soil type	Alfalfa	Wheat	Barley	Sugar beets	Potatoes	Corn silage	Pasture	
							Irrigated	Range or dryland
	Tons	*Bu.*	*Bu.*	*Tons*	*Bu.*	*Tons*	*Cow-acre-days* [1]	*Cow-acre-days* [1]
Sigurd loam, 2 to 5 percent slopes	2.5	30	35		175	8	150	8
Sigurd loam, 5 to 10 percent slopes	2.0	25	30		150	8	125	7
Sigurd fine sandy loam, overwash, 2 to 5 percent slopes	2.5	30	35		175	8	150	8
Sigurd clay loam, 2 to 5 percent slopes	2.5	30	35		175	8	150	8
Sigurd gravelly clay loam, 3 to 10 percent slopes	2.0	25	30		150	8	125	7
Skumpah loam, 0 to 2 percent slopes	3.0	35	45	10	250	10	200	9
Skumpah loam, eroded, 0 to 2 percent slopes								5
Skumpah loam, eroded, 2 to 5 percent slopes							150	8
Skumpah silty clay loam, 0 to 2 percent slopes	2.5	30	35	10	150	10	175	8
Skumpah silty clay loam, eroded, 0 to 2 percent slopes								5
Skumpah silty clay, 0 to 2 percent slopes								4
Sloping to very steep land, undifferentiated								5
Stillman fine sandy loam, 2 to 5 percent slopes	2.5	30	35		200	8	150	8
Stillman fine sandy loam, 0 to 2 percent slopes	3.0	35	40		225	10	160	9
Stillman gravelly sandy loam, 2 to 5 percent slopes							140	8
Stillman gravelly sandy loam, 0 to 2 percent slopes	2.0	25	30		150	8	145	8
Stillman stony sandy loam, 2 to 5 percent slopes								6
Stillman stony sandy loam, eroded, 2 to 5 percent slopes								4
Stillman stony sandy loam, 5 to 10 percent slopes								5
Stillman gravelly loamy sand, 2 to 5 percent slopes							100	5
Stillman stony loamy sand, 2 to 5 percent slopes								5
Taylorsville loam, 0 to 2 percent slopes	4.0	45	65	14	250	16	250	18
Taylorsville loam, 2 to 8 percent slopes	3.5	40	55	12	225	14	240	16
Taylorsville silty clay loam, 0 to 1 percent slopes	4.0	45	65	14	250	16	225	15
Welby fine sandy loam, 0 to 2 percent slopes	4.0	45	65	14	275	14	200	18
Welby loam, 1 to 4 percent slopes	4.0	45	65	14	275	14	250	18
Welby clay loam, 1 to 3 percent slopes	4.0	45	65	16	250	16	250	18

[1] Number of days that 1 acre will provide grazing for 1 cow without damaging the pasture stand.

SALT AND ALKALI

The Richfield Area has little rainfall and a high rate of evaporation; consequently, certain soils contain salt or alkali, or both, in amounts that significantly affect their use. Some of these soils are in low-lying places where stream waters have evaporated and left deposits of salt and alkali. Others were derived from rocks that contained appreciable quantities of soluble salts or alkali. In places poor drainage is a contributing cause. If saline or alkaline ground water rises too near the surface, it evaporates and leaves deposits of salt and engenders the formation of alkali within the root zone of plants.

The boundaries of areas affected by salt or alkali, or both, are normally shown on the map by black dotted lines. If, however, a salt or alkali boundary coincides with a soil boundary, only the soil boundary is shown. Four grades of salt or alkali concentration have been defined, and three of these are shown on the map by special letter symbols in blue.

1. No blue symbol: Salt concentration less than 0.2 percent, and alkali concentration not detrimental to crops.
2. Letter *S*, in blue: Salt concentration between 0.2 and 0.35 percent, or alkali concentration slightly to moderately detrimental to crops, or both. Concentrations in this case affect salt-tolerant crops slightly, and general farm crops slightly to moderately.
3. Letter *M*, is blue: Salt concentration 0.36 to 0.65 percent, or alkali in concentration seriously detrimental to crops, or both. Farm crops generally stunted and yellow.
4. Letter *A*, in blue: Salt concentration more than 0.65 percent, or alkali concentration that prohibits growth of most farm crops, or both. Only grassewood, saltgrass, or other salt- or alkali-tolerant plants will grow.

