SOIL SURVEY OF

Diamond Valley Area, Nevada

Parts of Elko, Eureka, and White Pine Counties

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

This is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and agencies of the States, usually the Agricultural Experiment Stations. In some surveys, other Federal and local agencies also contribute. The Soil Conservation Service has leadership for the Federal part of the National Cooperative Soil Survey. In line with Department of Agriculture policies, benefits of this program are available to all who need the information, regardless of race, color, national origin, sex, religion, marital status, or age.

Major fieldwork for this soil survey was completed in the period 1964–68. Soil names and descriptions were approved in 1971. Unless otherwise indicated, statements in the publication refer to conditions in the county in 1971. This survey was made cooperatively by the Soil Conservation Service, the Bureau of Land Management, and the University of Nevada Agricultural Experiment Station. It is part of the technical assistance furnished to the Eureka Conservation District.

HOW TO USE THIS SOIL SURVEY

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

Locating Soils

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

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

Finding and Using Information

The "Guide to Mapping Units" can be used to find information. This guide lists all the soils of the area in alphabetic order by map symbol and gives the capability classification of each as well as the range site, windbreak or woodland suitability group, and wildlife suitability group. It also shows the page where each soil is described and the page for the capability unit or subclass and range site in which the soil has been placed.

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

Farmers and those who work with farmers can learn about use and management of the soils from the soil descriptions and from the discussions of the capability units, the range sites, and the woodland groups.

Foresters and others can refer to the section "Woodland" where the soils of the area are grouped according to their suitability for trees.

Game managers, sportsmen, and others can find information about soils and wildlife under "Wildlife."

Ranchers and others can find, under "Range," groupings of the soils according to their suitability for range, and also the names of many of the plants that grow on each range site.

Community Planners and others can read about soil properties that affect the choice of sites for dwellings, industrial buildings, and recreation areas under "Engineering Interpretations of the Soils."

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

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

Newcomers in the Diamond Valley Area will be especially interested in the section "General Soil Map," where broad patterns of soils are described. They may also be interested in the information about the area given in the section "General Nature of the Area."

Cover: An old kiln used in the 1860–80 period for making charcoal to smelt ore from the mines in the area. The Pinyon-Juniper covered fan behind it is Ratto very stony loam, 4 to 15 percent slopes. The farming area, mainly Kobeh and Alhambra soils, can be seen in the middle background and Whistler Mountain is in the distance to the left.

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SOIL SURVEY OF DIAMOND VALLEY AREA PARTS OF EUREKA, ELKO, AND WHITE PINE COUNTIES, NEVADA

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

DIAMOND VALLEY AREA, parts of Elko, Eureka, and White Pine Counties [hereinafter referred to as Diamond Valley Area] consists of an intermountain valley in east-central Nevada (fig. 1). Most of the valley is in Eureka County; however, the north end extends into the southwestern part of Elko County, and a small part of White Pine County along the Eureka-White Pine County line is included in the survey area. The area consists of about 891 square miles, or 569,832 acres.

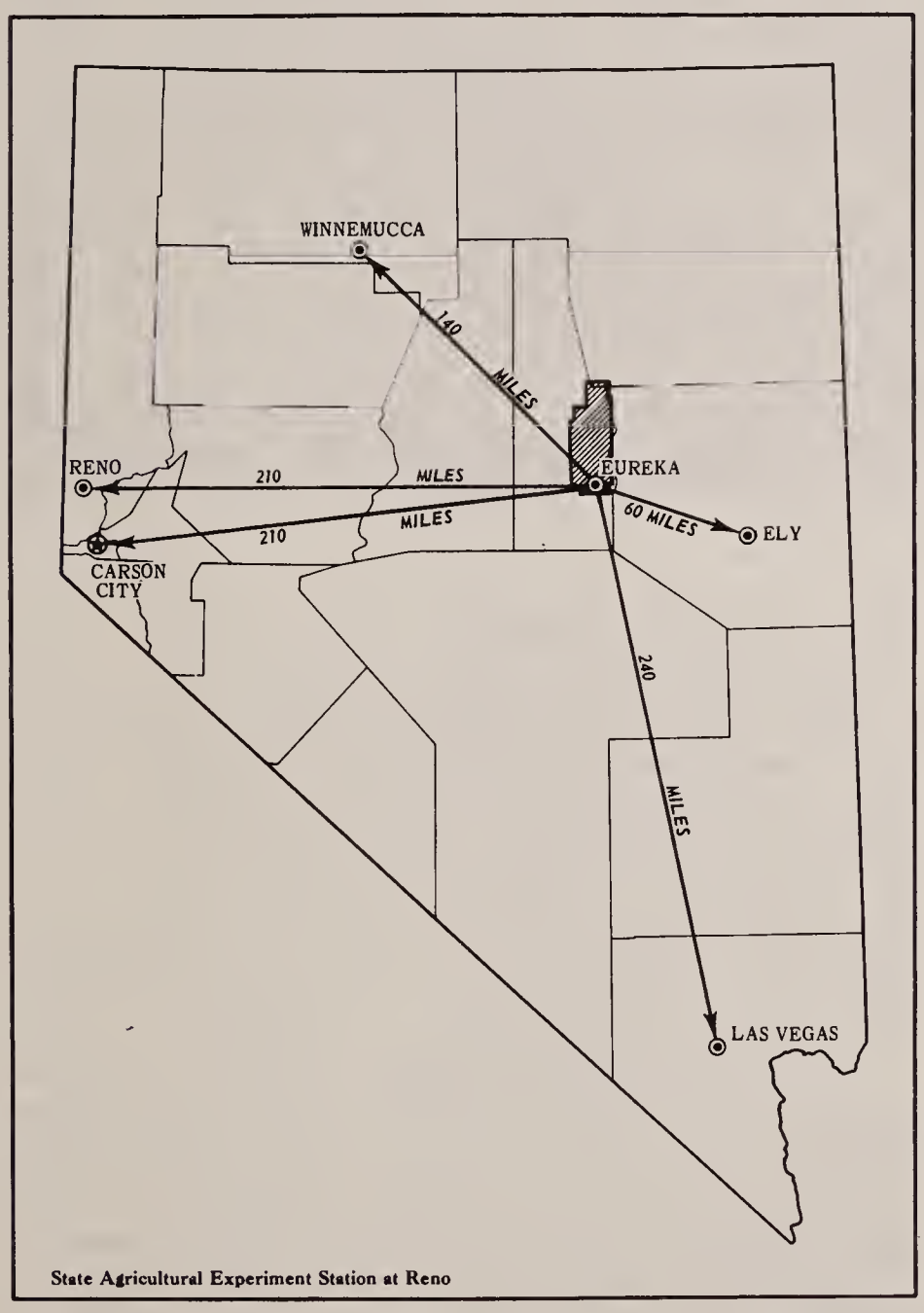

Figure 1.—Location of Diamond Valley Area in Nevada.

The survey area is roughly rectangular, bounded on the east by the crest of the Diamond Mountains and on the west by the Sulphur Springs Range and Whistler Mountain. The north end is bounded by the Diamond Hills and Black Mountain, and the south end is bounded by the Mahogany Hills and the Fish Creek Range.

The lowest part of the valley, at an altitude of 5,770 feet, is in the playa at the north end of the valley. Southward from the playa the valley floor rises about 9 feet per mile. Elevation is above 9,000 feet only in the Fish Creek Range and Diamond Mountains. The highest point is 10,614 feet on South Diamond Peak in the Diamond Mountains. The main town in the area is Eureka, the county seat of Eureka County (fig. 2).

General Nature of the Area

This section is mainly for those who are not familiar with Diamond Valley Area. It discusses subjects of general interest such as settlement and development, farming, transportation, water supply, climate, and physiography and geology.

Settlement and Development

Diamond Valley Area was developed initially to exploit the mineral resources of the Eureka district. The route of the Overland Trail was surveyed through the area in 1859. The first ore was discovered in 1864, a few miles southwest of the present town of Eureka.

In 1869, rich ore bodies were discovered in Ruby Hill, and Eureka developed into a prosperous mining district. Between 1871 and 1880, the town of Eureka had a population of more than 9,000. After 1880, the major ore bodies were apparently depleted. Production continued on a reduced scale, and no new discoveries were made until 1940. While the mines and smelters were operating at their peak, about 2,000 men were engaged

Figure 2.—A view of Eureka.

in the production of charcoal. Pinyon, juniper, and mahogany trees were clearcut from the surrounding mountains and burned to produce charcoal for the smelters. One cord of wood produced about 28 bushels of charcoal. About 200,000 bushels were used in the smelting operations (*5*).[1]

The first farming in the area was associated with the raising of livestock. Initial development consisted of no more than systems of ditches to distribute the available water. Meadows of native grasses were sustained by runoff water in the lower parts of some canyons and by spring discharge along the sides of the valley. Ranching operations consequently were established in those areas.

In 1970 the population of the Area was about 540, mostly residents of the town of Eureka and the southern part of the valley (*9*). The present economy of the Area is based mainly on farming, but mining, tourism, and recreation add to the economy.

The main crops in the valley are alfalfa and small grain. Most of the production is fed locally to beef cattle, and the rest is sold and transported out of the Area. Potatoes have been grown with good results, but the crop matures too late to be marketable. Small family gardens are common throughout the valley.

[1] Italic numbers in parentheses refer to Literature cited, p. 119.

Farming and Ranching

The first farming in the Area was by settlers on widely separated ranches at the mouth of the canyons or on the springs along the sides of the valley. Livestock production was the main enterprise. The small streams and springs were diverted into systems of ditches to distribute the available water and sustain the native grass meadows. In favorable years the native meadows were cut for hay, which was stacked and fed to the livestock in winter. Grazing of livestock on public domain, through a use permit issued by the Bureau of Land Management, is common.

As ranching became established along the east and west sides of the valley, additional improvements were made to use all readily available discharge from the springs. No attempts were made to develop additional water supplies until the 1940's, when flowing wells were drilled on two of the old, established ranches. The development of new lands in Diamond Valley using pumped wells began in 1949. Development continued at a rate of a few wells each year until 1958, when extensive efforts were begun to develop land for irrigation. By 1964, when the area was closed to additional development, more than 200 irrigation wells had been drilled, and about 35,000 acres of land was being irrigated by pumping. A total of about 38,000 acres has

been irrigated at one time or another since 1949 (*3*). In 1971 the total irrigated area was about 10,500 acres; the other lands have been abandoned for economic reasons.

Transportation

Eureka is the only town in the Area and is the county seat of Eureka County. It is in the southern end of the valley on the lower side of the Fish Creek Range. U.S. Highway 50 crosses the southern part of the valley and passes through Eureka. State Highway 51 joins U.S. Highway 50 about 3 miles northwest of Eureka and crosses part of the west side of the valley. It leaves the Area at Garden Pass and extends northward to U.S. Highway 40 at Carlin. State Highway 46, a graded gravel road, originates in Eureka, runs along the eastern side of the valley, and leaves the Area at Railroad Pass; from there it extends northward through Huntington Valley and connects with U.S. Highway 40 at Elko. The rest of the valley floor is traversed by graded and gravel roads. Graded roads have been constructed along most section lines in developed areas, and these permit access in all but the most severe weather.

The nearest rail connections are at Ely, about 76 miles east of Eureka, and at Carlin and Elko, about 100 miles north of Eureka. The town is served by a stage and truck line. Eureka County maintains a paved landing strip for light aircraft.

Water Supply

Because of the semiarid conditions in Diamond Valley, farming is possible only under irrigation. Most of the water used for irrigation is supplied from pumped ground water.

All irrigation water contains dissolved salts. The kind and amount of salts determines irrigation water quality. Some salts give irrigation water excellent quality; other salts are detrimental. Calcium and magnesium salts in moderate amounts add good properties to irrigated soils because they give the soil good tilth, which permits water to penetrate easily. Sodium salts destroy these desirable properties. As the concentration of sodium in the soil increases, it becomes toxic to some plants. Excessive amounts of carbonates and bicarbonates in irrigation water can also be hazardous, as they cause precipitation of calcium and magnesium as the soil dries after irrigation. This increases the proportion of sodium in the soil solution and subsequently increases the sodium-related problems.

The irrigation water in Diamond Valley is generally of good quality. All samples of water from irrigation wells and springs were low in sodium. In about 75 percent of the samples salinity was medium, and in 25 percent it was high. Where salinity is high, some treatment of the soil or the water may be necessary in the future to prevent accumulation of excessive amounts of salts in the soil.

Residual sodium carbonate also affects the chemical suitability of water for irrigation. In all samples of irrigation water, residual sodium carbonate was less than 1.25 milliequivalents per liter; therefore, the water is safe for irrigation.

Boron is one of the most critical constituents in irrigation water. A small amount is essential for proper plant nutrition, but boron is toxic to many plants in amounts only slightly more than needed. The boron content of all samples of the irrigation water is less than the amount that might be harmful to semitolerant crops.

Ground water used for domestic purposes has been sampled and tested. It is within the permitted limits recommended by the U.S. Public Health Service in 1962 for water used on interstate carriers for drinking purposes. These standards are commonly cited as standards for domestic use (*4*).

The development of new lands for irrigation by pumped wells began in 1949, but the major development took place between 1960 and 1964. By 1964, when the area was closed to additional development, permits to pump a total of more than 150,000 acre-feet per year had been granted, more than 200 irrigation wells had been drilled, and about 35,000 acres of land was being irrigated by pumping ground water. Because of problems inherent in developing new land, production has lagged behind acquisition, and in 1965 only 7,600 acres of crops was harvested. The acreage is increasing each year, and maximum production will be realized within a few years.

Sprinkling has been the most widely used method of applying irrigation water during the initial phases of land acquisition and development. Lateral and mainline and self-propelled rotary systems are the main types used. In Diamond Valley sprinkling generally requires less water than other irrigation methods because infiltration is reduced in sandy soil. The cost per acre-foot of pumping and sprinkling water is higher than with other methods, but the cost of labor and land preparation is generally less (*3*).

Climate [2]

Diamond Valley Area has a semiarid midlatitude steppe climate. Precipitation ranges from 8 to 12 inches per year in the valley, and the temperature regime is continental, which means summers are warm to hot while winters are near or below freezing. Even in summer when daytime temperatures are hot, the nighttime temperatures are relatively cool.

Two major topographical barriers influence the climate of Diamond Valley. These are the massive Sierra Nevada to the west and the Rocky Mountains, which lie to the east. The Sierra Nevada drains much of the moisture from storm clouds moving from the Pacific. The Rocky Mountains effectively divert cold Canadian airmasses from reaching the Great Basin. Occasionally, however, cold airmasses in winter spill over into Nevada and result in below-zero temperatures. Locally, Diamond Valley is influenced by mountain ridges around the valley. The abrupt rise to the mountain peaks is conducive to frequent inversions in the valley, as cold air drains from the mountainsides to the valley floor. When this happens nighttime temperatures are cooler on the valley floor than in Eureka, which is 500 to 600 feet higher. Daily high temperatures, however,

[2] CLARENCE M. SAKAMOTO, climatologist for Nevada, National Weather Service, U.S. Department of Commerce, prepared this section.

are similar at the two locations because of air mixing produced by surface heating.

Tables 1 and 2 give temperature data for Eureka and for the lower elevations of Diamond Valley. Data for the valley are available only for the period 1965–68, so the estimates in table 2 are based on comparisons between the two locations.

In Nevada, including Diamond Valley, there are inversions about 45 percent of the time. The effect of this phenomenon is that the growing season (base 32° F) is considerably shorter on the valley floor, 70 to 100 days, with the shortest period in the center and lowest parts of the valley. The growing season at Eureka averages 100 days, but it ranged from 47 to 147 days during the period of record, 1902 through 1930. Eureka, in spring, will have a temperature of 32° or lower later than July 8 in 1 year out of 10, later than June 30 in 25 years out of 100, and later than June 14 in 5 years out of 10. Eureka, in fall, will have a temperature of 32° or lower earlier than September 4 in 1 year out of 10, earlier than September 9 in 25 years out of 100, and earlier than September 21 in 5 years out of 10.

Because of the protection of the mountain ranges surrounding the valley, precipitation averages slightly lower in the valley (8 inches) than the higher mountains (16 to 20 inches). Intermediate elevations receive between 8 and 16 inches per year. Precipitation maximum is generally in spring. As much as 3 inches has fallen in 24 hours.

Since sunshine is abundant, lake evaporation is high, averaging slightly more than 45 inches per year. Humidity is very low, averaging about 30 percent in summer. In summer humidity can reach 20 percent during the day and 40 to 45 percent at night. Humidity in winter averages 65 percent.

The mountain range also affects wind direction and speed in the valley. In the valley winds are predominantly southerly or northerly; however, the wind can blow from all directions, particularly during storms. Average wind velocity is estimated to be less than 20 miles per hour. No wind records are available in the valley, but statistics in outlying counties suggest that gusts of 70 miles per hour can be expected, on an average, once in 50 years. Gusty surface winds are strongest when associated with passing storms, but valley winds can also reach high speeds.

About 25 to 30 days in a year have thunderstorms. Three or four of these are associated with hail. Hailstones, however, are commonly very small, and damage from hail is minimal.

An average 40 to 60 inches of snow falls each year. As much as 30 inches in a month and 134 inches in a year have been recorded.

Physiography and Geology

Diamond Valley is an intermountain valley in the central part of the Great Basin section of the Basin and Range Province. It is roughly elliptical, elongated in a northerly direction. The landforms are typical of those in the Great Basin. The valley is a structural depression that is partly filled by unconsolidated and semiconsolidated lacustrine and subaerial deposits. Its southern end terminates in the Fish Creek Range south of Eureka. The Diamond Mountains form the eastern boundary of the valley and connect with the Fish Creek Range on the south. The Sulphur Springs Range,

TABLE 1.—*Temperature and precipitation data, Eureka, Nevada*

[Period of record, 1902–1930]

Month	Temperature				Precipitation		
	Average daily high	Average daily low	Two years in 10 will have about 4 days with—		Average total	One year in 10 will have—	
			Maximum temperature equal to or higher than—	Minimum temperature equal to or lower than—		Less than—	More than—
	°F	*°F*	*°F*	*°F*	*Inches*	*Inches*	*Inches*
January	38.2	16.2	50.4	0.8	1.18	0.20	2.45
February	41.6	19.4	51.6	5.4	1.05	.34	1.90
March	48.5	24.0	61.9	11.0	1.64	.30	2.90
April	59.1	29.6	71.2	18.3	1.23	.35	2.42
May	66.4	36.5	77.5	25.1	1.52	.10	3.46
June	78.1	44.2	89.1	31.8	.91	.08	2.38
July	87.2	54.4	93.1	41.7	.79	.01	1.92
August	85.2	52.8	91.4	43.0	.68	.01	1.65
September	76.0	44.8	85.8	31.4	.65	.01	1.46
October	63.6	34.4	75.3	23.3	.88	.01	2.23
November	51.5	26.0	64.6	11.4	.63	.01	1.50
December	40.8	19.0	53.6	2.1	.86	.19	1.80
Year	61.4	33.4			12.02		

TABLE 2.—*Temperature and precipitation data, Diamond Valley, Nevada*

Month	Temperature		Precipitation
	Average daily high [1]	Average daily low [1]	Average total
	°F	°F	Inches
January	36.8	8.8	0.38
February	41.9	14.4	.65
March	48.5	20.2	1.03
April	60.2	25.3	.59
May	68.0	31.8	1.24
June	78.5	40.0	.83
July	87.4	47.4	.60
August	86.7	44.0	.45
September	78.3	38.5	.52
October	63.3	29.0	.65
November	54.7	20.0	.63
December	38.9	9.3	.46
Year	61.9	27.4	8.03

[1] Estimated.

Whistler Mountain, and Mountain Boy Range form the western boundary of the valley. The valley is closed at the northern end by the Diamond Hills, which connect the Diamond Mountains with the Sulphur Springs Range in the vicinity of Baily Mountains.

The mountains that border Diamond Valley are composed principally of complex faulted and folded Paleozoic sedimentary rocks (fig. 3). The overall size and shape of the mountains is the result of regional uplift and warping associated with normal faulting. The complex internal structures have had little control over the gross topographic features; however, the effects of internal structures may be pronounced in certain areas, and fault scarps and ridges formed by relatively resistant beds are locally prominent. The mountains are areas of active erosion and are generally deeply dissected. This dissection is prominent in the Diamond Mountains. Areas underlain by volcanic rocks generally have smooth convex upper surfaces and steep, talus covered slopes.

The alluvial apron is the area of intermediate slope between the mountains and the comparatively flat playa. The apron generally is composed of coalescing alluvial fans, but it may also contain pediments, or areas in which the bedrock is covered by a thin sheet of alluvium. The slope of the alluvial apron decreases from about 100 feet per mile near the mountain fronts to only a few feet per mile near the playa. Local relief may be as much as 25 feet, due principally to stream entrenchment on the higher slopes and to bars, spits, and beach deposits on intermediate and lower slopes.

Diamond Peak is the highest point in the area, with an altitude of 10,614 feet. Most of the crest altitudes of the Diamond Mountains are 9,000 feet or higher. Prospect Peak, south of Eureka, is 9,571 feet above sea level. Most of the crests of the Sulphur Springs Range are between 7,000 and 7,500 feet. Devil's Gate Gap (figs. 4 and 5), between Whistler Mountain and Moun-

***Figure 3.*—Diamond Range just north of South Diamond Peak showing folded Paleozoic rock. Soils are in the Sheege-Croesus association.**

Figure 4.—View to the northeast of Devil's Gate.

tain Boy Range, is a topographic low that permits drainage, both surface and subsurface, into Diamond Valley from Antelope, Kobeh, and Monitor Valleys. Railroad Pass in the northeast part of the valley was an outlet for drainage from Diamond Valley into Huntington Valley in Pleistocene time. The divide in Railroad Pass is about 125 feet above the playa in the valley.

The large playa, or alkali flat, occupies the floor of the valley and is at an altitude of about 5,770 feet. The floor of the valley rises southward. Near the airport, about 20 miles south of the edge of the playa, the altitude is 5,945 feet. The average gradient is about 9 feet per mile. The southern part of the floor of the valley has been somewhat modified by stream channels and Pleistocene lake features. Beaches and other shoreline features are prominent locally in the vicinity of Railroad Pass, in the northwest, and elsewhere. Shoreline features are best developed at altitudes between 5,860 and 6,040 feet. These features developed in late Pleistocene time.

Physiographically, the valley may be divided into three parts: the mountains; the alluvial apron; and the playa. The alluvial apron and the playa together form the valley floor. Pleistocene lake features have been developed largely on the alluvial apron.

During the Pleistocene and possibly earlier, a large lake occupied Diamond Valley. In the Pleistocene the level of the lake fluctuated between the present level of the playa (altitude 5,770 feet) and the outlet level at Railroad Pass (altitude about 6,040 feet). The material near the shore was reworked by the action of waves and near-shore currents. Where the shoreline extended onto the alluvial apron, terraces, cliffs, bars, spits, and beaches formed on the then-existing alluvial fans and pediments.

At the north end of the valley a series of beaches, terraces, cliffs, and spits are prominent between altitudes of 5,860 and 6,040 feet. The altitude of the highest terrace is the same as that of the outlet in Railroad Pass, about 6,040 feet. Subsequent erosion has lowered the pass to 5,895 feet. Lake features are best preserved along the west side and at the north end of the valley, but shoreline features may be observed along the east side. Many lacustrine features have been destroyed by the action of recent intermittent streams.

The playa occupies the northern part of the valley floor. Its surface is nearly flat, and it covers an area of about 50,000 acres. Fine-grained wind-blown material from the playa and lower slopes of the alluvial apron forms low dunes locally along the margins of the playa.

The rocks of Diamond Valley may be divided into two major units, the bedrock and the valley fill, on the basis of their general relationship to topography and ground water. The bedrock includes rocks of Paleozoic age, principally dolomite, limestone, and lesser amounts of shale, sandstone (or quartzite), and conglomerate;

Figure 5.—View to the west from Devil's Gate.

fresh-water limestone, silt, conglomerate, sandstone, and grit of Early Cretaceous age; intrusive rocks of Late Cretaceous or Early Tertiary age; and extrusive lavas and associated pyroclastics of Tertiary age. These rocks crop out in the mountains and underlie the valley fill. The valley fill includes clay, silt, sand, gravel, evaporites, probably freshwater limestone, and pyroclastics deposited under subaerial and lacustrine conditions. The valley fill also includes deposits of Cenozoic age and probably is several thousand feet thick beneath the floor of Diamond Valley.

The bedrock in the mountains has been extensively studied in the Eureka area. The valley fill has not been studied to an appreciable extent. Generally, however, it is the detritus derived from the surrounding mountains and adjacent region, it underlies the present area of the valley lowland and contiguous alluvial apron, and it is unconsolidated or only partly consolidated. The maximum thickness of the valley fill is not known. The thickness is substantial in some places, as is indicated by an exploratory well drilled in 1956 in sec. 30, T. 23 N., R. 54 E. This well penetrated 7,485 feet of valley fill and undifferentiated Tertiary strata before entering Paleozoic rock (*3*).

How This Survey Was Made

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

The soil scientists made comparisons among the profiles they studied and they compared these profiles with those in counties nearby and in places more distant.

They classified and named the soils according to nationwide, uniform procedures. The *soil series* and the *soil phase* are the categories of soil classification most used in a local survey.

Soils that have profiles almost alike make up a soil series. Except for different texture in the surface layer, all the soils of one series have major horizons that are similar in thickness, arrangement, and other important characteristics. Each soil series is named for a town or other geographic feature near the place where a soil of that series was first observed and mapped. Alpha and Shipley, for example, are the names of two soil series. All the soils in the United States having the same series name are essentially alike in those characteristics that affect their behavior in the undisturbed landscape.

Soils of one series can differ in texture of the surface layer and in slope, stoniness, or some other characteristic that affects use of the soils by man. On the basis of such differences, a soil series is divided into phases. The name of a soil phase indicates a feature that affects management. For example, Shipley silt loam, 0 to 2 percent slopes, is one of several phases within the Shipley series.

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

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

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

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

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

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

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

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

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

General Soil Map

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

A map showing soil associations is useful to people who want a general idea of the soils in an area, who want to compare different parts of an area, or who want to know the location of large tracts that are suitable for a certain kind of land use. Such a map is a useful general guide in managing a watershed, a wooded tract, or a wildlife area, or in planning engineering works, recreational facilities, and community developments. It is not a suitable map for planning the management of a farm or field, or for selecting the exact location of a road, building, or similar structure, because the soils in any one association ordinarily differ in slope, depth, stoniness, drainage, and other characteristics that affect their management.

The soil associations in Diamond Valley Area have been grouped into three general kinds of landscape for broad interpretative purposes. Each of the broad groups and their included soil associations are described in the following pages.

Soils of Old Lake Bottoms, Old Flood Plains, Low Lake Terraces, and Recent Alluvial Fans

These soils formed in alluvium from a wide variety of parent rock. The surface layer is moderately coarse textured, medium textured, or moderately fine textured. These soils are somewhat excessively drained to somewhat poorly drained, generally calcareous, and moderately alkaline to strongly alkaline.

The Nayped-Shipley association is on local alluvial fans and lake terraces just above the valley flood plains. The Kobeh-Alhambra association is in intermediate position on the valley flood plains and on the alluvial fans. The Playas-Dianev association is in the lowest position, on the valley bottom.

The three associations make up about 40 percent of the survey area.

1. Nayped-Shipley association

Nearly level and gently sloping, well drained, very deep soils; on alluvial fans and lake terraces

The Nayped-Shipley association is on alluvial fans and lake terraces around the margin of the floor of Diamond Valley. Elevation is 5,800 to 6,200 feet. Average annual precipitation is 8 to 10 inches, average annual temperature is 42° to 46° F, and the frost-free season is about 70 to 100 days.

The association covers about 5 percent of the survey area. Nayped soils make up about 45 percent of the association and Shipley soils 35 percent; the remaining 20 percent is Holtle, Kobeh, Lone, and Alhambra soils.

Nayped soils are on alluvial fans. They are well drained. Typically, they have a surface layer of light brownish gray and brown loam about 7 inches thick. The next layer is pale brown loam about 9 inches thick. Below this is stratified very pale brown, pale brown, light gray, and light yellowish brown loam and very fine sandy loam that contain a few silica-lime cemented nodules. The plant cover is mainly big sagebrush.

Shipley soils are on alluvial fans and lake terraces. They are well drained. Typically, the upper 18 inches of the profile is light brownish gray and light gray silt loam. Below this, to a depth of 60 inches, is light gray very fine sandy loam. The plant cover is mainly common winterfat and big sagebrush.

This association is used for irrigated crops, livestock grazing, and food and cover for wildlife. Additional areas can be irrigated if water is available. These soils are suited to range seeding.

2. Playas-Dianev association

Playas and nearly level, somewhat poorly drained very deep soils; on old lake bottoms and low lake terraces

The Playas-Dianev association is on old lake bottoms and adjacent low lake terraces. Elevation is 5,770 to 6,020 feet. Average annual precipitation is 8 to 10 inches, average annual temperature is 43° to 46° F, and the frost-free season is about 70 to 100 days.

The association covers about 15 percent of the survey area. Playas make up about 40 percent of the association and Dianev soils about 40 percent; the remaining 20 percent is Nevka, Vinsad, Sader, and Bicondoa soils.

Playas are low-lying basins on old lake bottoms. They are intermittently ponded. The Playas consist of stratified clay, silty clay, and silty clay loam. They are essentially barren.

Dianev soils are on low lake terraces. They are somewhat poorly drained. Typically, they are light gray silty clay loam to a depth of more than 60 inches. Plant cover is mainly greasewood, inland saltgrass, and rubber rabbitbrush.

This association is used mainly for livestock grazing and food and cover for wildlife. A small acreage of Dianev soils is used for meadow hay. These soils are generally not suited to irrigated crops, but small areas have limited suitability if water is available.

3. Kobeh-Alhambra association

Nearly level and gently sloping, somewhat excessively drained and well drained, very deep soils; on old flood plains and toe slopes of alluvial fans

The Kobeh-Alhambra association is on old flood plains and toe slopes of alluvial fans in the south-central part of the Area. Elevation is 5,800 to 6,100 feet. Average annual precipitation is 8 to 10 inches, average annual temperature is 41° to 45° F, and the frost-free season is about 70 to 100 days.

The association covers about 20 percent of the survey area. Kobeh soils make up about 50 percent of the association and Alhambra soils about 35 percent; the remaining 15 percent is Bruffy, Hamacer, Tonkin, and Shipley soils.

Kobeh soils are on old flood plains and alluvial fans. They are somewhat excessively drained. Typically, they have a surface layer of grayish brown sandy loam and light brownish gray fine sandy loam about 7 inches thick. The next layer is pale brown gravelly fine sandy loam about 10 inches thick. Below this is stratified gravelly sandy loam that contains a few silica-lime cemented nodules and very gravelly sand. The plant cover is mainly big sagebrush.

Alhambra soils are on old flood plains, alluvial fans, and terraces. They are well drained. Typically, the upper 15 inches of the profile is light gray and light brownish gray fine sandy loam. The next 21 inches is white and light gray sandy loam that contains a few silica-lime cemented nodules. Below this is stratified light gray gravelly sand and coarse sand. The plant cover is mainly big sagebrush, shadscale, and bud sagebrush.

This association is used mainly for irrigated crops, livestock grazing, and food and cover for wildlife. Additional areas can be irrigated if water is available. The soils are suited to range seeding and are a potential source of sand and gravel.

Soils of Old Alluvial Fans, Terraces, Pediments, and Foothills

These soils formed in local alluvium and residuum from a wide variety of parent rock. The surface layer is moderately coarse textured to fine textured and in places contains gravel. These soils are well drained. They are shallow to moderately deep over a silica-lime cemented hardpan, or they are deep over sand and gravel.

The Rubyhill and Ratto-Handy-Pedoli associations are on alluvial fans. The Umil-Bobs and Silverado-Hayeston-Credo associations are on the alluvial fans and lake terraces. The Ridit-Alpha and Fairydell-Gabel associations are on alluvial fans and foothills.

The six associations make up 25 percent of the survey area.

4. Rubyhill association

Nearly level to moderately sloping, well drained soils that are moderately deep to a hardpan; on old alluvial fans

The Rubyhill association is on old alluvial fans along the sides of valleys. Elevation is 5,900 to 6,300 feet. Average annual precipitation is 8 to 12 inches, average annual temperature is 42° to 45° F, and the frost-free season is about 70 to 100 days.

The association covers about 5 percent of the survey area. Rubyhill soils make up about 95 percent of the association; the remaining 5 percent is Kobeh, Shipley, and Umil soils.

Rubyhill soils are well drained. Slope is 0 to 8 percent. Typically, they have a surface layer of light brownish gray fine sandy loam about 4 inches thick. The next layer is pale brown loam about 17 inches thick. Below this is a very pale brown, silica-lime cemented hardpan. The plant cover is mainly big sagebrush and Sandberg bluegrass.

This association is used mainly for livestock grazing and food and cover for wildlife. The soils are suited to irrigated crops if water is available. They are suited to range seeding.

5. Ridit-Alpha association

Strongly sloping and moderately steep, well drained, moderately deep and deep soils; on foothills

The Ridit-Alpha association is in the northern part of the survey area. Elevation is 6,000 to 7,000 feet. Average annual precipitation is 8 to 12 inches, average annual temperature is 42° to 46° F, and the frost-free season is about 70 to 100 days.

The association covers about 3 percent of the survey area. Ridit soils make up about 50 percent of the association and Alpha soils about 40 percent; the remaining 10 percent is Holtle soils.

Ridit soils are on south- and west-facing hillsides. Slopes are 8 to 30 percent. The soils are well drained. Typically, the upper 15 inches of the profile is of light brownish gray gravelly loam and loam. The next 16 inches is light brownish gray and pale brown very gravelly loam. Below this is a white, silica-lime cemented hardpan, about 3 inches thick, that rests on andesite. The plant cover is mainly big sagebrush, Indian ricegrass, and bluebunch wheatgrass.

Alpha soils are on north- and east-facing hillsides where slopes are 8 to 30 percent. They are well drained. Typically, the upper 17 inches of the profile is of grayish brown loam. The next 19 inches is pale brown clay loam. This is underlain by a layer that contains 30 percent silica-lime nodules. The plant cover is mainly big sagebrush, Sandberg bluegrass, and bluebunch wheatgrass.

This association is used mainly for livestock grazing and food and cover for wildlife. The soils are suited to range seeding.

6. Umil-Bobs association

Gently sloping to steep, well drained soils that are shallow to a hardpan; on old alluvial fans and terraces

The Umil-Bobs association is on old alluvial fans and terraces in the southern and western parts of the survey area. Elevation is 6,000 to 6,600 feet. Average annual precipitation is 8 to 12 inches, average annual temperature is 42° to 45° F, and the frost-free season is about 70 to 100 days.

The association covers about 5 percent of the survey area. Umil soils make up about 75 percent of the association and Bobs soils 15 percent; the remaining 10 percent is Mau, Ratto, Holtle, and Hayeston soils.

Umil soils are on old alluvial fans and terraces. Slopes are dominantly 2 to 15 percent, but range to 50 percent. The soils are well drained. Typically, the upper 11 inches of the profile is light brownish gray and light gray loam. Below this is a white, silica-lime cemented hardpan. The plant cover is mainly black sagebrush, squirreltail, and Sandberg bluegrass.

Bobs soils are on old alluvial fans and terraces. Slopes are 4 to 15 percent. The soils are well drained. Typically, the surface layer is grayish brown gravelly loam about 4 inches thick. The next layer is pale brown and very pale brown gravelly loam about 15 inches thick. Below this is a white, indurated, lime-cemented hardpan. The plant cover is mainly an open stand of pinyon and juniper and an understory of big sagebrush, squirreltail, Sandberg bluegrass, black sagebrush, and bitterbrush.

This association is used mainly for livestock grazing and food and cover for wildlife.

7. Fairydell-Gabel association

Moderately steep, well drained, very deep and moderately deep soils; on old dissected fans, pediments, and foothills

The Fairydell-Gabel association is on old alluvial fans, pediments, and foothills in the southern part of the survey area. Elevation is 6,300 to 8,000 feet. Average annual precipitation is 10 to 16 inches, average annual temperature is 43° to 47° F, and the frost-free season is about 50 to 100 days.

The association covers about 2 percent of the survey area. Fairydell soils make up about 70 percent of the association and Gabel soils about 15 percent; the remaining 15 percent is Holtle and Hussa soils and areas of Badland.

Fairydell soils are on old, dissected alluvial fans and pediments. Slopes are 15 to 30 percent. The soils are well drained. Typically, the upper 23 inches of the profile is dark grayish brown, light yellowish brown,

and pale brown gravelly loam. Below this, to a depth of more than 60 inches, is pale brown very gravelly loam. The plant cover is mainly big sagebrush, Great Basin wildrye, and bluebunch wheatgrass.

Gabel soils are on foothills. Slopes are 15 to 30 percent. The soils are well drained. Typically, the surface layer is grayish brown gravelly loam about 7 inches thick. The next layer is pale brown very gravelly sandy clay loam about 8 inches thick. Below this is very gravelly coarse sandy loam about 9 inches thick. Soft tuff bedrock is at a depth of 24 inches. The plant cover is mainly big sagebrush, bitterbrush, Great Basin wildrye, and bluebunch wheatgrass.

This association is used mainly for livestock grazing and food and cover for wildlife.

8. Silverado-Hayeston-Credo association

Nearly level to strongly sloping, well drained, very deep soils; on old lake terraces and alluvial fans

The Silverado-Hayeston-Credo association is on old lake terraces and alluvial fans on the margin of the valley floor throughout the Area. Elevation is 5,800 to 6,300 feet. Average annual precipitation is 8 to 12 inches, average annual temperature is 42° to 46° F, and the frost-free season is about 70 to 100 days.

The association covers about 5 percent of the survey area. Silverado soils make up about 50 percent of the association, Hayeston soils 20 percent, and Credo soils about 15 percent; the remaining 15 percent is Rito and Lone soils.

Silverado soils are on old lake terraces and alluvial fans. Slopes range from 0 to 15 percent but are dominantly 0 to 4 percent. The soils are well drained. Typically, the surface layer is grayish brown and light brownish gray gravelly loamy coarse sand and sandy loam about 6 inches thick. The next layer is brown sandy loam about 7 inches thick. Below this is pale brown and light brownish gray, weakly silica-cemented gravelly sandy loam about 19 inches thick. This is underlain by light gray gravelly coarse sand. The plant cover is mainly big sagebrush.

Hayeston soils are on low lake terraces. Slopes are 2 to 4 percent. They are well drained. Typically, the upper 31 inches of the profile is pale brown gravelly fine sandy loam. The next 11 inches is very pale brown gravelly loamy fine sand. Below this is multicolored sand and gravel. The plant cover is mainly big sagebrush, Nevada bluegrass, and Great Basin wildrye.