The grades of concentration are based on field observation of the type and quality of native vegetation, the visible condition of field crops, the color and structure of the soil, and the presence of salt crusts, and on determinations of salt content by use of the electrolytic bridge.

The Mellor and Manassa soils generally are excessively alkaline. The Poganeab soils are affected by alkali to some extent.

The soils generally salt- and alkali-affected are the Poganeab, Skumpah, Manassa, and Mellor. The Navajo, Redfield, Musinia, and Naples soils have excess salt in spots. The Billings, Christianburg, Ravola, Mayfield, and Genola soils have developed from rocks that contained salt.

Because the soils differ, the results of reclamation efforts are not uniform. No attempt has been made to reclaim the areas where Mellor and Manassa loams occur in complexes, but soils in the Sanpete Valley that appear to be similar to Manassa clay loam have been reclaimed by regular irrigation and tillage. Poganeab soils, on the flood plain of the Sevier River, have a fluctuating water table, and salt tends to accumulate on and near the surface. Leveling and controlled flooding would probably reduce the salt content of these soils substantially.

Irrigation water readily removes salts from the Ravola, Mayfield, and Genola soils; it removes salts somewhat more slowly from the Billings and Christianburg soils, and from Skumpah silty clay loam, and very slowly from Skumpah silty clay. The Redfield soils, especially the silty clay loams, still have numerous small salty spots after

a long period of irrigation. It is doubtful that lasting improvement will result from irrigation, however, unless there is good soil drainage to remove the excess water and salt from the root zone. This is especially true for the soils affected by a fluctuating water table.

IRRIGATION

Agriculture in the Richfield Area depends almost entirely on irrigation. Dry-farming is feasible only in a very small part of the Area.

WATER SOURCES

In Sevier Valley, the Sevier River is the most important source of irrigation water. In the vicinity of Gunnison, the San Pitch River and its tributaries, Six Mile Creek, Nine Mile Creek, and Twelve Mile Creek, are important sources. Other streams of local importance are Willow Creek, Salina Creek, and Lost Creek. Large springs furnish some irrigation water at Fayette, Glenwood, and Redmond. At the base of an igneous mountain west of Glenwood, springs feed the Cove River. A few intermittent streams on the west side of Sevier Valley furnish early water from melting snows. Pump wells and flowing wells provide small amounts of irrigation water. Except in extremely dry years, the water supply is sufficient to provide about 3 acre-feet of water for each acre irrigated.

IRRIGATION FACILITIES

The first small irrigation canals were built in the 1860's. Most of the important canals were constructed between 1870 and 1880, and a few larger ones, including the South Bend and Sevier Valley canals, between 1880 and 1900.[3] Otter Creek Reservoir in Piute County was built between 1900 and 1905 to store water for irrigation companies in Sevier County. Between 1908 and 1914, the Piute Reservoir was built on the Sevier River about 10 miles south of Marysvale in Piute County. A high-line canal extending from Sevier to a point approximately as far north as Fayette was built along the west side of the Sevier Valley.

At the time of the survey, 32 companies operated canals providing water for approximately 73,000 acres in Sevier Valley. Only one company was operating in Round Valley, where a total of 1,500 acres was irrigated. Storage was provided by 8 reservoirs having a capacity of more than 1,000 acre-feet each, and by a number of small reservoirs. The reservoirs listed in table 5 stored water for late-season irrigation of approximately 70 percent of the irrigated land.[4]

IRRIGATION METHODS

The furrow method of irrigation is used almost entirely. Furrows 3 to 6 inches deep are cut about 2 to 2½ feet apart. Usually they run directly down the slope instead of following the contour. The spring season is usually dry and windy, so irrigation begins as soon as the

[3] GARDNER, F. D., AND JENSEN, C. A. SOIL SURVEY IN THE SEVIER VALLEY, UTAH. Division of Soils, U. S. Dept. Agr. 42 pp., illus. 1900.