Credo soils are on high and intermediate lake terraces. Slopes are 2 to 8 percent. The soils are well drained. Typically, the surface layer is grayish brown and light brownish gray gravelly loam and loam about 6 inches thick. The next 18 inches is pale brown loam over pale brown light clay loam. The underlying layer is pale brown, weakly silica-lime cemented gravelly sandy clay loam over very cobbly coarse sandy loam. The plant cover is mainly big sagebrush, squirreltail, and Great Basin wildrye.

This association is used mainly for livestock grazing and food and cover for wildlife. The Credo and Silverado soils are suited to irrigated crops if water is available. The soils are suited to range seeding. The Hayeston and Silverado soils are also a potential source of sand and gravel.

9. Ratto-Handy-Pedoli association

Gently sloping to strongly sloping, well drained soils that are shallow to a hardpan or are very deep; on old alluvial fans and lake terraces

The Ratto-Handy-Pedoli association is on old alluvial fans and lake terraces that surround Diamond Valley, mainly in the southern half of the survey area. Elevation is 6,000 to 6,400 feet. Average annual precipitation is 8 to 12 inches, average annual temperature is 43° to 47° F, and the frost-free season is about 70 to 100 days.

The association covers about 5 percent of the survey area. Ratto soils make up about 50 percent of the association, Handy soils 25 percent, and Pedoli soils about 15 percent; the remaining 10 percent is Credo and Stampede soils.

Ratto soils are on old alluvial fans. Slopes are 2 to 15 percent. The soils are well drained. Typically, the surface layer is light gray, light brownish gray, and pale brown gravelly fine sandy loam about 3 inches thick. Below this is pale brown, brown, and yellowish brown gravelly clay loam and gravelly clay about 17 inches thick. This is underlain by a very pale brown, silica-lime cemented hardpan. The plant cover is mainly big sagebrush, squirreltail, and scattered juniper.

Handy soils are on old alluvial fans. Slopes are 4 to 15 percent. The soils are well drained. Typically, the surface layer is pale brown gravelly loam about 4 inches thick. Below this is brown, yellowish brown, and very pale brown gravelly clay loam and gravelly clay about 26 inches thick. Below this is very pale brown gravelly fine sandy loam to a depth of 10 inches and more. The plant cover is mainly big sagebrush, squirreltail, and scattered pinyon and juniper.

Pedoli soils are on old alluvial fans and lake terraces. Slopes are 2 to 4 percent. The soils are well drained. Typically, the surface layer is pale brown gravelly fine sandy loam about 6 inches thick. The next layer is light yellowish brown and very pale brown gravelly clay loam about 19 inches thick. Below this is very pale brown gravelly sandy loam and very gravelly loamy sand to a depth of more than 60 inches. The plant cover is mainly big sagebrush, squirreltail, and scattered juniper.

This association is used mainly for livestock grazing and food and cover for wildlife. Pedoli soils are suited to range seeding.

Soils of the Hills and Mountains

These soils formed in residuum and colluvium from sedimentary and igneous rocks. In some places loess overlies these materials. Outcrops of bedrock are common. The surface layer is extremely stony, very stony, very gravelly, or gravelly and medium textured. These soils are well drained and very shallow to moderately deep over bedrock.

All of the associations are on moderately steep to very steep hills and mountains that surround the valley. Elevation ranges from 6,000 to 10,600 feet.

The four associations make up 35 percent of the survey area.

10. Fera-Roca-Devoy association

Strongly sloping to steep, well drained, deep and moderately deep soils; on mountains and hills

The Fera-Roca-Devoy association is on mountains and hills in the northern part of the Diamond Range, on Richmond Mountain, Whistler Mountain, and Mt. Hope Mountain in the northwestern part of the survey area. Elevation is 6,000 to 8,000 feet. Average annual precipitation is 8 to 14 inches, average annual temperature is 41° to 46° F, and the frost-free season is about 50 to 100 days.

The association covers about 7 percent of the survey area. Fera soils make up about 35 percent of the association, Roca soils 30 percent, and Devoy soils about 20 percent; the remaining 15 percent is Tica and Mau soils and areas of Rock outcrop.

Fera soils are on north-facing mountainsides. Slopes are 15 to 50 percent. The soils are well drained. Typically, the surface layer is grayish brown stony loam and brown very gravelly loam and is about 11 inches thick. Below this is light brown very gravelly clay loam and brown very gravelly clay about 31 inches thick. Conglomerate bedrock is at a depth of about 42 inches. The plant cover is mainly big sagebrush and bluebunch wheatgrass. Pinyon and juniper are in fire-protected areas.

Roca soils are on south-facing mountainsides. Slopes are 15 to 50 percent. The soils are well drained. Typically, the surface layer is light brownish gray very stony loam about 4 inches thick. Below this is light brownish gray and gravelly clay loam and brown gravelly clay about 20 inches thick. Shale bedrock is at a depth of about 24 inches. The plant cover is mainly big sagebrush and Sandberg bluegrass. Pinyon and juniper are in fire-protected areas.

Devoy soils are on mountainsides and hillsides. Slopes are 8 to 50 percent. The soils are well drained. Typically, the surface layer is grayish-brown very stony loam and gravelly loam about 12 inches thick. The next layer is light gray, light yellowish brown and yellowish brown very gravelly heavy clay loam and very gravelly clay about 18 inches thick. Alaskite bedrock is at a depth of about 30 inches. The plant cover is mainly pinyon, juniper, big sagebrush, and bluebunch wheatgrass.

This association is used mainly for livestock grazing and food and cover for wildlife.

11. Labshaft-Hopeka association

Moderately steep to very steep, well drained to excessively drained, shallow soils; on mountains and hills

The Labshaft-Hopeka association is on mountains and hills of the Sulphur Springs Range along the western side of the survey area. Elevation is 6,000 to 8,000 feet. Average annual precipitation is 10 to 14 inches, average annual temperature is 41° to 46° F, and the frost-free season is about 50 to 70 days.

The association covers about 11 percent of the survey area. Labshaft soils make up about 45 percent of the association and Hopeka soils 35 percent; the remaining 20 percent is about half Locane soils and half Sheege, Holtle, and Atrypa soils and areas of Rock outcrop.

The Labshaft soils are on mountainsides and hillsides. Slopes are 15 to 75 percent. The soils are well drained. Typically, the surface layer is grayish brown stony and gravelly loam about 12 inches thick. The next layer is yellowish brown gravelly sandy clay loam about 7 inches thick. Conglomerate bedrock is at a depth of about 19 inches. The plant cover is mainly pinyon, juniper, big sagebrush, and bluebunch wheatgrass.

Hopeka soils are on mountainsides. Slopes are 15 to 75 percent. The soils are well drained. Typically, the soil is light gray very gravelly loam and gravelly loam about 7 inches thick over dolomite bedrock. The plant cover is mainly juniper.

This association is used mainly for livestock grazing and food and cover for wildlife.

12. Sheege-Fusulina-Croesus association

Steep and very steep, well drained, shallow and moderately deep soils; on mountains

The Sheege-Fusulina-Croesus association is on the crest of the Diamond Range on the eastern side of the survey area. Elevation is 7,000 to 10,600 feet. Average annual precipitation is 12 to 18 inches, average annual temperature is 35° to 45° F, and the frost-free season is less than 50 days.

The association covers about 10 percent of the survey area. Sheege soils make up about 50 percent of the association, Fusulina soils 25 percent, and Croesus soils about 15 percent; the remaining 10 percent is Tahquats and Tica soils and areas of Rock outcrop.

Sheege soils are on convex mountainsides. Slopes are 30 to 75 percent. The soils are well drained. Typically, the profile is grayish brown very cobbly loam and very gravelly very fine sandy loam about 17 inches thick over limestone bedrock. The plant cover is mainly pinyon, juniper, black sagebrush, bitterbrush and mountain brome.

Fusulina soils are on mountainsides. Slopes are 30 to 75 percent. The soils are well drained. Typically, the profile is dark brown shaly loam about 12 inches thick over shale bedrock. The plant cover is mainly big sagebrush, bitterbrush, pinyon, juniper, and Great Basin wildrye.

Croesus soils are in concave areas on mountainsides. Slopes are 30 to 50 percent. The soils are well drained. Typically, the upper 9 inches of the profile is dark grayish brown gravelly loam. The next 25 inches is dark brown very gravelly loam. Limestone is at a depth of about 34 inches. The plant cover is mainly big sagebrush, bitterbrush, mountain-mahogany, bluebunch wheatgrass, mountain brome, and Great Basin wildrye.

This association is used mainly for limited livestock grazing and food and cover for wildlife.

13. Bartine-Overland-Atrypa association

Moderately sloping to very steep, well drained, moderately deep and shallow soils, on mountains and foothills

The Bartine-Overland-Atrypa association is on low mountains and hills near Garden Pass and Phillipsburg Mine and throughout the southern parts of the survey area. Elevation is 6,000 to 8,500 feet. Average annual precipitation is 8 to 16 inches, average annual tempera-

ture is 42° to 46° F, and the frost-free season is about 50 to 100 days.

The association covers about 7 percent of the survey area. Bartine soils make up about 40 percent of the association, Overland soils 30 percent, and Atrypa soils about 15 percent; the remaining 15 percent is Siri soils and areas of Rock outcrop.

Bartine soils are on north- and east-facing mountainsides. Slopes are 15 to 50 percent. The soils are well drained. Typically, the upper 14 inches of the profile is grayish brown and light brownish gray gravelly loam. The next 17 inches is pale brown very gravelly loam. Limestone bedrock is at a depth of about 31 inches. The plant cover is mainly pinyon, juniper, big sagebrush, low sagebrush, and bluebunch wheatgrass.

Overland soils are on south- and west-facing mountainsides. Slopes are 15 to 50 percent. The soils are well drained. Typically the surface layer is light brownish gray very gravelly loam and gravelly loam about 8 inches thick. Below this is very pale brown and light gray very gravelly loam about 14 inches thick. Limestone bedrock is at a depth of 22 inches. The plant cover is mainly juniper and pinyon.

Atrypa soils are on foothills and mountainsides. Slopes are 4 to 75 percent. The soils are well drained. Typically, the surface layer is grayish brown loam about 7 inches thick. Below this is brown loam about 6 inches thick. Shale bedrock is at a depth of about 13 inches. The plant cover is mainly big sagebrush, pinyon, and juniper.

This association is used mainly for livestock grazing and food and cover for wildlife.

Descriptions of the Soils

This section describes the soil series and mapping units in Diamond Valley Area. Each soil series is described in detail, and then, briefly, each mapping unit in that series. Unless it is specifically mentioned otherwise, it is to be assumed that what is stated about the soil series holds true for the mapping units in that series. Thus, to get full information about any one mapping unit, it is necessary to read both the description of the mapping unit and the description of the soil series to which it belongs.

An important part of the description of each soil series is the soil profile; that is, the sequence of layers from the surface downward to rock or other underlying material. Each series contains two descriptions of this profile. The first is brief and in terms familar to the layman. The second is much more detailed and is for those who need to make thorough and precise studies of soils. Color terms are for dry soil unless otherwise stated. The profile described in the series is representative for mapping units in that series. If the profile of a given mapping unit is different from the one described for the series, these differences are stated in describing the mapping unit, or they are differences that are apparent in the name of the mapping unit.

As mentioned in the section, "How This Survey Was Made," not all mapping units are members of a soil series. Playas, for example, is not a soil series, but nevertheless, is listed in alphabetic order along with the soil series.

Preceding the name of each mapping unit is a symbol that identifies the mapping unit on the detailed soil map. Listed at the end of each description of a mapping unit is the capability unit, range site, and woodland group in which the mapping unit has been placed. The page for the description of each capability unit, range site, woodland group, or other interpretative group can be found by referring to the "Guide to Mapping Units" at the back of this survey.

The acreage and proportionate extent of each mapping unit are shown in table 3. Many of the terms used in describing soils can be found in the Glossary at the end of this survey, and more detailed information about the terminology and methods of soil mapping can be obtained from the Soil Survey Manual (*6*).

Alhambra Series

The Alhambra series consists of well-drained soils that formed in loamy alluvium. The alluvium was derived mainly from mixed rock sources and has admixtures of loess that is high in volcanic ash. These soils are on old flood plains, fan deltas, and intermediate lake terraces. Slope ranges from 0 to 2 percent. The vegetation is mainly big sagebrush, shadscale, and bud sagebrush. Greasewood, inland saltgrass, and alkali sacaton grow in saline-alkali affected areas adjacent to the playa. Elevation is 5,800 to 6,100 feet. Average annual precipitation is 8 to 10 inches, average air temperature is 42° to 45° F, and the frost-free season is 70 to 100 days.

In a representative profile the upper 15 inches of the profile is light gray and light brownish gray fine sandy loam. The next 21 inches is white and light gray sandy loam that contains very hard silica-lime-cemented nodules. This is underlain by light brownish gray gravelly sand and gravelly coarse sand stratified with weakly silica-lime-cemented layers to a depth of 60 inches and more.

Permeability is moderate or moderately rapid. Effective rooting depth is 60 inches. Available water capacity is low to high.

Representative profile of Alhambra fine sandy loam in an unsurveyed area, Eureka County, 2,500 feet north and 2,100 feet east of the northwest corner of sec. 4, T. 21½ N., R. 53 E.:

A1—0 to 3 inches; light gray (10YR 6/1) fine sandy loam, dark brown (10YR 3/3) moist; weak medium platy structure; slightly hard, very friable, slightly sticky and nonplastic; many very fine roots; few fine interstitial, common fine and very fine vesicular, and common fine and very fine tubular pores; slightly effervescent; moderately alkaline; abrupt smooth boundary.

C1—3 to 8 inches; light brownish gray (10YR 6/2) fine sandy loam, dark brown (10YR 4/3) moist; massive; soft, very friable, nonsticky and nonplastic; few medium, common fine, and many very fine roots; common fine and many very fine tubular pores; strongly effervescent; strongly alkaline; clear smooth boundary.

C2—8 to 15 inches; light gray (10YR 7/1) fine sandy loam, dark brown (10YR 4/3) moist; massive; soft, very friable, nonsticky and nonplastic; many medium, common fine, and many very fine roots; common fine and many very fine tubular pores; strongly effervescent; strongly alkaline; clear wavy boundary.

C3sica—15 to 24 inches; white (10YR 8/2) sandy loam

TABLE 3.—*Approximate acreage and proportionate extent of the soils*

Mapping symbol		Soil	Acres		Percent
High intensity	Low intensity		High intensity	Low intensity	
Ab	----------	Alhambra fine sandy loam	9,342	----------	1.6
AbC	----------	Alhambra fine sandy loam, hummocky	480	----------	.1
Ac	----------	Alhambra silt loam	4,218	----------	.7
Ad	----------	Alhambra silt loam, silty substratum	2,891	----------	.5
Ah	----------	Alhambra complex	1,261	----------	.2
Ak	----------	Alhambra-Kobeh complex	32,934	----------	5.8
Am	----------	Alhambra-Kobeh complex, saline	471	----------	.1
As	----------	Alhambra-Shipley complex	578	----------	.1
----------	AT	Atrypa association	----------	4,200	.7
----------	AY	Atrypa-Hopeka association	----------	2,200	.4
----------	BA	Bartine-Overland association	----------	22,986	4.0
----------	BC	Bartine-Siri association	----------	7,355	1.3
----------	BD	Bicondoa-Dianev association	----------	7,366	1.3
----------	BGD	Bobs gravelly loam, 4 to 15 percent slopes	----------	5,373	.9
Br	----------	Bruffy silt loam	863	----------	.2
Bs	----------	Bruffy silt loam, alkali	603	----------	.1
Bu	----------	Bruffy-Kobeh complex	3,049	----------	.5
CfB	----------	Credo fine sandy loam, 2 to 4 percent slopes	1,037	----------	.2
CgC	----------	Credo gravelly loam, 4 to 8 percent slopes	338	----------	.1
----------	CS	Croesus-Sheege association	----------	4,582	.8
----------	CY	Cyan association	----------	2,993	.5
----------	DC	Devoy-Rock outcrop complex	----------	5,892	1.0
----------	DE	Devoy association	----------	2,080	.4
----------	DN	Dianev silt loam	----------	21,756	3.8
----------	DO	Dianev silty clay loam	----------	3,156	.6
----------	FAE	Fairydell gravelly loam, 15 to 30 percent slopes	----------	9,262	1.6
----------	FR	Fera-Roca association	----------	25,784	4.5
----------	FU	Fusulina-Sheege association	----------	25,933	4.5
----------	GAE	Gabel gravelly loam, 15 to 30 percent slopes	----------	1,831	.3
----------	GB	Gabel-Badland association	----------	792	.1
HaA	----------	Hamacer loamy fine sand, 0 to 2 percent slopes	5,525	----------	1.0
----------	HDD	Handy gravelly loam, 4 to 15 percent slopes	----------	4,533	.8
----------	HE	Hayeston-Silverado association	----------	8,443	1.5
HlA	----------	Holtle loam, 0 to 2 percent slopes	1,097	----------	.2
HmA	----------	Holtle loam, occasionally flooded, 0 to 2 percent slopes	572	----------	.1
----------	HNB	Holtle loam, 0 to 4 percent slopes	----------	2,959	.5
----------	HO	Hopeka-Labshaft association	----------	23,327	4.1
----------	HS	Hopeka-Sheege association	----------	15,956	2.8
----------	HUB	Hussa loam, 0 to 4 percent slopes	----------	950	.2
KbA	----------	Kobeh sandy loam, 0 to 2 percent slopes	11,964	----------	2.1
KgA	----------	Kobeh gravelly sandy loam, 0 to 2 percent slopes	18,315	----------	3.2
----------	KHB	Kobeh gravelly fine sandy loam, 2 to 4 percent slopes	----------	2,796	.5
Km	----------	Kobeh sandy loam, sandy subsoil variant	1,426	----------	.3
----------	LAE	Labshaft-Locane association, steep	----------	6,412	1.1
----------	LAF	Labshaft-Locane association, very steep	----------	6,766	1.2
----------	LK	Labshaft-Rock outcrop complex	----------	11,884	2.1
LmA	----------	Lone gravelly sandy loam, 0 to 2 percent slopes	845	----------	.1
LnB	----------	Lone gravelly loam, undulating	2,501	----------	.4
----------	LR	Lone-Rito association	----------	8,258	1.4
----------	MAE	Mau stony loam, 15 to 30 percent slopes	----------	3,454	.6
NaB	----------	Nayped loamy very fine sand, 2 to 4 percent slopes	1,008	----------	.2
NdA	----------	Nayped loam, 0 to 2 percent slopes	2,211	----------	.4
NdB	----------	Nayped loam, 2 to 4 percent slopes	6,969	----------	1.2
----------	NK	Nayped-Kobeh association	----------	1,998	.4
Ns	----------	Nevka silt loam	3,437	----------	.6
PeB	----------	Pedoli gravelly fine sandy loam, 2 to 4 percent slopes	4,133	----------	.7
----------	PL	Playas	----------	29,204	5.1
----------	PS	Playas-Dianev complex	----------	20,471	3.6
----------	RAC	Ratto gravelly fine sandy loam, 2 to 8 percent slopes	----------	11,551	2.0
----------	RCD	Ratto very stony loam, 4 to 15 percent slopes	----------	2,297	.4
----------	RD	Ridit-Alpha association	----------	15,910	2.8
RfA	----------	Rubyhill fine sandy loam, 0 to 2 percent slopes	453	----------	.1
----------	RHC	Rubyhill fine sandy loam, 2 to 8 percent slopes	----------	21,166	3.7
----------	RL	Rubyhill association	----------	7,103	1.2
----------	SA	Sader loam	----------	4,828	.8
----------	SD	Sader loam, occasionally flooded	----------	1,466	.3
----------	SE	Sheege-Croesus association	----------	15,702	2.8
SfB	----------	Shipley fine sandy loam, 2 to 4 percent slopes	1,144	----------	.2
ShA	----------	Shipley silt loam, 0 to 2 percent slopes	3,021	----------	.5
SlA	----------	Shipley silt loam, moderately saline-alkali, 0 to 2 percent slopes	1,609	----------	.3

TABLE 3.—*Approximate acreage and proportionate extent of the soils*—Continued

Mapping symbol		Soil	Acres		Percent
High intensity	Low intensity		High intensity	Low intensity	
	SMA	Shipley silt loam, occasionally flooded, 0 to 2 percent slopes		1,715	0.3
Sn		Shipley complex	1,849		.3
SoA		Silverado sandy loam, 0 to 2 percent slopes	8,429		1.5
SoB		Silverado sandy loam, 2 to 4 percent slopes	569		.1
	SRD	Silverado gravelly sandy loam, 4 to 15 percent slopes		617	.1
StA		Silverado silt loam, occasionally flooded, 0 to 2 percent slopes	392		.1
	SUF	Siri very gravelly loam, 30 to 50 percent slopes		3,208	.6
	SVB	Stampede loam, 2 to 4 percent slopes		401	.1
	TAD	Tahquats stony loam, 4 to 15 percent slopes		2,048	.4
	TCF	Tica very stony loam, 30 to 50 percent slopes		4,413	.8
	TK	Tica-Rock outcrop complex		1,109	.2
Tn		Tonkin fine sandy loam	1,704		.3
To		Tonkin fine sandy loam, slightly wet	1,558		.3
	UMB	Umil loam, 2 to 4 percent slopes		14,801	2.6
	US	Umil association		12,171	2.1
	VN	Vinsad very fine sandy loam		3,524	.6
		Water		6,054	1.1
		Total acres by intensity	138,796	431,036	
		Total	569,832		100.0

brown (10YR 5/3) moist; massive; very friable, nonsticky and nonplastic; common fine and many very fine roots; many very fine tubular pores; 50 percent cylindrical silica-lime durinodes; strongly effervescent; strongly alkaline; clear wavy boundary.

C4sica—24 to 36 inches; light gray (10YR 7/1) sandy loam, grayish brown (10YR 5/2) moist; massive; soft, friable, nonsticky and nonplastic; common fine and many very fine roots; many very fine tubular pores between nodules; 35 percent cylindrical silica-lime durinodes; strongly effervescent; strongly alkaline; abrupt wavy boundary.

IIC5—36 to 43 inches; light brownish gray (10YR 6/2) gravelly sand, dark brown (10YR 3/3) moist; single grained; loose dry and moist; few fine and many very fine roots; many very fine interstitial pores; strongly effervescent; strongly alkaline; abrupt wavy boundary.

IIC6sica—43 to 60 inches; stratified gravelly coarse sand and weakly silica-lime cemented layers; single grained; loose, nonsticky and nonplastic; cemented layers are hard, firm, and brittle; common very fine interstitial pores; strongly effervescent; strongly alkaline.

The A horizon is weak to strong, very thin to medium, platy in structure, or it is massive. The C horizon above the unconformable material is weak or moderate, thin to thick, platy in structure, or it is massive. The Csica horizon is at a depth of 4 to 18 inches. It is 20 to 60 percent silica-lime durinodes that are ½ to 1 inch in diameter. The part of the profile between depths of 10 and 40 inches is dominantly fine sandy loam and sandy loam and contains as much as 15 percent gravel in places; thin stratification with loam, silty clay loam, very fine sandy loam, or silt loam is not uncommon. Reaction ranges from pH 8.5 to more than 9.6 throughout the profile.

Ab—Alhambra fine sandy loam. This nearly level soil is in long, irregularly shaped areas on old flood plains. It has the profile described as representative of the series. Included with this soil in mapping, and making up about 15 percent of the acreage, are areas of Shipley soils, Kobeh soils, and soils similar to Kobeh soils.

Permeability is moderately rapid. Available water capacity is low. Runoff is slow, and the hazard of erosion is slight.

This soil is used mainly for irrigated crops, livestock grazing, and wildlife habitat. Capability units IIIc–2, irrigated, and VIc, dryland; Range Site NV 28–21 (Semidesert Loamy Plain).

AbC—Alhambra fine sandy loam, hummocky. This nearly level soil is in irregularly shaped areas on old flood plains. It has a profile similar to that described as representative of the series, but it has a wind-blown accumulation of fine sandy loam in hummocks 2 to 8 feet high. Included with this soil in mapping, and making up about 15 percent of the acreage, are areas of Shipley and Kobeh soils and areas of sand dunes.

Permeability is moderately rapid. Available water capacity is moderate. Runoff is slow, and the hazard of soil blowing is moderate.

If leveled, this soil is suited to irrigated crops. It is used for livestock grazing and wildlife habitat. Capability units IIIc–2, irrigated, and VIc, dryland; Range Site NV 28–21 (Semidesert Loamy Plain).

Ac—Alhambra silt loam. This nearly level soil is in small, elongated, slightly depressional areas on old flood plains. It has a profile similar to that described as representative of the series, but the upper 6 to 12 inches of the soil is slightly saline-alkali affected silt loam. Included with this soil in mapping, and making up about 5 percent of the acreage, are areas of other Alhambra soils that are occasionally flooded.

Permeability is moderately rapid. Available water capacity is moderate. Runoff is very slow, and the hazard of erosion is slight.

This soil is suited to irrigated crops. It is used for livestock grazing and wildlife habitat. Capability units IIIc–2, irrigated, and VIc, dryland; Range Site NV 28–21 (Semidesert Loamy Plain).

Ad—Alhambra silt loam, silty substratum. This soil is in elongated areas on lake shoreline terraces. It has a profile similar to that described as representative of the series, but the upper 10 inches of the soil is silt loam and the soil is stratified lakelaid sandy loam, very fine sandy loam, and silt loam below a depth of 36 inches. Included with this soil in mapping, and making up about 10 percent of the acreage, are areas of Shipley and Nayped soils.

Permeability is moderate. Available water capacity is moderate or high. Runoff is slow, and the hazard of erosion is slight.

This soil is suited to irrigated crops. It is used for livestock grazing and wildlife habitat. Capability units IIIc–2, irrigated, and VIc, dryland; Range Site NV 28–21 (Semidesert Loamy Plain).

Ah—Alhambra complex. This complex is in large, irregularly shaped areas on the dissected deltaic deposits. It is about 60 percent Alhambra silt loam that is strongly saline-alkali affected and about 30 percent Alhambra gravelly sandy loam that is slightly saline-alkali affected. The soils are in an intricate pattern. The Alhambra silt loam is in the lower, depressional positions. The Alhambra gravelly sandy loam is on the higher remnants of the deltaic surface. The soils have profiles similar to the one described as representative of the series, but they are saline-alkali affected. Included with these soils in mapping, and making up about 10 percent of the acreage, are isolated and interfingering small areas of Playas.

Permeability is moderately rapid. Available water capacity is moderate. Runoff is very slow, and the hazard of erosion is slight.

This complex is not suited to irrigated crops, because of the saline-alkali condition and limited drainage outlets. The soils are used mainly for livestock grazing and wildlife habitat. Capability unit VIIs, dryland; Alhambra silt loam part, in Range Site NV 28–26 (Arid Salty Flat) and Alhambra gravelly sandy loam part, in Range Site NV 28–23 (Arid Loamy Bottomland, Saline-Alkali).

Ak—Alhambra-Kobeh complex. This complex is of nearly level soils in elongated areas of variable size on braided flood plains. (fig. 6). It is about 50 percent Alhambra fine sandy loam and about 30 percent Kobeh sandy loam. The soils are in an intricate braided pattern. The Alhambra soil has a profile similar to that described as representative of the Alhambra series. The Kobeh soil has a profile similar to the one described as representative of the Kobeh series, but it is gravelly sandy loam to a depth of about 24 inches and gravelly sand below. Included with this complex in

Figure 6.—Fan delta area south of the playas looking east along the old Overland Trail toward the Diamond Range. The soils in this area are in the Alhambra and Kobeh series. The native vegetation on these soils is big sagebrush.

mapping, and making up about 20 percent of the acreage, are areas of Bruffy, Hamacer, and Shipley soils.

Permeability is moderately rapid. Available water capacity is low. Runoff is very slow, and the hazard of erosion is slight.

This complex is used mainly for irrigated crops, livestock grazing, and wildlife habitat. Capability units IVs–115, irrigated, and VIIs, dryland; Range Site NV 28–21 (Semidesert Loamy Plain).

Am—Alhambra-Kobeh complex, saline. This complex of nearly level soils is in elongated, irregularly shaped areas on braided flood plains. It is about 50 percent Alhambra fine sandy loam that is moderately saline-alkali affected and about 30 percent Kobeh fine sandy loam that has slopes of 0 to 2 percent and is slightly saline-alkali affected. The soils are in an intricate pattern. The Alhambra soil is in a lower position and has patchy salt crusting on the surface. The Kobeh soil is 1 to 3 feet higher in position, and it shows little or no surface salt crusting. These soils have profiles similar to the ones described as representative of their respective series, but they are saline-alkali affected. Included with this complex in mapping, and making up about 20 percent of the acreage, are areas of Bruffy and Shipley soils.

Permeability is moderately rapid in the Alhambra soil and rapid in the Kobeh soil. Available water capacity is moderate in the Alhambra soil and low in the Kobeh soil. Runoff is very slow, and the hazard of erosion is slight.

These soils are suited to irrigated crops if leveled and conditioned by reclamation. They are used for a limited amount of irrigated crops but are used mainly for livestock grazing and wildlife habitat. Capability units, IVs–116, irrigated, and VIIs, dryland; Alhambra part in Range Site NV 28–23 (Arid Loamy Bottomland, Saline-Alkali) and Kobeh part in Range Site NV 28–21 (Semidesert Loamy Plain).

As—Alhambra-Shipley complex. This complex of nearly level soils is in irregularly-shaped areas of small and medium size on braided flood plains. It is about 40 percent Alhambra fine sandy loam; about 30 percent Shipley silt loam, sandy subsoil variant; and 20 percent Shipley silt loam, 0 to 2 percent slopes. The soils are an intricate pattern. Included with this complex in mapping, and making up about 10 percent of the acreage, are areas of Kobeh soils.

Permeability is moderately rapid in the Alhambra soil and moderate in the Shipley variant soil and the Shipley soil. Available water capacity is low in the Alhambra soil, moderate in the Shipley variant soil, and high in the Shipley soil. Runoff is very slow, and the hazard of erosion is slight.

This complex is used mainly for irrigated crops, livestock grazing, and wildlife habitat. Capability units IIIc–2, irrigated, and VIc, dryland; Alhambra and Shipley variant parts in Range Site NV 28–21 (Semidesert Loamy Plain) and Shipley part in Range Site NV 28–25 (Semidesert Silty Plain, Winterfat).

Alpha Series

The Alpha series consists of well-drained soils that formed in residuum from basalt and andesite that has additions of loess that is high in volcanic ash. These soils are on north-facing sides of foothills. Slope ranges from 8 to 30 percent. The vegetation is big sagebrush, squirreltail, Sandberg bluegrass, and bluebunch wheatgrass. Elevation is 6,000 to 7,000 feet. Average annual precipitation is 10 to 12 inches, average annual air temperature is 43° to 46° F, and the frost-free season is 70 to 100 days.

In a representative profile the upper 17 inches of the soil is grayish-brown loam. The next 19 inches is pale brown clay loam. Below this, to a depth of 60 inches, is pale brown clay loam that has white masses and veins of lime and silica-lime nodules.

Permeability is moderately slow. Effective rooting depth is 40 to 60 inches or more. Available water capacity is high.

Alpha soils were mapped only in the Ridit-Alpha association.

Representative profile of Alpha loam in an area of Ridit-Alpha association in Elko County, 1,800 feet south and 1,700 feet west of the northeast corner of sec. 33, T. 27 N., R. 54 E.:

A11—0 to 3 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; moderate fine granular structure; soft, very friable, slightly sticky and slightly plastic; many very fine roots; many very fine interstitial pores; neutral; abrupt wavy boundary.

A12—3 to 9 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; moderate fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; few medium and fine and many very fine roots; many fine and very fine interstitial pores; neutral; clear smooth boundary.

B1—9 to 17 inches; grayish brown (10YR 5/2) loam, dark brown (10YR 3/3) moist; moderate fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; few medium and fine and common very fine roots; many fine and very fine tubular pores; neutral; clear smooth boundary.

B2—17 to 36 inches; pale brown (10YR 6/3) clay loam, dark brown (10YR 4/3) moist; moderate medium and fine angular blocky structure; hard, friable, sticky and plastic; few medium, fine, and very fine roots; many fine and very fine tubular pores; neutral; clear smooth boundary.

C1sica—36 to 60 inches; pale brown (10YR 6/3) clay loam, brown (10YR 4/3) moist; massive; hard, friable, sticky and plastic; very few very fine roots; many very fine interstitial and tubular pores; 15 percent gravel; 30 percent hard and firm silica-lime durinodes; strongly effervescent, white (10YR 8/2) masses and veins of lime; strongly alkaline.

The dark-colored surface horizons range from 10 to 18 inches in thickness and have weak, medium, platy or granular structure. The A and B horizons are neutral. Structure of the B2 horizon is weak or moderate coarse subangular blocky to fine angular blocky. It is loam or clay loam and in some areas contains as much as 20 percent gravel or cobblestones. The Csica horizon has 20 to 50 percent silica-lime durinodes. Depth to basalt ranges from 40 inches to more than 60 inches. The C horizon is slightly effervescent to strongly effervescent and moderately alkaline to strongly alkaline.

Atrypa Series

The Atrypa series consists of well-drained soils that formed in residuum from soft shale and has minor amounts of limestone, dolomite, and conglomerate rocks. These soils are on hills and mountains. Slope

ranges from 4 to 75 percent. The vegetation is big sagebrush, squirreltail, Sandberg bluegrass, pinyon, and juniper. Elevation is 6,400 to 7,000 feet. Average annual precipitation is 12 to 14 inches, average annual air temperature is 42° to 46° F, and the frost-free season is 50 to 100 days.

In a representative profile the surface layer is grayish brown loam about 7 inches thick. Below this is brown and light brownish gray loam about 6 inches thick. Shale bedrock is at a depth of 13 inches.

Permeability is moderate. Effective rooting depth is 10 to 20 inches. Available water capacity is low.

Representative profile of Atrypa loam in an area of Atrypa association in Eureka County, 2,350 feet north, and 2,400 feet west of the southeast corner of sec. 31, T. 23 N., R. 52 E.:

A11—0 to 2 inches; grayish brown (10YR 5/2) loam, dark brown (10YR 3/3) moist; moderate fine granular structure; soft, very friable, slightly sticky and slightly plastic; common fine and very fine roots; few fine and common very fine tubular pores; neutral; clear smooth boundary.

A12—2 to 7 inches; grayish brown (10YR 5/2) loam, dark brown (10YR 3/3) moist; moderate fine granular structure; soft, very friable, sticky and slightly plastic; many fine and very fine roots; few fine and common very fine tubular pores; neutral; gradual smooth boundary.

C1ca—7 to 10 inches; brown (10YR 5/3) loam, dark brown (10YR 3/3) moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; many fine and very fine roots; few fine and common very fine tubular pores; slightly effervescent; moderately alkaline; clear wavy boundary.

C2ca—10 to 13 inches, light brownish gray (10YR 6/2) loam, dark grayish brown (10YR 4/2) moist; massive; hard, very friable, slightly sticky and slightly plastic; few fine and common very fine roots; many very fine tubular pores; strongly effervescent; strongly alkaline; abrupt wavy boundary.

R—13 inches, shale bedrock of the Vinini Formation; lime-coated seams and fractures; this shale has a hardness of less than 3 and is highly fractured.

The A1 horizon ranges from fine sandy loam to loam. Structure is weak to strong, fine and medium granular, or it is weak, medium or thick, platy. In some places as much as 15 percent gravel is on the surface. Reaction ranges from pH 6.6 to 7.8. The thickness of the A horizon ranges from 7 to 10 inches. The Cca horizon ranges from pH 7.9 to 9.0. It is massive or has weak, subangular blocky structure. The Cca horizon has less than 15 percent carbonates. Shale bedrock is at a depth of 10 to 20 inches.

AT—Atrypa association. This association of moderately sloping to moderately steep soils is in irregularly shaped areas of medium size on foothills. It is about 60 percent Atrypa gravelly loam that has slopes of 15 to 30 percent, and about 30 percent Atrypa loam that has slopes of 4 to 15 percent. The Atrypa gravelly loam has a profile similar to the one described as representative of the series, but the surface layer is gravelly. The Atrypa loam has the profile described as representative of the series. Included with this association in mapping, and making up about 10 percent of the acreage, are other Atrypa soils.

Runoff is rapid on the Atrypa gravelly loam and medium on the Atrypa loam. The hazard of erosion is severe on the Atrypa gravelly loam and moderate on the Atrypa loam.

These soils are used mainly for livestock grazing and wildlife habitat. Capability unit VIIs, dryland; woodland suitability group 3x1.

AY—Atrypa-Hopeka association. This association of very steep soils is in large, irregularly shaped areas on south-facing mountainsides. It is about 40 percent Atrypa very gravelly loam that has slopes of 50 to 75 percent, about 30 percent Hopeka very gravelly loam that has slopes of 50 to 75 percent, and about 20 percent Rock outcrop. The Atrypa soil has a surface layer that is dark colored when moist. The Hopeka soil has a surface layer that is light colored when moist. The Atrypa soil has a profile similar to the one described as representative of the Atrypa series; but the surface layer is gravelly loam 6 to 10 inches thick. The Hopeka soil has a profile similar to the one described as representative of the Hopeka series. Included with these soils in mapping, and making up about 10 percent of the acreage, are areas of Fusulina soils.

Runoff is rapid, and the hazard of erosion is severe.

These soils are used mainly for livestock grazing and wildlife habitat. Atrypa and Hopeka parts in capability unit VIIs, dryland, and Rock outcrop in capability unit VIIIs; Atrypa part in woodland suitability group 3x1 and Hopeka part in woodland suitability group 3d1.

Badland

This miscellaneous land type consists of essentially barren, steep and very steep, soft tuff beds. It is actively eroding and produces a large amount of sediment.

Badland is mapped only in Gabel-Badland association.

Runoff is very rapid, and the hazard of erosion is severe.

This land type is used for wildlife habitat, recreation, and esthetic purposes. Capability unit VIIIe, dryland.

Bartine Series

The Bartine series consists of well-drained soils that formed in residuum from limestone that has some admixture of shale, conglomerate, and quartzite. These soils are on north- and east-facing mountainsides. Slope ranges from 15 to 50 percent. The vegetation is pinyon and juniper and an understory of big sagebrush, low sagebrush, bitterbrush, Nevada ephedra, and bluebunch wheatgrass. Elevation is 6,000 to 8,500 feet. Average annual precipitation is 10 to 16 inches, average annual air temperature is 42° to 46° F, and the frost-free season is 50 to 100 days.

In a representative profile the surface layer is grayish brown gravelly loam about 5 inches thick. The next layer is light brownish gray gravelly loam about 9 inches thick. Below this is pale brown very gravelly loam about 17 inches thick. Limestone bedrock is at a depth of 31 inches. Discontinuous silica-lime coats are on the rock surface and in fractures.