[4] ISRAELSON, O. W., MAUGHN, J. H., AND SOUTH, G. P. IRRIGATION COMPANIES IN UTAH, THEIR ACTIVITIES AND NEEDS. Utah Agr. Exp. Sta. Bul. 322. 62 pp., illus. 1945.

TABLE 5.—*Reservoirs that provided supplemental irrigation water for a large part of the Richfield Area in 1944*

Reservoir	Capacity	Stream	County in which reservoir is located	County in which irrigated land is located
	Acre-feet			
Gunnison	20, 264	San Pitch River	Sanpete	Sanpete.
Highland or Nine Mile.	3, 500	Nine Mile Creek	Sanpete	Sanpete.
Otter Creek	52, 600	Otter Creek	Piute	Sevier.
Piute	84, 800	Sevier River	Piute	Sevier, Sanpete, Millard.
Rockford	2, 115	Sevier River	Sevier	Sevier.
Scipio Lake	8, 872	Round Valley Creek.	Millard	Millard.
Three Lakes	1, 000	Three Lakes	Sevier	Sevier.
Willow Creek	1, 050	Willow Creek	Sevier	Sanpete.

land is seeded and, especially for small-seeded crops, must be repeated often during the early part of the growing season. Water is delivered to the land under either the "demand system" or the "rotation system." Under the demand system, water is supplied as needed. This system can be used where there are water-storage facilities; it is advantageous because the frequency of irrigation can be adjusted to the needs of the crops and to the soil. Under the rotation system, water is allocated to each farm for definite lengths of time at regular intervals.

SOIL FORMATION AND CLASSIFICATION

Soils in the Richfield Area have been formed from a variety of igneous and sedimentary rocks, in a desert climate, in an area of smooth to undulating relief.

Most of the Area has a desert climate. The annual rainfall is about 8 inches. The vegetation consists of desert shrubs—mainly shadscale with some sagebrush, rabbitbrush, and greasewood. Because the plant growth is sparse, the soils contain little organic matter. Higher elevation somewhat modifies climate and vegetation in part of the Area. The eastern border of the Pavant Plateau has a semiarid climate. The annual precipitation in that locality is about 14 inches, and the native vegetation is sagebrush, bunchgrass, and some oakbrush and juniper.

In the Sevier Valley south of Richfield the parent material was derived from igneous rocks, principally dark-gray diorites, basalts, and trachytes on the Sevier Plateau, and from black rhyolite on the Pavant Plateau. A series of low ridges in the southern end of the Area are mainly volcanic tuff. The soils from all these igneous rock materials are pale brown to very pale brown.

North of Richfield, the soil materials were derived from sedimentary rocks. From Richfield north to Aurora, the soils have formed from material derived from stratified, calcareous sandstones, limestones,

and shales of the Pavant Mountains, which are part of the Pavant Plateau. These rocks are pink, reddish brown, cream colored, and almost pure white. North of Aurora the rocks of the Pavant Plateau are quartzites, limestones, and sandstones less brightly colored than those between Richfield and Aurora.

The Canyon Range, north of the Pavant Plateau, consists almost entirely of Carboniferous limestone and quartzite overlain by conglomerate.

The Wasatch Plateau, on the east side of the Area, consists largely of upper Cretaceous and early Tertiary strata of gray and cream-colored limestone, calcareous sandstone, and shaly limestone.

Stretching from Salina to Gunnison on the eastern side of Sevier Valley is a narrow belt where rocks of Jurassic age have thrust up through the late Tertiary rocks and formed a chain of foothills and badlands. On the west side of this upthrust the Tertiary rocks have been tilted to a steep angle. The Jurassic rocks are largely light-gray or brown soft shales that contain much gypsum and rock salt. Because of the upthrust, there is a complicated pattern of physiography and soils.

The Gunnison Plateau and Valley Mountains in the northern part of the Area are a mixture of limestone, sandstone, shale, quartzite, and conglomerate.

CLASSIFICATION OF SOILS

In table 6 the soil series of the Richfield Area are classified by orders and great soil groups, and the parent rock, relief, and drainage are given for each. As the table shows, one series is in the zonal order, 13 in the intrazonal, and 20 in the azonal.

ZONAL SOILS

Zonal soils reflect the influence of climate and vegetation on soil formation. They have formed where the parent material has lain in place long enough to permit soil-forming processes to operate, and where the relief is gently sloping or undulating but not steep enough to permit rapid erosion. The only soil series classified as zonal in the Area is the Hoye, a member of the Sierozem great soil group.

Sierozem soils have been defined as follows: "A zonal group of soils having a brownish-gray surface horizon that grades through lighter colored material into a layer of carbonate accumulation and frequently into a hardpan layer, developed under mixed shrub vegetation in a temperate to cool arid climate." [5]

Hoye soils have distinct textural B horizons and distinct horizons of carbonate accumulation. They are not so high in free calcium carbonate as many of the other soils of the Area, probably because their parent material is lower in calcium carbonate.

Following is a description of a typical profile of Hoye gravelly sandy loam:

A_1 0 to 4 inches, pale-brown (10YR 6/3, dry) to dark grayish-brown (10YR 4/2, moist) gravelly sandy loam; moderate fine granular structure; slightly hard when dry and friable when moist; organic-matter content about 1 percent; noncalcareous; pH about 7.2.

[5] U. S. Dept. Agr. YEARBOOK 1938: 1,232 pp. illus. 1938.

B_{21} 4 to 10 inches, brown (10YR 5/3, dry) to dark-brown (10YR 4/3, moist) gravelly loam; moderate fine granular structure; slightly hard when dry but friable when moist; about 0.8 percent organic matter; noncalcareous; pH 7.3.

B_{22} 10 to 16 inches, pale-brown (10YR 6/3, dry) to brown (10YR 5/3, moist) gravelly loam containing slightly more clay than the B_{21} horizon; weak fine granular structure; slightly hard or hard when dry but friable when moist; about 0.5 percent organic matter; weakly calcareous; pH about 8.2.

C_{ca} 16 to 25 inches, pink (7.5YR 8/4, dry; 7/4, moist) gravelly loam or gravelly sandy loam; massive; hard when dry but friable when moist; about 0.2 percent organic matter; strongly calcareous; weakly lime cemented in places; pH 8.4 (1:5 dilution).

C 25 to 60 inches, pale-brown (10YR 6/13, dry) to brown (10YR 5/3, moist) gravelly loamy fine sand; loose or slightly coherent; no measurable organic matter; moderately to weakly calcareous; pH 8.2.

INTRAZONAL SOILS

Intrazonal soils are those that possess some, but not all, of the significant characteristics of zonal soils because relief, parent material or some other genetic factor has reduced the effectiveness of climate and vegetation in modifying the parent material. Two intrazonal great soil groups are represented in this Area, Calcisols and Solonetz soils.

Calcisols have A_1–C_{ca}–C–D or D_r horizon sequence; usually all horizons are calcareous.[6] Depending upon drainage, climatic conditions and vegetation, the A_1 may be dark and high in organic matter or light-colored and low in organic matter. Some Calcisols are high in exchangeable sodium in one or more horizons, but they lack the textural B horizon of solonetzic soils. Eleven soil series in the Richfield Area have been classified as Calcisols. A typical series is the Calita. Calita soils occur on alluvial fans in the upper part of Round Valley and have developed in alluvium derived from quartzite, sandstone and limestone.

The following is a description of a representative profile of Calita silty clay loam:

A_{11} 0 to 7 inches, brown (7.5YR 5/4, dry) to dark-brown (6.5 YR 3/4, moist) silty clay loam; strong medium to fine granular structure; slightly hard when dry but friable when moist; moderately high in organic matter (about 2.8 percent); noncalcareous or weakly calcareous; pH 7.5 to 8.0 (1:5 dilution).

A_{12} 7 to 18 inches, brown (7.5YR 5/2, dry) to dark-brown (7.5YR 4/2, moist) silty clay loam; moderate medium granular structure; hard when dry but friable when moist; about 1.2 percent organic matter; weakly to moderately calcareous; has a few small flecks of gray and white calcium carbonate; pH about 8.0 (1:5 dilution).