Permeability is moderate. Effective rooting depth is 20 to 40 inches. Available water capacity is low.

Representative profile of Bartine gravelly loam in an area of Bartine-Siri association in Eureka County, 1,300 feet west of the southeast corner of sec. 28, T. 20 N. R. 52 E.:

A1—0 to 5 inches; grayish brown (10YR 5/2) gravelly loam, very dark grayish brown (10YR 3/2) moist; weak coarse subangular blocky structure; soft, friable, slightly sticky and slightly plastic; few fine and common very fine roots; many fine and very fine vesicular pores; 30 percent gravel; strongly effervescent; moderately alkaline; clear smooth boundary.

C1—5 to 14 inches; light brownish gray (10YR 6/2) gravelly loam, dark brown (10YR 4/3) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; many coarse and medium and common fine and very fine roots; few fine and many very fine tubular pores; 40 percent gravel; strongly effervescent; strongly alkaline; clear wavy boundary.

C2sica—14 to 31 inches; pale brown (10YR 6/3) very gravelly loam, dark brown (10YR 4/3) moist; massive; hard, friable, slightly sticky and slightly plastic; common coarse, medium, fine, and very fine roots; common very fine tubular pores; 70 percent gravel with silica and lime pendants; strongly effervescent; strongly alkaline; abrupt wavy boundary.

R—31 inches; limestone with discontinuous silica-lime coats on the rock surface and fractures. Roots matted on surface and following some fractures in bedrock.

The surface is covered with about 20 percent gravel and 10 percent cobbles. The average volume of coarse fragments in the profile is 50 to 70 percent. The A horizon is granular or subangular blocky in structure. It is slightly to strongly effervescent. The Csica horizon is strongly or violently effervescent. Depth to bedrock is 20 to 40 inches.

BA—Bartine-Overland association. This association of moderately steep to steep soils is in large, irregularly shaped areas on mountains. It is about 40 percent Bartine gravelly loam that has slopes of 15 to 50 percent, and about 40 percent Overland very gravelly loam that has slopes of 15 to 50 percent. The Bartine soil is mainly on north-facing slopes, and the Overland soil is on the south-facing slopes. Included with these soils in mapping, and making up about 10 percent of the acreage, are areas of Holtle and Umil soils. Another 10 percent of the acreage is areas of Rock outcrop.

Runoff is medium or rapid, and hazard of erosion is moderate or severe.

These soils are used mainly for livestock grazing and wildlife habitat. Bartine part in capability unit VIIe, dryland, and Overland part in capability unit VIIs, dryland; woodland suitability group 3x1.

BC—Bartine-Siri association. This association of steep soils is in irregularly shaped areas of large and medium size on foothills. It is about 50 percent Bartine gravelly loam that has slopes of 30 to 50 percent and about 30 percent Siri very gravelly loam, 30 to 50 percent slopes. The Bartine soil is on north-facing slopes at higher elevations, and the Siri soil is generally in lower positions and on south- and west-facing slopes. The Bartine soil has the profile described as representative of the Bartine series. The Siri soil has a profile similar to the one described as representive of the Siri series. Included with these soils in mapping, and making up about 10 percent of the acreage, are areas of Atrypa and Overland soils. Another 10 percent of the acreage is areas of Rock outcrop.

Permeability is moderate. Runoff is rapid, and the hazard of erosion is moderate to severe.

These soils are used for livestock grazing and wildlife habitat. Bartine part in capability unit VIIe, dryland, and Siri part in capability unit VIIs, dryland; Bartine part in woodland suitability group 3x1; Siri part in Range Site NV 28–29 (Semidesert Loamy Slope).

Bicondoa Series

The Bicondoa series consists of poorly drained soils that formed in fine-textured alluvium over lacustrine material of mixed parent mineralogy. These soils are on low lake terraces and old lake bottoms. Slope ranges from 0 to 2 percent. The vegetation is wiregrass, sedges, bluejoint wildrye, and saltgrass. Elevation is 5,770 to 6,050 feet. Average annual precipitation is 8 to 10 inches, average annual air temperature is 45° to 46° F., and the frost-free season is 70 to 100 days.

In a representative profile the surface layer is dark gray loam that is high in organic-matter content and about 5 inches thick. Below this is mottled, light-gray and white silty clay and silty clay loam to a depth of 60 inches.

Permeability is slow. Effective rooting depth is 60 inches. Available water capacity is high.

Representative profile of Bicondoa silty clay loam in an area of Bicondoa-Dianev association, 900 feet north and 1,700 feet west of the southeast corner of sec. 29, T. 24 N., R. 53 E.:

A11—0 to 1 inch; gray (5Y 5/1) heavy silty clay loam, dark grayish brown (2.5Y 4/2) moist; moderate medium and fine granular structure; very hard, friable, sticky and plastic; many fine and very fine roots; many very fine interstitial pores; violently effervescent; strongly alkaline; abrupt wavy boundary.

A12—1 inch to 5 inches; dark gray (10YR 4/1) loam, black (10YR 2/1) moist; moderate medium and fine granular structure; hard, friable, slightly sticky and slightly plastic; common fine and very fine roots; no pores evident; violently effervescent; strongly alkaline; abrupt wavy boundary.

C1—5 to 11 inches; light gray (5Y 7/1) silty clay, olive gray (5Y 5/2) moist; many fine distinct olive gray (5Y 5/3) iron mottles; weak medium and fine granular structure; very hard, friable, very sticky and very plastic; few very fine roots; no pores evident; violently effervescent; strongly alkaline; gradual wavy boundary.

C2—11 to 24 inches; light gray (5Y 7/1) silty clay, olive gray (5Y 5/2) moist; many fine faint olive gray (2.5Y 5/2) mottles; massive; very hard, friable, very sticky and very plastic; few very fine roots; no pores evident; violently effervescent; very strongly alkaline.

C3—24 to 35 inches; light gray (5Y 7/1) light silty clay, light olive gray (5Y 6/2) moist; many medium faint light brownish gray (2.5Y 5/2) iron mottles; massive; very hard, friable, very sticky and very plastic; few very fine roots; no pores evident; strongly effervescent; very strongly alkaline; gradual smooth boundary.

C4ca—35 to 47 inches; white (5Y 8/1) light silty clay, light gray (5Y 7/2) moist; massive; very hard, friable, very sticky and very plastic; few very fine roots; no pores evident; violently effervescent, 20 percent calcium carbonate concretions less than 2 millimeters in diameter; very strongly alkaline; clear smooth boundary.

C5—47 to 60 inches; white (2.5Y 8/1) silty clay loam, light brownish gray (2.5Y 6/2) moist; massive; very hard, friable, sticky and very plastic; violently effervescent; very strongly alkaline.

The A horizon is 5 to 15 percent organic matter and is loam or silt loam when the upper 7 inches is mixed. The A horizon is hard when dry and is granular or blocky. The A horizon is moderately alkaline to very strongly alkaline and

strongly to violently effervescent. Mottling or gleying, or both, are common in the C horizon. This horizon is hard or very hard when dry. It is moderately alkaline to very strongly alkaline and strongly to violently effervescent. Strata of loam, silt loam, or very fine sandy loam may be at any depth.

Bicondoa soils as mapped in Diamond Valley Area have a dark-colored surface horizon less than 10 inches thick. This is thinner than is defined as within the range for the series, but this difference does not affect the use and management of these soils.

BD—Bicondoa-Dianev association. This association of nearly level soils is in large, elongated areas on flood plains and low lake terraces parallel to the old shoreline around the playa. The soils are deep, poorly drained and somewhat poorly drained, and moderately fine textured. This association is about 60 percent Bicondoa silty clay loam and 30 percent Dianev silty clay loam that is strongly saline-alkali affected. The poorly drained Bicondoa soil is in the lower positions. The somewhat poorly drained Dianev soil is on slightly raised areas and has salt accumulations on the surface. Included with these soils in mapping, and making up about 10 percent of the acreage, are areas of similar soils that have a surface layer of loam to sandy loam, and some soils that have a thick surface layer of peat or muck, or both.

Permeability is slow, and available water capacity is high. Runoff is slow or ponded, and the hazard of erosion is slight. The seasonal high water table is at a depth of 0 to 2 feet in Bicondoa soils and at a depth of 2.5 to 4 feet in Dianev soils.

These soils are used mainly as native pasture, and a small acreage is cut for hay. They provide livestock grazing and wildlife habitat. Capability unit VIIw, dryland; Bicondoa part in Range Site NV 28–27 (Arid Saline Meadow) and Dianev part in Range Site NV 28–26 (Arid Salty Flat).

Bobs Series

The Bobs series consists of well-drained soils that formed in gravelly loamy alluvium. The alluvium derived mainly from limestone or dolomite but contains an admixture of loess that is high in volcanic ash. These soils are on old terraces and alluvial fans in the uplands. Slope ranges from 4 to 15 percent. The vegetation is open stands of pinyon and juniper and an understory of big sagebrush, squirreltail, Sandberg bluegrass, black sagebrush, bitterbrush, and Nevada ephedra. Elevation is 6,000 to 6,500 feet. Average annual precipitation is 10 to 12 inches, average annual air temperature is 42° to 45° F, and the frost-free season is 70 to 100 days.

In a representative profile the surface layer is grayish brown gravelly loam 4 inches thick. The next 15 inches is pale brown and very pale brown gravelly loam. A white, indurated, lime-cemented hardpan is at a depth of 19 inches.

Permeability is moderate. Effective rooting depth is 12 to 20 inches. Available water capacity is low.

Representative profile of Bobs gravelly loam, 4 to 15 percent slopes, in Eureka County, 2,400 feet south and 1,800 feet east of the northwest corner of sec. 20, T. 26 N., R. 53 E.:

A1—0 to 4 inches; grayish brown (10YR 5/2) gravelly loam, very dark brown (10YR 3/2) moist; weak fine platy structure; soft, friable, slightly sticky and slightly plastic; common very fine roots; common fine and very fine interstitial pores; violently effervescent; moderately alkaline; abrupt smooth boundary.

C1—4 to 14 inches; pale brown (10YR 6/3) gravelly loam, brown (10YR 4/3) moist; massive; soft, friable, slightly sticky and slightly plastic; common fine and very fine and few medium roots; many very fine interstitial pores; violently effervescent; moderately alkaline; abrupt smooth boundary.

C2ca—14 to 19 inches; very pale brown (10YR 7/3) gravelly loam with 30 percent white (10YR 8/1) indurated pan fragments, brown (10YR 5/3) moist; massive; soft, friable, slightly sticky and slightly plastic; few fine and medium roots; many very fine interstitial pores; violently effervescent; strongly alkaline; abrupt smooth boundary.

C3cam—19 to 24 inches; indurated lime cemented hardpan with discontinuous opal laminae and pendants on underside of hardpan layers.

The A horizon is weak or moderate, granular or platy in structure. Reaction is moderately alkaline to strongly alkaline and slightly to violently effervescent. The upper 1 to 6 inches of the profile in some places is near neutral and noneffervescent. The C horizon is weak subangular blocky or platy in structure, or it is massive. Reaction is moderately alkaline to strongly alkaline and strongly to violently effervescent. Depth to the hardpan is 12 to 20 inches. It is lime cemented and has this discontinuous silica laminae in some places.

BGD—Bobs gravelly loam, 4 to 15 percent slopes. This moderately sloping to strongly sloping soil is in roughly rectangular areas on old coalescing fans. Included with this soil in mapping, and making up about 10 percent of the acreage, are areas of Hopeka and Holtle soils.

Runoff is medium, and the hazard of erosion is moderate.

This soil is not suited to irrigated crops. It is used mainly for livestock grazing and wildlife habitat. Capability unit VIIs, dryland; Range Site NV 28–22 (Semidesert Shallow Loamy Slope).

Bruffy Series

The Bruffy series consists of well-drained soils that formed in moderately fine textured alluvium derived from mixed parent rocks. These soils are on flood plains in an intricately braided pattern. Slope ranges from 0 to 2 percent. The vegetation is big sagebrush, rabbitbrush, shadscale, and greasewood. Elevation is 5,850 to 5,900 feet. Average annual precipitation is 8 to 10 inches, average annual air temperature is 43° to 45° F, and the frost-free season is 70 to 100 days.

In a representative profile the upper 18 inches of the soil is very pale brown silt loam. The next layer is dark grayish brown silt loam about 5 inches thick. Below this is about 5 inches of light gray gravelly sandy clay loam that has 15 percent hard nodules. Next is pale brown gravelly fine sandy loam about 7 inches thick. This loam is underlain by light brownish gray gravelly sand to a depth of 60 inches.

Permeability is moderate. Effective rooting depth is 60 inches. Available water capacity is moderate.

Representative profile of Bruffy silt loam in Eureka County at the Eureka County Airport, 2,250 feet east of the northwest corner of sec. 16, T. 20 N., R. 53 E.:

A11—0 to 2 inches; very pale brown (10YR 7/3) silt loam, dark brown (10YR 3/3) moist; weak thick platy

structure; soft, very friable, slightly sticky and nonplastic; many very fine roots; many very fine vesicular and tubular pores; neutral; abrupt smooth boundary.

A12—2 to 7 inches; very pale brown (10YR 7/3) silt loam, brown (10YR 4/3) moist; moderate thin platy structure; soft, very friable, sticky and slightly plastic; common very fine roots; many very fine tubular pores; slightly effervescent; moderately alkaline; clear wavy boundary.

C1—7 to 18 inches; very pale brown (10YR 7/3) silt loam, brown (10YR 5/3) moist; moderate fine subangular blocky structure; slightly hard, friable, sticky and plastic; common very fine roots; common very fine tubular pores; 10 percent cylindrical durinodes; very slightly effervescent; moderately alkaline; abrupt smooth boundary.

A1b—18 to 23 inches; dark grayish brown (10YR 4/2) silt loam, very dark gray (10YR 3/1) moist; moderate fine granular structure; soft, friable, slightly sticky and slightly plastic; few very fine roots; common very fine tubular pores; slightly effervescent; moderately alkaline; abrupt wavy boundary.

IIC2ca—23 to 28 inches; light gray (10YR 7/2) gravelly sandy clay loam, grayish brown (10YR 5/2) moist; massive; slightly hard, friable, sticky and plastic; few very fine roots; many very fine interstitial pores; 15 percent durinodes; strongly effervescent; strongly alkaline; clear wavy boundary.

IIIC3ca—28 to 35 inches; pale brown (10YR 6/3) gravelly fine sandy loam, brown (10YR 4/3) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots; many very fine interstitial and tubular pores; strongly effervescent; strongly alkaline; clear wavy boundary.

IVC4—35 to 60 inches; light brownish gray (10YR 6/2) gravelly sand, brown (10YR 4/3) moist; single grained; loose, nonsticky, and nonplastic; many very fine interstitial pores; slightly effervescent; strongly alkaline.

The A horizon has weak or moderate, thin to thick, platy structure, or it is massive. Thickness ranges from 4 to 8 inches. The C horizon has platy or blocky structure, or it is massive. The upper part of the C horizon is stratified with silty clay to sandy loam, and in some areas it is as much as 35 percent gravel. The texture generally is silty clay loam or silt loam. The lower part of the C horizon is stratified with fine sandy loam to sand and in places is as much as 40 percent gravel. Depth to sand and gravel is 30 to 48 inches. As much as 15 percent hard silica-lime cemented nodules is in one or more horizons in some areas, but this is not diagnostic for the series. Lime content is as high as 15 percent in any one horizon. There are relict mottles in places. The upper surface of a buried A1 horizon generally is above a depth of 40 inches.

Br—Bruffy silt loam. This nearly level soil is in long, narrow, meandering areas on the lowest parts of the flood plains. It has the profile described as representative of the series. Included with this soil in mapping, and making up about 20 percent of the acreage, are areas of Shipley, Alhambra, Kobeh, and other Bruffy soils.

Runoff is slow, and the hazard of erosion is slight. The soil is susceptible to occasional overflow.

This soil is used mainly for cultivated crops, livestock grazing, and wildlife habitat. Capability units IIIw–120, irrigated, and VIw, dryland; Range Site NV 28–24 (Semidesert Silty Plain).

Bs—Bruffy silt loam, alkali. This nearly level soil is in long, narrow, irregularly shaped, meandering areas on the lowest parts of the flood plains. It has a profile similar to that described as representative of the series, but it is slightly saline and alkali affected in places. Included with this soil in mapping, and making up about 20 percent of the acreage, are areas of other Bruffy soils, Shipley soils, and Alhambra soils.

Runoff is slow, and the hazard of erosion is slight. This soil is susceptible to occasional overflow.

This soil is suited to irrigated crops if reclaimed. It is used mainly for livestock grazing and wildlife habitat. Capability units IIIw–120, irrigated, and VIw, dryland; Range Site NV 28–24 (Semidesert Silty Plain).

Bu—Bruffy-Kobeh complex. This complex of nearly level soils is in meandering, elongated areas of moderate size on old flood plains of intricately braided streams. It is about 50 percent Bruffy silt loam, alkali, and 30 percent Kobeh sandy loam, 0 to 2 percent slopes. The Bruffy soil is on the lower parts of the landscape and has medium and moderately fine texture. The Kobeh soil is in slightly raised old braided stream channels and has moderately coarse texture. The Bruffy soil has a profile similar to the one described as representative of the Bruffy series, but it is slightly saline-alkali affected. The Kobeh soil has a profile similar to the one described as representative of the Kobeh series.

Permeability is moderately slow in the Bruffy soil and rapid in the Kobeh soil. Available water capacity is moderate in the Bruffy soil and low in the Kobeh soil. Runoff is slow, and the hazard of erosion is slight. The Bruffy soil is susceptible to occasional overflow.

This complex is used mainly for irrigated crops (fig. 7). The Bruffy soil needs to be reclaimed. The soils are used for livestock grazing and wildlife habitat. Capability units IVs–115, irrigated, and VIIs, dryland; Bruffy part in Range Site NV 28–24 (Semidesert Silty Plain), Kobeh part in Range Site NV 28–21 (Semidesert Loamy Plain).

Credo Series

The Credo series consists of well-drained soils that formed in material of mixed origin that has been worked by waves. Some loess deposition has influenced the upper few inches of the surface layer. These soils are on high and intermediate lake terraces and alluvial fans. Slope ranges from 2 to 8 percent. The vegetation is big sagebrush, bluegrass, rabbitbrush, cheatgrass, Great Basin wildrye, and squirreltail. Elevation is 5,800 to 6,200 feet. Average annual precipitation is 8 to 12 inches, average annual air temperature is 43° to 45° F, and the frost-free season is 70 to 100 days.

In a representative profile the surface layer is grayish brown gravelly loam and light brownish gray loam about 6 inches thick. The next layer is pale brown loam about 12 inches thick. Below this is pale brown light clay loam about 6 inches thick. Next is pale brown gravelly sandy clay loam about 10 inches thick. This is underlain by weakly silica-lime cemented very cobbly coarse sandy loam to a depth of 60 inches.

Permeability is moderately slow. Effective rooting depth is 60 inches. Available water capacity is moderate.

Representative profile of Credo gravelly loam, 4 to 8 percent slopes, in Eureka County, 1,600 feet south and 1,900 feet east of the northwest corner of sec. 15, T. 24 N., R. 54 E.:

A11—0 to 2 inches; grayish brown (10YR 5/2) gravelly loam, very dark grayish brown (10YR 3/2) moist; moderate medium and fine granular structure; soft,

Figure 7.—**A young stand of alfalfa being irrigated in an area of Bruffy-Kobeh complex.**

very friable, nonsticky, and nonplastic; many very fine roots; many very fine and fine interstitial pores; neutral; abrupt smooth boundary.