C_{ca} 18 to 32 inches, pinkish-white (7.5YR 8/2, dry) to pinkish-gray (7.5YR 7/2, moist) marly clay loam; massive; slightly hard when dry but friable when moist; no measureable organic matter; contains about 25 percent calcium carbonate; pH 8.6 to 8.9 (1:5 dilution).

C 32 to 60 inches, very pale brown (10YR 8/3, dry; 7/3, moist) loam or clay loam; massive; slightly hard when dry but friable when moist; no measurable organic matter; strongly calcareous; contains 8 to 10 percent of calcium carbonate; pH about 8.6 (1:5 dilution).

ARAPIEN soils have remarkably thick horizons of carbonate accumulation. It is believed that the thick carbonate horizons have developed

[6] HARPER, W. G. MORPHOLOGY AND GENESIS OF CALCISOLS. Proc. Soil Sci. Soc. Amer. 21: 420–424, illus. 1957.

TABLE 6.—*Soil series of the Richfield Area, Utah, classified by order and great soil group, and the parent rock, relief, and drainage of each*

Great soil group and series	Parent rock	Relief	Drainage
ZONAL SOILS			
Sierozem:			
Hoye	Mixed igneous	Nearly level to moderately steep	Good.
INTRAZONAL SOILS			
Calcisols:			
Arapien	Mixed sedimentary	Nearly level to gently sloping	Good.
Calita	Chiefly mixed sedimentary	Nearly level to gently sloping	Good.
Centerfield	Mixed sedimentary	Nearly level	Good to somewhat excessive.
Denmark	Chiefly mixed sedimentary	Gently sloping to moderately steep	Good.
Hiko Springs	Mixed igneous	Gently sloping to moderately steep	Good.
Pavant	Chiefly mixed sedimentary	Gently sloping to moderately steep	Good.
Pharo	Chiefly mixed sedimentary	Gently sloping to moderately steep	Somewhat excessive.
Ralston	Mixed igneous and sedimentary	Nearly level	Somewhat excessive.
Sanpete	Chiefly mixed sedimentary	Nearly level to steep	Somewhat excessive.
Taylorsville	Chiefly mixed sedimentary	Nearly level to gently sloping	Moderately good.
Welby	Chiefly mixed sedimentary	Nearly level to gently sloping	Good.
Solonetz:			
Mellor	Mixed sedimentary	Nearly level to gently sloping	Good.
Skumpah	Mixed sedimentary	Nearly level to gently sloping	Good.

Alluvial soils:			
Annabella	Mixed igneous	Nearly level to sloping	Somewhat excessive.
Ashley	Mixed sedimentary	Nearly level	Somewhat excessive to very poor.
Bertelson	Volcanic siliceous tuff	Nearly level to sloping	Good.
Billings	Chiefly mixed sedimentary	Nearly level	Good to very poor.
Christianburg	Mixed sedimentary	Nearly level to gently sloping	Moderately good to imperfect.
Duggins	Mixed sedimentary	Nearly level	Moderately good to imperfect.
Ebbs	Chiefly mixed sedimentary	Nearly level to gently sloping	Good.
Genola	Chiefly mixed sedimentary	Nearly level to gently sloping	Good to imperfect.
Ivie	Chiefly mixed sedimentary	Nearly level to gently sloping	Somewhat excessive.
Jura	Mixed igneous and sedimentary	Nearly level	Moderately good to very poor.
Manassa	Mixed sedimentary	Nearly level to gently sloping	Imperfect.
Mayfield	Local shales and sandstone	Nearly level to sloping	Good.
Musinia	Mixed igneous	Nearly level to gently sloping	Good to imperfect.
Naples	Chiefly mixed sedimentary	Nearly level to gently sloping	Good to imperfect.
Navajo	Chiefly mixed sedimentary	Nearly level	Moderately good to imperfect.
Poganeab	Mixed igneous and sedimentary	Nearly level	Moderately good to very poor.
Ravola	Mixed sedimentary	Nearly level to sloping	Good.
Redfield	Mixed sedimentary	Nearly level to gently sloping	Good to imperfect.
Sigurd	Chiefly mixed sedimentary	Nearly level to sloping	Somewhat excessive.
Stillman	Mixed sedimentary	Nearly level to sloping	Somewhat excessive.

through the action of laterally moving seepage water that carries large amounts of calcium bicarbonate.