A12—2 to 6 inches; light brownish gray (10YR 6/2) loam, dark grayish brown (10YR 4/2) moist; moderate thin platy structure; slightly hard, very friable, slightly sticky and slightly plastic; common very fine roots; many very fine interstitial pores; 10 percent fine gravel; neutral; abrupt smooth boundary.

B11—6 to 10 inches; pale brown (10YR 6/3) loam, brown (10YR 4/3) moist; weak medium and fine subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; common very fine roots; many very fine tubular pores; few thin clay films in pores; 10 percent fine gravel; neutral; abrupt wavy boundary.

B12—10 to 18 inches; pale brown (10YR 6/3) loam, brown (10YR 4/3) moist; weak medium and fine subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine roots; many very fine tubular pores; 10 percent fine gravel; neutral; abrupt wavy boundary.

B2t—18 to 24 inches; pale brown (10YR 6/3) light clay loam, brown (10YR 4/3) moist; moderate fine and medium subangular blocky structure; hard, friable, sticky and plastic; many very fine roots; many very fine and few fine tubular pores; common thin clay films in pores and on ped faces; 15 percent gravel; neutral; clear wavy boundary.

IIB3tsica—24 to 34 inches; pale brown (10YR 6/3) gravelly sandy clay loam, brown (10YR 4/3) moist; massive; hard, friable, sticky and plastic; few very fine roots; common very fine tubular pores; many thin clay films in pores and bridging mineral grains; 30 percent gravel and cobbles; thin silica and lime coatings on underside of pebbles; noneffervescent in matrix but strongly effervescent under pebbles; moderately alkaline; clear wavy boundary.

IIC1sica—34 to 60 inches; pale brown (10YR 6/3) very cobbly heavy coarse sandy loam, brown (10YR 5/3) moist; massive; soft, very friable, slightly sticky and nonplastic; few very fine roots; many very fine interstitial pores; 55 percent cobbles and gravel; thin silica and lime coatings on underside of cobbles and pebbles; noneffervescent in matrix but slightly effervescent under pebbles and cobbles; strongly alkaline.

The surface is covered with 20 to 35 percent gravel. The A1 horizon has weak or moderate, fine or medium, granular or thin to thick, platy structure, or it is massive. It is loam to fine sandy loam that is 5 to 35 percent gravel. The A horizon is neutral in reaction. The transitional B1 horizon has weak or moderate, fine or medium, subangular blocky structure. It is loam, silt loam, or light clay loam. Depth to Bt horizon ranges from 14 to 20 inches. The Bt horizon ranges in thickness from 5 to 14 inches and is sandy clay loam, heavy loam, or clay loam that is 10 to 35 percent gravel. It has moderate or strong, fine to coarse, subangular blocky structure. The Bt horizon is neutral to mildly alkaline. The B3t horizon, where present, has weak, subangular blocky structure, or it is massive. Thickness of the A and B horizons ranges from 30 to 40 inches. The horizon of

accumulation of silica and lime is in the lower part of the B horizon and in the C horizon and consists of thin to moderately thick silica and lime coatings and pendants on the undersides of pebbles and cobbles. The Csica horizon ranges from moderately alkaline to strongly alkaline in reaction.

CfB—Credo fine sandy loam, 2 to 4 percent slopes. This gently sloping soil is in fan-shaped areas of moderate size on alluvial fans. It has a profile similar to that described as representative of the series, but the surface layer is fine sandy loam and less than 20 percent gravel. Included with this soil in mapping, and making up about 20 percent of the acreage, are areas of Kobeh and Alhambra soils and areas of a soil that has a strong silica-lime cemented hardpan.

Runoff is medium, and the hazard of erosion is moderate.

This soil is used mainly for cultivated crops, livestock grazing, and wildlife habitat. Capability units IIIe–40, irrigated, and VIc, dryland; Range Site NV 28–21 (Semidesert Loamy Plain).

CgC—Credo gravelly loam, 4 to 8 percent slopes. This moderately sloping soil is in long, narrow areas parallel to the old shoreline on intermediate and high lake terraces. It has the profile described as representative of the series. Included with this soil in mapping, and making up about 15 percent of the acreage, are areas of Kobeh and Alhambra soils and areas of a soil that has a strongly silica-lime cemented hardpan.

Runoff is medium, and the hazard of erosion is moderate.

This soil is suited to irrigated crops. It is used mainly for livestock grazing and wildlife habitat. Capability units IIIe–40, irrigated, and VIc, dryland; Range Site NV 28–21 (Semidesert Loamy Plain).

Croesus Series

The Croesus series consists of well-drained soils that formed in residuum and colluvium from limestone, siltstone, and conglomerate. These soils are in snow pockets on concave high mountainsides. Slope ranges from 30 to 50 percent. The vegetation is big sagebrush, bitterbrush, serviceberry, mountain-mahogany, bluebunch wheatgrass, squirreltail, Great Basin wildrye, and mountain brome. Elevation is 7,500 to 10,600 feet. Average annual precipitation is 14 to 18 inches, average annual temperature is 40° to 45° F, and the frost-free season is less than 50 days.

In a representative profile the upper 9 inches of the soil is dark grayish brown gravelly loam. The next 25 inches is dark brown very gravelly loam. Siltstone is at a depth of 34 inches.

Permeability is moderate. Effective rooting depth is 20 to 40 inches. Available water capacity is very low.

Representative profile of Croesus gravelly loam in an area of Croesus-Sheege association in White Pine County, 32 miles north of Eureka in an unsurveyed area, 3,400 feet south and 2,400 feet east of the southwest corner of sec. 36, T. 25 N., R. 54 E.:

A11—0 to 9 inches; dark grayish brown (10YR 4/2) gravelly loam, very dark brown (10YR 2/2) moist; massive; soft, very friable, nonsticky and nonplastic; many very fine and fine and few medium roots; many very fine and fine tubular pores; 40 percent gravel; slightly acid; gradual wavy boundary.

A12—9 to 21 inches; dark brown (7.5YR 4/2) very gravelly loam, very dark brown (10YR 2/2) moist; massive; soft, very friable, nonsticky and nonplastic, many very fine and fine and common medium roots; many fine and very fine tubular pores; 60 percent gravel; neutral; gradual wavy boundary.

A13ca—21 to 34 inches; dark brown (7.5YR 4/2) very gravelly loam, very dark brown (10YR 2/2) moist; massive; soft, very friable, nonsticky and nonplastic; many very fine and fine and common medium roots; many fine and very fine tubular pores; 60 percent gravel; thin lime under pebbles; mildly alkaline; abrupt wavy boundary.

R—34 inches, siltstone.

The profile is loam, very fine sandy loam, or fine sandy loam that averages 50 to 70 percent gravel throughout. The profile has weak, subangular blocky structure, or it is massive. Reaction generally is slightly acid to neutral, but the A13ca horizon is mildly alkaline to moderately alkaline. Bedrock is at a depth of 20 to 40 inches.

CS—Croesus-Sheege association. This association of steep to very steep soils is in large, elongated areas on mountains. The soils are shallow and moderately deep over limestone. The association is about 50 percent Croesus gravelly loam that has slopes of 30 to 50 percent and 30 percent Sheege very cobbly loam that has slopes of 30 to 75 percent. The Croesus soil is in concave snow pockets. The Sheege soil is on the steep to very steep mountainsides. Included with these soils in mapping, and making up about 10 percent of the acreage, are areas of Croesus-like soils that have bedrock below a depth of 40 inches. Another 10 percent of the acreage is areas of Rock outcrop.

Permeability is moderate. Available water capacity is very low. Runoff is rapid, and the hazard of erosion is severe.

These soils are not suited to irrigated crops. They are used mainly for livestock grazing and wildlife habitat. Croesus part in capability unit VIIe, dryland, and Sheege part in capability unit VIIs, dryland; woodland suitability group 3x2.

Cyan Series

The Cyan series consists of well-drained, moderately sloping to moderately steep soils that formed in residuum from andesite. These soils are on north-facing foothills. Slope ranges from 4 to 30 percent. The vegetation is scattered pinyon-juniper, big sagebrush, low sagebrush, Douglas rabbitbrush, squirreltail, Sandberg bluegrass, and bluebunch wheatgrass. Elevation is 6,000 to 7,500 feet. Average annual precipitation is 10 to 12 inches, average annual air temperature is 43° to 46° F, and the frost-free season is 50 to 70 days.

In a representative profile the surface layer is grayish brown very cobbly loam about 8 inches thick. The next layer is dark brown very gravelly clay about 9 inches thick. Below this is pale brown very gravelly sandy loam about 21 inches thick. This loam is underlain by pale brown, weakly cemented very gravelly sandy loam to a depth of 50 inches or more.

Permeability is moderate or moderately slow. Effective rooting depth is 50 inches or more. Available water capacity is low.

Representative profile of Cyan very cobbly loam in an area of Cyan association in Eureka County, 800 feet east of the southwest corner of sec. 8, T. 19 N., R. 54 E.:

A11—0 to 2 inches; grayish brown (10YR 5/2) very cobbly loam, very dark grayish brown (10YR 3/2) moist; moderate fine granular structure; soft, friable, slightly sticky and slightly plastic; many very fine roots; many fine and very fine interstitial pores; neutral; clear smooth boundary.

A12—2 to 8 inches; grayish brown (10YR 5/2) very cobbly loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure; soft, friable, slightly sticky and slightly plastic; common very fine and few medium and fine roots; many fine and very fine vesicular pores; neutral; gradual wavy boundary.

B2t—8 to 17 inches; dark brown (10YR 4/3) very gravelly clay, dark brown (7.5YR 4/3) moist; massive; hard, friable, very sticky and plastic; common medium, few fine, and many very fine roots; common fine and many very fine tubular pores; many thin and moderately thick clay films bridging and coating mineral grains; neutral; gradual wavy boundary.

B3t—17 to 38 inches; pale brown (10YR 6/3) very gravelly sandy loam, dark brown (10YR 4/3) moist; massive; very hard, friable, nonsticky and nonplastic; few root mats in the upper part; many very fine and fine interstitial pores; many thin and moderately thick clay film bridges between sand grains; neutral; gradual wavy boundary.

Csi—38 to 50 inches; pale brown (10YR 6/3), weakly silica cemented very gravelly sandy loam, dark brown (10YR 4/3) moist; massive; hard, firm, nonsticky and nonplastic; many fine and very fine interstitial pores; common thin and moderately thick, clear translucent silica films as bridges on and between sand grains, and silica coatings 1 to 10 millimeters thick on underside of pebbles and cobbles; neutral.

The A horizon is gravelly to very cobbly or stony loam that is 40 to 65 percent gravel or cobbles. Structure is weak or moderate granular or blocky. Thickness ranges from 6 to 10 inches. The Bt horizon is sandy clay loam to heavy sandy loam that is 18 to 35 percent clay and in places is 45 to 70 percent coarse fragments. It ranges from 20 to 36 inches in thickness and is very gravelly or cobbly sandy loam. It is massive and hard or very hard when dry. In places it is firm and brittle when moist. Depth to the Csi horizon ranges from 30 to 40 inches. This horizon is hard and very hard and is difficult to excavate in places. Bedrock is above a depth of 60 inches in places. Reaction is neutral to slightly acid throughout.

CY—Cyan association. This association of moderately sloping to moderately steep soils is in large irregularly shaped areas on north-facing foothills. The soils are deep, cobbly to very cobbly, and medium textured. The association is about 50 percent Cyan cobbly loam that has slopes of 15 to 30 percent and about 40 percent Cyan very cobbly loam that has slopes of 4 to 15 percent. The Cyan very cobbly loam has the profile described as representative of the series. The Cyan cobbly loam has a profile similar to that described as representative of the series, but it has fewer cobbles on the surface. Included with this association in mapping, and making up about 10 percent of the acreage, are areas of a soil that is similar to Cyan soils but that has lime in the C horizon.

Runoff is rapid on the moderately steep soils and medium on the moderately sloping to strongly sloping soils. The hazard of erosion is severe on the moderately steep soils and moderate on the moderately sloping to strongly sloping soils.

These soils are not suited to irrigated crops. They are used mainly for livestock grazing and wildlife habitat. Capability unit VIIs, dryland; Range Site NV 28–29 (Semidesert Loamy Slopes).

Devoy Series

The Devoy series consists of well-drained soils that formed in residuum from alaskite and andesite. These soils are on hills and mountainsides. Slope ranges from 8 to 50 percent. The vegetation is pinyon, juniper, big sagebrush, Nevada ephedra, squirreltail, and bluebunch wheatgrass. Elevation is 6,500 to 8,000 feet. Average annual precipitation is 10 to 14 inches, average annual air temperature is 43° to 46° F, and the frost-free season is 50 to 100 days.

In a representative profile the surface layer is grayish brown very stony loam and gravelly loam about 12 inches thick. The next layer is variegated light gray and light yellowish brown very gravelly heavy clay loam about 6 inches thick. Below this is yellowish brown very gravelly clay about 12 inches thick. Alaskite bedrock is at a depth of 30 inches.

Permeability is slow. Effective rooting depth is 26 to 40 inches. Available water capacity is low.

Representative profile of Devoy very stony loam in an area of Devoy-Rock outcrop complex in Eureka County, 2,200 feet northwest of the triangulation station (Jack's) VABM 8147, T. 20 N., R. 52 E.:

A11—0 to 5 inches; grayish brown (10YR 5/2) very stony loam, dark brown (10YR 3/3) moist; weak very fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; few fine and many very fine roots; many fine and very fine vesicular pores; 40 percent gravel, 20 percent cobbles, and 5 percent stones; neutral; clear smooth boundary.

A12—5 to 12 inches; grayish brown (10YR 5/2) gravelly loam, very dark grayish brown (10YR 3/2) moist; weak fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common coarse and many medium, fine, and very fine roots; many fine and very fine tubular pores; neutral; clear smooth boundary.

A&B—12 to 18 inches; variegated light gray and light yellowish brown (10YR 7/1, 6/4) very gravelly heavy clay loam, variegated light brownish gray and yellowish brown (10YR 6/2, 5/4) moist; weak fine granular structure; hard, friable, very sticky and very plastic; few fine and very fine roots; many fine and very fine tubular pores; slightly acid; clear wavy boundary.

B2t—18 to 30 inches; yellowish brown (10YR 5/4) very gravelly clay, dark yellowish brown (10YR 4/4) moist; strong coarse angular blocky structure; very hard, friable, very sticky and very plastic; very few very fine roots; common very fine tubular pores; slightly acid; abrupt wavy boundary.

R—30 inches, alaskite bedrock; clay in fractures.

The A horizon is 50 to 65 percent gravel, cobbles, and stones. Structure is platy, subangular blocky, or granular, and consistence is soft to slightly hard. Thickness is 9 to 16 inches, increasing with elevation. The Bt horizon is sandy clay or clay that is 35 to 60 percent coarse fragments. Structure tends toward prismatic where coarse fragments are fewest but is otherwise angular blocky. A thin zone of lime accumulation occurs just above the bedrock in some places.

DC—Devoy-Rock outcrop complex. This complex of steep soils and Rock outcrop is in large, oblong areas on hills and mountainsides. It is about 75 percent Devoy very stony loam that has slopes of 30 to 50 percent and about 15 percent Rock outcrop. The Devoy soil has the profile described as representative of the series. Included with this complex in mapping, and making

up about 10 percent of the acreage, are areas of Handy soils.

Runoff is rapid on the Devoy soil, and the hazard of erosion is severe.

The Devoy soil is not suited to irrigated crops. It is used mainly for livestock grazing and wildlife habitat. The Rock outcrop is barren. Capability unit VIIs, dryland; Devoy part in woodland suitability group 3x1.

DE—Devoy association. This association of strongly sloping and moderately steep soils is in medium and large, irregularly shaped areas on mountains. It is about 45 percent Devoy cobbly loam that has slopes of 8 to 15 percent and 40 percent Devoy cobbly loam that has slopes of 15 to 30 percent. The soils have profiles similar to that described as representative of the series, but the surface layer is cobbly. Included with these soils in mapping, and making up about 15 percent of the acreage, are areas of Holtle soils.

Runoff is medium to rapid, and the hazard of erosion is moderate to severe.

These soils are not suited to irrigated crops. They are used mainly for livestock grazing and wildlife habitat. Capability unit VIIs, dryland; woodland suitability group 3x1.

Dianev Series

The Dianev series consists of moderately well drained to somewhat poorly drained soils that formed in alluvium and lacustrine material from mixed rock sources. These soils are on flood plains and low lake terraces. Slope ranges from 0 to 2 percent. The vegetation is greasewood, saltgrass, alkali sacaton, bluejoint wildrye, squirreltail, rubber rabbitbrush, and Great Basin wildrye. Elevation is 5,770 to 6,020 feet. Average annual precipitation is 8 to 10 inches, average annual air temperature is 43° to 46° F, and the frost-free season is 70 to 100 days.

In a representative profile the soil is fairly uniform light gray silty clay loam to a depth of more than 60 inches. It is mottled below a depth of 40 inches.

Permeability is slow or very slow. Effective rooting depth is 60 inches. Available water capacity is high.

Representative profile of Dianev silty clay loam, in Eureka County, 700 feet east and 1,250 feet south of the northwest corner of sec. 18, T. 20 N., R. 52 E.:

A1—0 to 2 inches; light gray (10YR 7/2) silty clay loam, dark grayish brown (10YR 4/2) moist; moderate very fine granular structure; slightly hard, friable, sticky and plastic; many fine and very fine vesicular pores; violently effervescent; very strongly alkaline; abrupt smooth boundary.

C1—2 to 10 inches; light gray (10YR 7/2) heavy silty clay loam, brown (10YR 5/3) moist; moderate fine angular blocky structure; hard, friable, sticky and plastic; many medium and common fine and very fine roots; common fine and many very fine tubular pores; violently effervescent; very strongly alkaline; clear smooth boundary.

C2—10 to 26 inches; light gray (10YR 7/2) silty clay loam, brown (10YR 5/3) moist; weak medium platy structure; hard, friable, sticky and plastic; common very fine roots; many very fine tubular pores; violently effervescent; strongly alkaline; clear smooth boundary.

C3—26 to 40 inches, light gray (10YR 7/2) silty clay loam, brown (10YR 5/3) moist; weak medium platy structure; hard, friable, sticky and slightly plastic; few very fine roots; many very fine tubular pores; violently effervescent; strongly alkaline; clear smooth boundary.

C4—40 to 60 inches; light gray (10YR 7/2) silty clay loam, pale brown (10YR 6/3) moist; common coarse faint iron mottles, brown (10YR 5/3) moist; massive; hard, firm, sticky and plastic; violently effervescent; strongly alkaline.

The A1 horizon is platy or granular. The upper part of the C horizon, to a depth of about 36 inches, is silt loam to silty clay loam. It has platy structure, or it is massive. The C horizon below a depth of 36 inches is gleyed or mottled and generally is light silty clay loam to clay, but there are some strata of loamy very fine sand to very fine sandy loam in places.

DN—Dianev silt loam. This nearly level soil is in elongated areas of large and moderate size around and parallel to the sides of the playa on low lake terraces. It has a profile similar to that described as representative of the series, but the upper 23 inches is silt loam. The soil is drained. Some of the salt and alkali have been removed through leaching. Included with this soil in mapping, and making up about 15 percent of the acreage, are areas of Alhambra soils, Playas, and other Dianev soils.

Runoff is slow, and the hazard of erosion is slight. A seasonal high water table is at a depth of 3 to 6 feet.

This soil is suited to irrigated crops. It is used for cultivated crops, livestock grazing, and wildlife habitat. Capability units IIIs–111, irrigated, and VIs, dryland; Range Site NV 28–23, (Arid Loamy Bottomland, Saline-Alkali).

DO—Dianev silty clay loam. This nearly level soil is in elongated, irregularly shaped areas on flood plains and low lake terraces. It has the profile described as representative of the series. It is strongly saline-alkali affected and is somewhat poorly drained. Included with this soil in mapping, and making up about 15 percent of the acreage, are areas of Bicondoa soils and other Dianev soils.

Runoff is slow or ponded, and the hazard of erosion is slight. A seasonal high water table is at a depth of 2½ to 4 feet.

This soil is not suited to irrigated crops. It is used mainly for native hay, livestock grazing, and wildlife habitat. It has potential for development as waterfowl habitat. Capability unit VIIw, dryland; Range Site NV 28–26 (Arid Salty Flats).

Fairydell Series

The Fairydell series consists of well-drained, moderately steep soils that formed in alluvium from limestone and conglomerate. These soils are on old dissected fans and pediments. Slope ranges from 15 to 30 percent. The vegetation is big sagebrush, rabbitbrush, Great Basin wildrye, Sandberg bluegrass, low sagebrush, and bluebunch wheatgrass. Elevation is 6,500 to 8,000 feet. Average annual precipitation is 12 to 16 inches, average annual air temperature is 44° to 47° F, and the frost-free season is 50 to 70 days.

In a representative profile the upper 23 inches of the soil is dark grayish brown, light yellowish brown, and pale brown gravelly loam. Below is pale brown very gravelly loam that is 60 percent lime coated cobbles and pebbles and that extends to a depth of 60 inches and more.

Permeability is moderate. Effective rooting depth is

60 inches or more. Available water capacity is moderate.

Representative profile of Fairydell gravelly loam, 15 to 30 percent slopes, in Eureka County, 950 feet south and 2,700 feet west of the northeast corner of sec. 2 T. 19 N., R. 54 E.:

A1—0 to 6 inches; dark grayish brown (10YR 4/2) gravelly loam, very dark brown (10YR 2/2) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common medium and fine and many very fine roots; many fine and very fine vesicular pores; 35 percent gravel; noneffervescent except for limestone pebbles; mildly alkaline; clear wavy boundary.

B2—6 to 12 inches; light yellowish brown (10YR 6/4) gravelly loam, dark brown (10YR 4/3) moist; dark grayish brown (10YR 4/2) organic stains; moderate medium subangular blocky structure; hard, friable, sticky and plastic; common medium and fine and many very fine roots; common fine and many very fine tubular pores; slight effervescence, except strongly effervescent near and beneath limestone gravel and cobbles; moderately alkaline; clear wavy boundary.

B3sica—12 to 23 inches; variegated brown and pale brown (10YR 5/3, 6/3) gravelly loam, brown (10YR 4/3) moist; weak fine subangular blocky structure; hard, friable, sticky and plastic; few fine and common very fine roots; common fine and many very fine tubular pores; strongly effervescent; silica and lime coats on gravel and cobbles, thin on top and moderately thick on bottom; moderately alkaline; clear wavy boundary.

Csica—23 to 60 inches; pale brown (10YR 6/3) very gravelly loam, brown (10YR 5/3) moist; massive; hard, friable, sticky and plastic; few fine and common very fine roots; few fine and common very fine tubular pores; 60 percent cobbles and gravel; silica and lime coats on gravel and cobbles, thin on top and thick on underside; many fine distinct white (10YR 8/2) lime masses, violently effervescent; strongly alkaline.

Gravel content of the A horizon ranges from 40 to 65 percent. Structure is granular or blocky. Reaction is neutral to moderately alkaline. The B horizon is loam to heavy loam that is 40 to 65 percent gravel. Effervescence is slight to strong. The Csica horizon is 50 to 80 percent cobbles and gravel.

FAE—Fairydell gravelly loam, 15 to 30 percent slopes. This moderately steep soil is in large, irregularly shaped areas on high, dissected, old alluvial fans and pediments. Included with this soil in mapping, and making up about 15 percent of the acreage, are areas of Holtle soils and areas of a soil that is similar to Fairydell soils but that lacks the subsoil characteristics of Fairydell soils.

Runoff is medium, and the hazard of erosion is moderate.

This soil is not suited to irrigated crops. It is used mainly for livestock grazing and wildlife habitat. Capability unit VIe, dryland; woodland suitability group 3x1.

Fera Series

The Fera series consists of well-drained soils that formed in shale and conglomerate residuum. These soils are on north-facing low mountainsides. Slope ranges from 15 to 50 percent. The vegetation is big sagebrush, bluebunch wheatgrass, and rabbitbrush. Pinyon and juniper are in fire-protected areas. Elevation is 6,000 to 7,500 feet. Average annual precipitation is 8 to 12 inches, average annual air temperature is 41° to 45° F, and the frost-free season is 50 to 100 days.

In a representative profile the surface layer is grayish brown very stony loam and brown very gravelly loam about 11 inches thick. The next layer is light brown very gravelly clay loam about 7 inches thick. Below this is 24 inches of brown very gravelly clay that is 60 percent gravel. Conglomerate bedrock is at a depth of 42 inches.

Permeability is slow. Effective rooting depth is 40 to 60 inches. Available water capacity is low.

Representative profile of Fera very stony loam in an area of Fera-Roca association in Eureka County, 1,000 feet west and 1,600 feet north of the southeast corner of sec. 23, T. 24 N., R. 54 E.:

A11—0 to 5 inches; grayish brown (10YR 5/2) very stony loam, very dark grayish brown (10YR 3/2) moist; moderate fine and medium granular structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine roots; many fine and very fine interstitial pores; class 2 stoniness; 50 percent gravel; neutral; clear wavy boundary.

A12—5 to 11 inches; brown (10YR 5/3) very gravelly loam, dark brown (10YR 3/3) moist; weak fine and medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine roots; many fine and very fine tubular pores; 60 percent gravel; neutral; clear wavy boundary.

B1t—11 to 18 inches; light brown (7.5YR 6/4) very gravelly clay loam, brown (7.5YR 5/4) moist; moderate fine and very fine angular blocky structure; hard, friable, sticky and plastic; common very fine roots; many fine and very fine interstitial and tubular pores; 60 percent gravel; neutral; clear wavy boundary.

B2t—18 to 42 inches; brown (7.5YR 5/4) very gravelly clay, brown (7.5YR 5/4) moist; moderate medium and fine angular blocky structure; very hard, firm, very sticky and very plastic; common very fine roots; common very fine tubular pores; 60 percent gravel; neutral; abrupt wavy boundary.

R—42 inches; conglomerate bedrock.

The A horizon is loam that contains 40 to 80 percent gravel, cobbles, and stones. It has weak or moderate, fine or medium, granular or subangular blocky structure. The Bt horizon commonly has moderate or strong, very fine to medium, angular or subangular blocky structure, but in some places where coarse fragments are less than 50 percent by volume the horizon has weak, prismatic structure. The Bt horizon is heavy clay loam or clay that is 35 to 70 percent gravel, cobbles, and stones. A B3 and a C horizon are present in some places where bedrock is shale and is below a depth of 48 inches.

FR—Fera-Roca association. This association of moderately steep and steep soils is in elongated, irregularly shaped areas on low mountainsides. It is about 40 percent Fera very stony loam that has slopes of 15 to 50 percent. The Fera soil has north-facing slopes and a grayish brown surface layer. The Roca soil has south-facing slopes and a thin, light brownish gray surface layer. Included with these soils in mapping, and making up about 20 percent of the acreage, are areas of Rock outcrop.

Runoff is rapid, and the hazard of erosion is moderate to severe.

This association is not suited to irrigated crops. It is used mainly for livestock grazing and wildlife habitat.

Capability unit VIIs, dryland; woodland suitability group 3x1.

Fusulina Series

The Fusulina series consists of well-drained soils that formed in residuum from soft shale on mountainsides. Slope ranges from 30 to 75 percent. The vegetation is big sagebrush, bitterbrush, pinyon, juniper, and Great Basin wildrye. Elevation is 7,000 to 10,600 feet. Average annual precipitation is 12 to 18 inches, average annual air temperature is 40° to 44° F, and the frost-free season is less than 50 days.

In a representative profile the soil is about 12 inches of dark brown shaly loam that is 20 to 30 percent shale fragments. This is underlain by soft shale.

Permeability is moderate. Effective rooting depth is 6 to 16 inches. Available water capacity is very low.

Representative profile of Fusulina shaly loam in an area of Fusulina-Sheege association in Eureka County, 650 feet west of the southeast corner of sec. 13, T. 19 N., R. 54 E.:

A11—0 to 2 inches; dark brown (10YR 4/3) shaly loam, very dark grayish brown (10YR 3/2) moist; massive; soft, very friable, nonsticky and nonplastic; few very fine roots; many fine and very fine interstitial pores; 20 percent shale fragments; neutral; abrupt smooth boundary.

A12—2 to 12 inches; dark brown (10YR 4/3) shaly loam, very dark grayish brown (10YR 3/2) moist; massive; soft, very friable, nonsticky and nonplastic; many very fine and few fine roots; common fine and very fine interstitial pores; 30 percent shale fragments; neutral; abrupt irregular boundary.

R—12 inches; tilled shale bedrock (Chainman Formation).

The profile is 15 to 35 percent shale fragments. Depth to soft shale is 6 to 16 inches.

FU—Fusulina-Sheege association. This association of steep and very steep soils is in large, elongated areas on mountainsides. It is about 45 percent Fusulina shaly loam that has slopes of 50 to 75 percent and about 30 percent Sheege very cobbly loam that has slopes of 50 to 75 percent. Included with these soils in mapping, and making up about 25 percent of the acreage, are areas of Croesus soils and Rock outcrop.

Runoff is rapid, and the hazard of erosion is severe.

These soils are not suited to irrigated crops. They are used for limited wildlife habitat. Fusulina part in capability unit VIIe, dryland, and Sheege part in capability unit VIIs, dryland; woodland suitability group 3x2.

Gabel Series

The Gabel series consists of well-drained soils that formed in residuum from tuff that has an admixture of loess. These soils are on foothills. Slope ranges from 15 to 30 percent. The vegetation is big sagebrush, bitterbush, Douglas rabbitbrush, Great Basin wildrye, snowberry, squirreltail, bluebunch wheatgrass, and pinyon-juniper. Elevation is 6,300 to 7,200 feet. Average annual precipitation is 10 to 14 inches, average annual air temperature is 43° to 46° F, and the frost-free season is 50 to 100 days.

In a representative profile the surface layer is grayish brown gravelly loam about 7 inches thick. The next layer is very gravelly sandy clay loam about 8 inches thick. Below this is pale brown very gravelly coarse sandy loam about 9 inches thick. This is underlain by light gray tuff to a depth of 40 inches or more.

Permeability is moderately slow. Effective rooting depth is 20 to 40 inches. Available water capacity is very low.

Representative profile of Gabel gravelly loam, 15 to 30 percent slopes, Eureka County, 1,050 feet north and 1,450 feet west of the southeast corner of sec. 14, T. 19 N., R. 53 E.:

A11—0 to 3 inches; grayish brown (10YR 5/2) gravelly loam, very dark grayish brown (10YR 3/2) moist; weak medium and fine granular structure; soft, friable, slightly sticky and slightly plastic; many medium, fine, and very fine roots; many fine and very fine interstitial pores; 20 percent gravel; neutral; clear smooth boundary.

A12—3 to 7 inches; grayish brown (10YR 5/2) gravelly loam, very dark brown (10YR 2/2) moist; weak medium subangular blocky structure; slightly hard, friable, sticky and plastic; many medium, fine, and very fine roots; few fine and common very fine tubular pores; 20 percent gravel; neutral; clear wavy boundary.

B2t—7 to 15 inches; pale brown (10YR 6/3) very gravelly sandy clay loam, dark brown (10YR 4/3) moist; massive; slightly hard, friable, sticky and plastic; few fine and very fine roots; many fine and very fine interstitial pores; 60 percent gravel; common thin clay bridges between sand grains; noneffervescent except for spots; neutral; gradual smooth boundary.

B3t—15 to 24 inches; pale brown (10YR 6/3) very gravelly coarse sandy loam, dark brown (10YR 4/3) moist; massive; slightly hard, friable, slighty sticky and slightly plastic; few fine and very fine roots; many fine and very fine interstitial pores; 70 percent gravel; few thin clay bridges between sand grains; noneffervescent except in spots; neutral; abrupt wavy boundary.

C—24 to 40 inches; light gray (10YR 7/2) tuff, brown (10YR 5/3) moist; hardness on Mohs' scale less than 3; noncalcareous except for a very thin, discontinuous, silica-lime lamina, less than 2 millimeters thick, on surface of horizon.

The A1 horizon has weak or moderate, blocky structure, or it is massive. It is fine sandy loam to heavy loam that is 20 to 40 percent gravel, by volume. The Bt horizon is sandy clay loam to light clay loam that is 35 to 70 percent angular gravel. It has prismatic or blocky structure, or the horizon is massive. The profile is mostly neutral or slightly acid throughout, but in a few areas it contains lime.

GAE—Gabel gravelly loam, 15 to 30 percent slopes. This moderately steep soil is in irregularly shaped areas of moderate size on hills. It has the profile described as representative of the series. Included with this soil in mapping, and making up about 20 percent of the acreage, are areas of soils that are similar to Gabel soils but that are less than 20 inches deep to bedrock, and areas of tuff Rock outcrop.

Runoff is medium, and the hazard of erosion is moderate.

This soil is not suited to irrigated crops. It is used mainly for livestock grazing and limited urban development. Capability unit VIIe, dryland; Range Site NV 28–22 (Semidesert Shallow Loamy Slope).

GB—Gabel-Badland association. This association of moderately steep soils is in irregularly shaped areas of medium size on foothills. It is about 60 percent Gabel gravelly loam, 15 to 30 percent slopes, and about 30

percent Badland. The Gabel soil is on the moderately steep ridgetops and side slopes. The Badland is on steep and very steep, eroded tuff side slopes. Included with these soils in mapping, and making up about 10 percent of the acreage, are areas of a soil that is similar to this Gabel soil but that is less than 20 inches deep to bedrock, and scattered areas of Rock outcrop.

Runoff is medium on the Gabel soil and very rapid on the Badland. The hazard of erosion is moderate on the Gabel soil and very severe on the Badland.

This association is not suited to crops. It is used mainly for livestock grazing and wildlife habitat. Gabel part in capability unit VIIe, dryland, and Badland part in capability unit VIIIe, dryland; Gabel part in Range Site NV 28–22 (Semidesert Shallow Loamy Slope).

Hamacer Series

The Hamacer series consists of somewhat excessively drained soils that formed in alluvial and eolian material from mixed rock sources that are high in siliceous material and influenced by volcanic ash. These soils are on old flood plains and stream terraces. Slope ranges from 0 to 2 percent. The vegetation is big sagebrush, Indian ricegrass, and rubber rabbitbrush. Elevation is 5,800 to 6,100 feet. Average annual precipitation is 8 to 10 inches, average annual air temperature is 42° to 45° F, and the frost-free season is 70 to 100 days.

In a representative profile the upper 21 inches of the soil is grayish brown and light brownish gray loamy fine sand. The next 12 inches is pale brown fine sand that is 50 percent hard, brittle, silica-lime cemented nodules. Below this is pale brown loamy fine sand over light brownish gray fine sand that extends to a depth of 60 inches.

Permeability is rapid. Effective rooting depth is 60 inches. Available water capacity is low.

Small grain and alfalfa are the main cultivated crops.

Representative profile of Hamacer loamy fine sand, 0 to 2 percent slopes, in Eureka County, 150 feet north and 2,950 feet east of the southwest corner of sec. 16, T. 21 N., R. 53 E.:

A1—0 to 4 inches; grayish brown (10YR 5/2) loamy fine sand, dark brown (10YR 3/3) moist; massive; soft, very friable, nonsticky and nonplastic; few fine and common very fine roots; many very fine interstitial pores; neutral; abrupt smooth boundary.

C1—4 to 21 inches; light brownish gray (10YR 6/2) loamy fine sand, brown (10YR 4/3) moist; massive; slightly hard, very friable, nonsticky and nonplastic; common medium, few fine, and common very fine roots; many very fine interstitial pores; neutral; clear wavy boundary.

C2si—21 to 33 inches; pale brown (10YR 6/3) fine sand, brown (10YR 4/3) moist; massive; slightly hard, friable, nonsticky and nonplastic; common very fine roots; many very fine interstitial pores; 50 percent hard, firm, and brittle cylindrical silica-lime cemented durinodes; neutral; clear wavy boundary.

C3—33 to 38 inches; pale brown (10YR 6/3) loamy fine sand, dark grayish brown (10YR 4/2) moist; massive; soft, friable, nonsticky and nonplastic; common very fine roots; many very fine interstitial pores; neutral; gradual smooth boundary.

C4—38 to 60 inches; light brownish gray (10YR 6/2) fine sand, dark grayish brown (10YR 4/2) moist; massive; soft, friable, nonsticky and nonplastic; few very fine roots; many very fine interstitial pores; neutral.

The profile is loamy fine sand or fine sand throughout. It is normally nongravelly, but in some places the C horizon is gravelly. Hard, brittle, silica-lime cemented durinodes, ½ to 1 inch in diameter, make up 20 to 90 percent, by volume, of the Csi horizon. Reaction varies from pH 7.0 to 8.6 throughout. The profile is generally noneffervescent throughout, but in some places there are calcareous strata. The profile is single grained or massive, and it ranges from loose to slightly hard in consistence.

HaA—Hamacer loamy fine sand, 0 to 2 percent slopes. This soil is in large, irregularly shaped areas on old stream terraces and flood plains. Included with this soil in mapping, and making up about 10 percent of the acreage, are areas of Silverado soils and other soils that are similar to Hamacer soils but that have slopes as steep as 4 percent.

Runoff is slow, and the hazard of soil blowing moderate or severe.

This soil is used mainly for alfalfa hay and small grain where irrigation water has been provided. It is also used for livestock grazing and wildlife habitat. Capability unit IIIs–115, irrigated, and VIs, dryland; Range Site NV 28–28 (Semidesert Sandy Plain).

Handy Series

The Handy series consists of well-drained soils that formed in alluvium. The alluvium derived mainly from alaskite but was influenced by limestone and dolomite. These soils are on old alluvial fans. Slope ranges from 4 to 15 percent. The vegetation is big sagebrush, Nevada ephedra, bluegrass, squirreltail, and a scattering of pinyon and juniper. Elevation is 6,000 to 6,400 feet. Average annual precipitation is 8 to 12 inches, average annual air temperature is 43° to 47° F, and the frost-free season is 70 to 100 days.

In a representative profile, the surface layer is pale brown gravelly loam about 4 inches thick. The next layer is brown gravelly clay loam about 4 inches thick. Below this is yellowish brown, light yellowish brown, and pale brown gravelly clay about 22 inches thick. This is underlain by very pale brown gravelly fine sandy loam to a depth of 60 inches or more.

Permeability is slow. Effective rooting depth is 60 inches. Available water capacity is moderate.

Representative profile of Handy gravelly loam, 4 to 15 percent slopes, in Eureka County, 1,000 feet south of the southeast corner of sec. 36, T. 21 N., R. 52 E.:

A1—0 to 4 inches; pale brown (10YR 6/3) gravelly loam, brown (10YR 4/3) moist; weak fine and very fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots; many very fine and few fine interstitial pores; 20 percent gravel; neutral; abrupt smooth boundary.