SANPETE AND CENTERFIELD soils occur in the drier parts of the Area, where the annual rainfall averages only about 8 inches. They resemble some of the other Calcisols, but their A horizons are low in organic matter and their carbonate horizons are relatively close to the surface.

DENMARK, HIKO SPRINGS AND PAVANT soils all have strongly developed C_{ca} horizons. In the Denmark and Pavant the C_{ca} is a massive, lime-cemented hardpan. The C_{ca} horizon of the Hiko Springs is prominent but only weakly cemented.

PIIARO soils have moderately developed C_{ca} horizons, usually at depths of from 20 to 30 inches, in a gravelly sandy loam substratum.

RALSTON, TAYLORSVILLE AND WELBY soils have distinct C_{ca} horizons that are less strongly developed than those of the other Calcisols in the Area. Ralston soils develop on old stream terraces along the Sevier River; they are underlain by strata of cobbly and gravelly alluvium. Taylorsville and Welby soils develop in lake-laid sediments high in calcium carbonate.

Solonetz soils have been defined as follows: "An intrazonal group of soils having a variable surface horizon of friable soil underlain by dark hard soil, ordinarily with columnar structure; usually highly alkaline; developed under grass or shrub vegetation, mostly in a subhumid or semiarid climate." [7]

MELLOR AND SKUMPAH soils have been classified as Solonetz soils. Both have formed in alluvium from a mixture of sedimentary rocks, on nearly level to gently sloping alluvial fans. Mellor soils have a distinct A_2 horizon, whereas the Skumpah have little or no A_2. Also, the parent material of Skumpah soils is high in gypsum but that of the Mellor ordinarily is not.

Following is a description of a representative profile of Mellor loam:

A_{v-1} 0 to 2 inches, very pale brown (10YR 6.5/3, dry) to brown (10YR 5.5/3, moist) loam; moderate thin platy structure; vesicular; soft when dry and very friable when moist; contains about 0.8 percent organic matter; pH about 8.3 (1:5 dilution).

A_{v-2} 2 to 6 inches, loam of about the same color as the subhorizon above; weak medium to fine granular structure; less vesicular than the subhorizon above.

A_2 6 to 6¼ inches, white (10YR 8/2, dry) to very pale brown (10YR 7/3, moist) loam; massive; soft when dry and friable when moist; very low in organic matter; weakly calcareous; pH 8.5 (1:5 dilution).

B_2 6¼ to 12 inches, light-brown (7.5YR 6/4, dry) to brown (7.5YR 5/4, moist) silty clay loam; strong medium columnar structure, breaking to strong medium blocky; hard when dry and firm to friable when moist; faces of structural units have glaze or varnish of colloidal material; less than 0.5 percent organic matter; strongly calcareous; pH 9.3 to 10.0 (1:5 dilution).

B_{3ca} 12 to 20 inches, pinkish-white (7.5YR 8/2, dry) to pink (7.5YR 7/4, moist) silty clay loam; includes lower part of the columns and part of layer where columns merge with weak coarse blocky aggregates; many white flecks for about 1 or 2 inches, and below this the finely divided lime is well disseminated; horizon is hard when dry and firm when moist; practically no organic matter; pH 9.6 or higher (1:5 dilution); very strongly calcareous.

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[7] See footnote 6, p. 89.

C_{ca} 20 to 36 inches, massive loam that is similar to the B_{2ca} in color and lime content; slightly hard when dry but friable when moist.

C 36 to 60 inches, very pale brown (10 YR 8/3, dry) to pale-brown (10 YR 6/3, moist) loam; massive; soft when dry and very friable when moist; essentially no organic matter; strongly calcareous; pH, on dilution, usually 9.6 or higher, but in some places, where gypsum is present, the pH may be as low as 8.0

AZONAL SOILS

Azonal soils are pedogenically young, that is, they do not have well-developed profile characteristics. The lack of development may be attributed to youthfulness of the material in which they are forming or to conditions of parent material or relief that prevent the development of normal soil profile characteristics.

In the Richfield Area the azonal order is represented by one great soil group, Alluvial soils. Alluvial soils are forming in recently deposited, water-transported materials on alluvial fans, terraces, and floodplains. Twenty of the soil series of the Area have been classified as Alluvial soils. No profile descriptions are given in this section, but some important characteristics of the different series have been listed in table 6. It should be remembered that Alluvial soils usually have an A_1–C horizon sequence; that they lack a textural B horizon, although different layers may vary in texture because of stratification; that they lack distinct horizons of calcium carbonate accumulation; that excess sodium may occur in any part of the profile.

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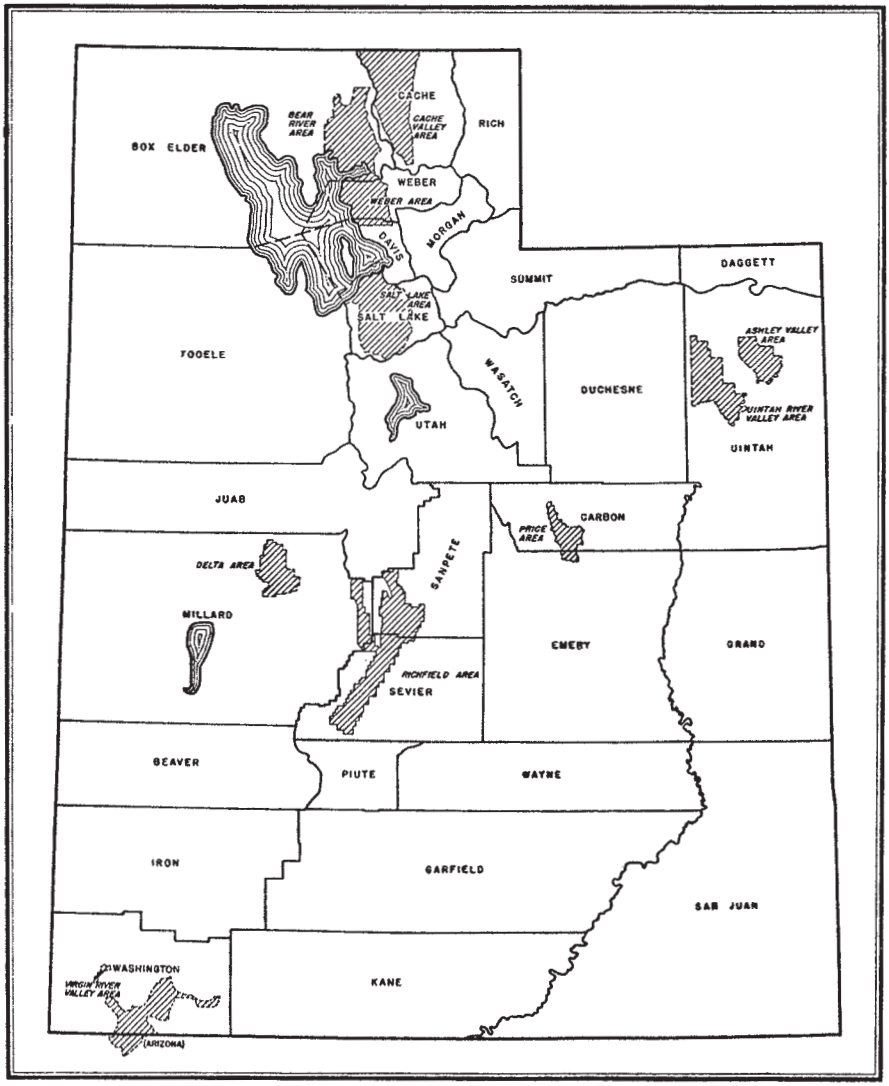

Areas surveyed in Utah shown by shading.

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