B1—4 to 8 inches; brown (10YR 5/3) gravelly clay loam, brown (10YR 4/3) moist; weak fine and very fine granular structure; slightly hard, friable, sticky and plastic; common fine and many very fine and fine roots; many very fine and fine interstitial pores and few fine tubular pores; 15 percent gravel; neutral; abrupt smooth boundary.

B21t—8 to 13 inches; yellowish brown (7.5YR 5/4) gravelly clay, brown (10YR 4/3) moist; strong fine prismatic structure; hard, firm, very sticky and very plastic; few coarse, medium, fine, and very fine

roots; common very fine and fine interstitial pores and few fine tubular pores; 15 percent gravel; common moderately thick clay films on peds and in pores; neutral; abrupt smooth boundary.

B22t—13 to 19 inches; light yellowish brown (10YR 6/4) gravelly clay, dark yellowish brown (10YR 4/4) moist; strong fine prismatic structure; hard, firm, very sticky and very plastic; few coarse, medium, fine, and very fine roots; few very fine tubular pores; 15 percent gravel; many thick clay films on peds and in pores; slightly effervescent on underside of some pebbles; neutral; clear smooth boundary.

B3ca—19 to 30 inches; very pale brown (10YR 8/4) gravelly clay, light yellowish brown (10YR 6/4) moist; moderate very fine and fine subangular blocky structure; slightly hard, friable, sticky and plastic; common, very fine, and fine roots; few very fine and fine interstitial pores; 25 percent gravel; lime coats on underside of pebbles; mildly alkaline; abrupt smooth boundary.

Cca—30 to 60 inches; very pale brown (10YR 7/3) gravelly fine sandy loam, light yellowish brown (10YR 6/4) moist; massive; soft, very friable, nonsticky and nonplastic; common fine and very fine roots; many fine and very fine interstitial pores; 30 percent gravel; violently effervescent; moderately alkaline.

The A horizon generally has weak or moderate, granular structure, but it has weak, thick, platy structure in some places. It is loam to fine sandy loam that is 10 to 25 percent gravel. The B2t horizon has moderate to strong, angular blocky or prismatic structure. It is clay that contains 10 to 30 percent gravel and some cobbles in places. The C horizon ranges in texture from loam to loamy sand, and it generally is more than 35 percent gravel. Reaction increases with depth from neutral in the upper part of the profile to mildly alkaline or moderately alkaline in the lower part of the B horizon, and moderately alkaline or strongly alkaline in the Cca horizon. The Cca horizon is strongly or violently effervescent. Lime pendants or coatings are beneath the pebbles and cobbles.

HDD—Handy gravelly loam, 4 to 15 percent slopes. This soil is in large, irregularly shaped areas on old alluvial fans. Included with this soil in mapping, and making up about 10 percent of the acreage, are areas of Nayped, Rubyhill, and Umil soils.

Runoff is medium, and the hazard of erosion is moderate.

This soil is not suited to irrigated crops. It is used mainly for livestock grazing and wildlife habitat. Capability unit VIs, dryland; Range Site NV 28–29 (Semidesert Loamy Slope).

Hayeston Series

The Hayeston series consists of well-drained soils that formed in lakeshore sediment. The sediment derived from limestone and dolomite and some basalt. These soils are on low lake terraces and beaches. Slope ranges from 2 to 4 percent. The vegetation is big sagebrush, Nevada bluegrass, Great Basin wildrye, and Douglas rabbitbrush. Elevation is 5,800 to 6,100 feet. Average annual precipitation is 8 to 10 inches, average annual air temperature is 45° to 46° F, and the frost-free season is 70 to 100 days.

In a representative profile, the upper 31 inches of the soil is very pale brown gravelly fine sandy loam. The next 11 inches is very pale brown gravelly loamy fine sand. Below this, to a depth of 60 inches, is multicolored sand and gravel that has white lime coatings on the underside of pebbles.

Permeability is moderately rapid. Effective rooting depth is 60 inches. Available water capacity is low.

Representative profile of Hayeston gravelly fine sandy loam in an area of Hayeston-Silverado association in Eureka County, 1,000 feet south and 500 feet west of the east quarter-corner of sec. 2, T. 22 N., R. 52 E.:

A1—0 to 3 inches; very pale brown (10YR 7/3) gravelly fine sandy loam, brown (10YR 5/3) moist; massive; soft, very friable, nonsticky and nonplastic; few fine and common very fine roots; many fine and very fine and few medium tubular pores; 30 percent gravel; strongly effervescent; strongly alkaline; abrupt smooth boundary.

C1—3 to 31 inches; very pale brown (10YR 7/3) gravelly fine sandy loam, brown (10YR 5/3) moist; massive; soft, very friable, nonsticky and nonplastic; common fine, very fine, and medium roots; many fine and very fine and few medium tubular pores; 30 percent gravel; violently effervescent; strongly alkaline; abrupt smooth boundary.

IIC2—31 to 42 inches; very pale brown (10YR 7/4) gravelly loamy fine sand, yellowish brown (10YR 5/4) moist; single grained; loose, nonsticky and nonplastic; common fine and very fine roots; many fine and very fine interstitial pores; 30 percent gravel; violently effervescent; strongly alkaline; abrupt smooth boundary.

IIC3—42 to 60 inches; multicolored very gravelly loamy sand (various colored pebbles and sand); single grained; loose, nonsticky and nonplastic; no roots; many fine and very fine interstitial pores; 60 percent gravel; lime coating on underside of larger pebbles; violently effervescent; strongly alkaline.

The profile is slightly to strongly effervescent, but it is noneffervescent to a depth of 6 inches in places. The A horizon is 5 to 30 percent gravel. The C1 horizon is fine sandy loam, sandy loam, or loamy sand that is 5 to 35 percent rounded gravel. The IIC horizon is gravelly loamy sand or sand.

HE—Hayeston-Silverado association. This association is in long, narrow strips that follow the old shoreline on lake terraces and beaches. It is about 50 percent Hayeston gravelly fine sandy loam that has slopes of 2 to 4 percent and about 30 percent Silverado sandy loam, 2 to 4 percent slopes. The Hayeston soil is on slightly lower positions on the landscape, and the Silverado soil is on slightly higher positions. The Hayeston soil has the profile described as representative of the Hayeston series. The Silverado soil has a profile similar to the one described as representative of the Silverado series, but the surface layer is sandy loam. Included with these soils in mapping, and making up about 20 percent of the acreage, are areas of Shipley, Nayped, and Umil soils.

Runoff is medium on the Hayeston soil and slow or medium on the Silverado soil. The hazard of erosion is slight on the Hayeston soil and slight to moderate on the Silverado soil.

This association is used for irrigated crops, livestock grazing, and wildlife habitat. Capability units IVe–45, irrigated, and VIc, dryland; Range Site NV 28–21 (Semidesert Loamy Plain).

Holtle Series

The Holtle series consists of well-drained, nearly level and gently sloping soils that formed in alluvium from mixed parent material. These soils are on alluvial fans, flood plains, and terraces. Slope ranges from 0 to

4 percent. The vegetation is big sagebrush, bluebunch wheatgrass, Sandberg bluegrass, and rabbitbrush. Elevation is 5,800 to 6,500 feet. Average annual precipitation is 8 to 12 inches, average annual air temperature is 42° to 44° F, and the frost-free season is 70 to 100 days.

In a representative profile the upper 18 inches of the soil is grayish brown and pale brown loam. The next 11 inches is pale brown loam that is about 30 percent silica-lime cemented nodules. Below this is pale brown loam to a depth of 60 inches.

Permeability is moderate. Effective rooting depth is 60 inches. Available water capacity is high.

Representative profile of Holtle loam, 0 to 2 percent slopes, in Eureka County, 200 feet west of the northeast corner of sec. 31, T. 27 N., R. 54 E.:

A11—0 to 4 inches; grayish brown (10YR 5/2) loam, dark brown (10YR 3/3) moist; strong, thick and very thick platy structure; soft, very friable, slightly sticky and slightly plastic; few very fine and fine roots, mostly between plates; many very fine interstitial pores; 5 percent gravel; neutral; abrupt smooth boundary.

A12—4 to 10 inches; grayish brown (10YR 5/2) loam, dark brown (10YR 3/3) moist; moderate thin platy structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine and few fine and medium roots; many very fine interstitial pores and many very fine tubular pores; few cicada (insect) burrows; neutral; abrupt smooth boundary.

B2—10 to 18 inches; pale brown (10YR 6/3) loam, dark brown (10YR 3/3) moist; weak very thin platy structure; slightly hard, friable, slighty sticky and slightly plastic; few very fine and fine roots; many very fine interstitial pores and few fine tubular pores; neutral; abrupt smooth boundary.

C1si—18 to 29 inches; pale brown (10YR 6/3) loam, dark brown (10YR 3/3) moist; massive; hard, friable, slightly sticky and slightly plastic; few very fine and fine roots; few coarse tubular pores and many very fine and fine interstitial and tubular pores; about 30 percent very hard, firm, and brittle cylindrical silica-lime cemented durinodes ½ to 1-inch diameter; mildly alkaline; abrupt smooth boundary.

C2—29 to 60 inches; pale brown (10YR 6/3) loam, dark brown (10YR 4/3) moist; massive; very hard, firm to friable, nonsticky and slightly plastic; no roots observed; common very fine and fine interstitial pores and few very fine and fine tubular pores; noneffervescent except where there are common fine and medium distinct white (10YR 8/2) lime masses; strongly alkaline.

The A horizon is very fine sandy loam or heavy loam. Structure is platy or blocky. The A horizon is noneffervescent and neutral to mildly alkaline. The B horizon is very fine sandy loam, silt loam, silt, or light clay loam. It is neutral to mildly alkaline and noneffervescent. The Csi horizon contains more than 20 percent hard, firm, brittle, silica-lime cemented durinodes. The C horizon is sand, sandy loam, fine sandy loam, very fine sandy loam, or loam in texture, but it is normally fine sandy loam or light loam. In places gravel or cobbles make up as much as 15 percent of the profile.

HlA—Holtle loam, 0 to 2 percent slopes. This soil is in irregularly shaped areas of small and medium size on alluvial fans and flood plains. It has the profile described as representative of the series. Included with this soil in mapping, and making up about 20 percent of the acreage, are areas of Nayped soils, other Holtle soils, and a soil that is similar to this Holtle soil but that is not dark colored in the upper part.

Runoff is slow or medium, and the hazard of erosion is slight to moderate.

This soil is used mainly for alfalfa and small grain, livestock grazing, and wildlife habitat. Capability units IIIc–2, irrigated, and VIc, dryland; Range Site NV 28–20 (Arid Flood Plain).

HmA—Holtle loam, occasionally flooded, 0 to 2 percent slopes. This soil is in fan-shaped areas of small and medium size on alluvial fans at the mouth of canyons that contain intermittent streams. This soil is susceptible to occasional flooding and deposition in spring and summer. Included with this soil in mapping, and making up about 15 percent of the acreage, are areas of Shipley soils and other Holtle soils that are not flooded.

Runoff is slow, and the hazard of erosion is slight.

This soil is suited to irrigated crops. It is used mainly for livestock grazing and wildlife habitat. Capability units IIIw–120, irrigated, and VIw, dryland; Range Site NV 28–20 (Arid Flood Plain).

HNB—Holtle loam, 0 to 4 percent slopes. This soil is in irregularly shaped areas of small and medium size that are elongated downslope on high alluvial fans and terraces. Slopes are complex; they are less than 2 percent on the high parts of the areas and as much as 4 percent on side slopes. This soil has a profile similar to that described as representative of the series, but in some areas the soil is as much as 15 percent gravel. Included with this soil in mapping, and making up about 15 percent of the acreage, are areas of Holtle loam, occasionally flooded, 0 to 2 percent slopes, and areas of a soil that is similar to this Holtle soil but that lacks silica-cemented nodules or a dark surface layer.

Runoff is slow to medium, and the hazard of erosion is slight to moderate.

This soil is suited to irrigated crops. It is used mainly for livestock grazing and wildlife habitat. Capability units IIIe–40, irrigated, and VIc, dryland; Range Site NV 28–20 (Arid Flood Plain).

Hopeka Series

The Hopeka series consists of well-drained to excessively drained soils that formed in residuum from dolomite. These soils are on the sides of low mountains. Slope ranges from 15 to 75 percent. The vegetation is juniper and some pinyon and a sparse understory of low sagebrush, Nevada ephedra, and squirreltail. Elevation is 6,000 to 7,800 feet. Average annual precipitation is 10 to 14 inches, average annual air temperature is 41° to 46° F, and the frost-free season is 50 to 70 days.

In a representative profile the soil is light gray very gravelly loam and gravelly loam about 7 inches thick. Below this is massive, lime-coated dolomite bedrock.

Permeability is moderate above the bedrock. Effective rooting depth is 4 to 10 inches. Available water capacity is very low.

Representative profile of Hopeka very gravelly loam is an area of Hopeka-Labshaft association in Eureka County, 200 feet west of the east quarter corner of sec. 15, T. 22 N., R. 52 E.:

A1—0 to 2 inches; light gray (10YR 7/2) very gravelly loam, dark grayish brown (10YR 4/2) moist;

strong thick platy structure; soft, very friable, slightly sticky and slightly plastic; few roots; many fine and very fine vesicular pores; 55 percent gravel; violently effervescent; strongly alkaline; abrupt smooth boundary.

C1—2 to 7 inches; light gray (10YR 7/2) gravelly loam, dark grayish brown (10YR 4/2) moist; weak fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine and fine roots; few very fine tubular pores and common fine and very fine interstitial pores; 40 percent gravel; violently effervescent; strongly alkaline; abrupt irregular boundary.

R—7 inches; massive, lime-coated dolomite bedrock; some cracking evident.

The profile is gravelly or very gravelly loam that is 35 to 65 percent angular dolomite gravel. Reaction is constant at pH 8.4 to 8.6. Effervescence is generally violent, but it is only strong in the upper part of the A horizon in some places. The C horizon has weak, blocky structure, or it is massive. Depth to bedrock ranges from 4 to 10 inches.

HO—Hopeka-Labshaft association. This association of moderately steep and steep soils is in large, irregularly shaped areas on mountainsides. It is about 40 percent Hopeka very gravelly loam that has slopes of 15 to 50 percent and 30 percent Labshaft very stony loam that has slopes of 15 to 50 percent. The Hopeka soil has south- and west-facing slopes, and the Labshaft soil has north- and east-facing slopes. The Hopeka soil has the profile described as representative of the Hopeka series. The Labshaft soil has a profile similar to the one described as representative of the Labshaft series. Included with this soil in mapping, and making up about 10 percent of the acreage, are areas of Sheege soils. Another 20 percent of the acreage is Rock outcrop.

Runoff is medium to rapid on the Hopeka soil and rapid on the Labshaft soil. The hazard of erosion is severe.

These soils are not suited to irrigated crops. They are used mainly for livestock grazing and wildlife habitat. Capability unit VIIs, dryland; Hopeka part in woodland suitability group 3d1 and Labshaft part in woodland suitability group 3x1.

HS—Hopeka-Sheege association. This association of moderately steep to very steep soils is in large, elongated areas on mountains. It is about 60 percent Hopeka very gravelly loam that has slopes of 15 to 50 percent and about 30 percent Sheege very cobbly loam that has slopes of 30 to 75 percent. The Hopeka soil is on lower positions and have south- and west-facing slopes. The Sheege soil has north-facing, higher, and steeper slopes and a dark-colored surface layer. Included with these soils in mapping, and making up about 10 percent of the acreage, are areas of Rock outcrop.

Runoff is medium to rapid, and the hazard of erosion is high.

These soils are not suited to irrigated crops. They are used mainly for livestock grazing and wildlife habitat. Capability unit VIIs, dryland; Hopeka part in woodland suitability group 3d1, Sheege part in woodland suitability group 3x2.

Hussa Series

The Hussa series consists of poorly drained soils that formed in stratified loamy alluvium. These soils are in narrow canyon bottoms. Slope ranges from 0 to 4 percent. The vegetation is big sagebrush, bluejoint rye, rubber rabbitbrush, and Basin wildrye. Elevation is 6,000 to 7,000 feet. Average annual precipitation is 8 to 12 inches, average annual air temperature is 43° to 46° F, and the frost-free season is 70 to 100 days.

In a representative profile the surface layer is grayish brown loam over dark gray silt loam and is about 17 inches thick. The next layer is light gray silt loam about 9 inches thick. Below this is grayish brown silty clay loam about 10 inches thick. It is underlain by grayish brown gravelly loam and light brownish gray loam to a depth of 60 inches.

Permeability is moderately slow. Effective rooting depth is 60 inches. Available water capacity is high.

Representative profile of Hussa loam, 0 to 4 percent slopes, in Eureka County, 1,500 feet south and 2,000 feet west of the northeast corner of sec. 25, T. 11 N., R. 53 E.:

A11—0 to 7 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; moderate thin and very thin platy structure; soft, very friable, nonsticky and slightly plastic; common medium and many fine and very fine roots; many fine and very fine interstitial pores; 5 percent gravel; slightly effervescent; strongly alkaline; clear smooth boundary.

A12—7 to 17 inches; dark gray (10YR 4/1) silt loam, very dark gray (10YR 3/1) moist; weak medium and thin platy structure; slightly hard, very friable, nonsticky and slightly plastic; common medium and fine and many very fine roots; few fine and many very fine tubular pores; slightly effervescent; strongly alkaline; clear wavy boundary.

C1—17 to 26 inches; light gray (10YR 6/1) heavy silt loam, very dark grayish brown (10YR 3/2) moist; common fine distinct dark yellowish brown (10YR 4/4) iron mottles; massive; hard, friable, slightly sticky and plastic; common fine and many very fine roots; common fine and many very fine tubular pores; moderately alkaline; clear wavy boundary.

A1b1—26 to 36 inches; grayish brown (10YR 5/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; massive; hard, friable, sticky and plastic; few fine and many very fine roots; few fine and many very fine tubular pores; very slightly effervescent; moderately alkaline; clear wavy boundary.

IIA1b2—36 to 54 inches; grayish brown (10YR 5/2) gravelly loam, dark brown (10YR 3/3) moist; few fine distinct brown (10YR 4/3) iron mottles; massive; slightly hard, very friable, slightly sticky and slightly plastic; few fine and many very fine roots; many fine and very fine tubular pores; slightly effervescent; moderately alkaline; clear wavy boundary.

IIIC2—54 to 60 inches; light brownish gray (10YR 6/2) loam, very dark grayish brown (10YR 3/2) moist; many medium faint dark brown (10YR 3/3) iron mottles; massive; slightly hard, very friable, slightly sticky and slightly plastic; few fine and common very fine roots; many very fine tubular pores; slightly effervescent; moderately alkaline.

The A horizon has weak or moderate, fine to medium, subangular blocky structure or thin to thick, weak or moderate, platy structure. Texture is stratified loam, silt loam, fine sandy loam, or clay loam that is as much as 15 percent gravel. The C horizon has common to many, fine or medium, faint, or distinct mottles. Texture is stratified loam, silt loam, fine sandy loam, or clay loam that contains 0 to 30 percent gravel. At any depth, there can be a buried A1 horizon similar to the A1 horizon.

HUB—Hussa loam, 0 to 4 percent slopes. This soil is in small areas in narrow canyons and valley bottoms.

Included with this soil in mapping, and making up about 15 percent of the acreage, are areas of Holtle and Dianev soils.

Runoff is slow or medium, and the hazard of erosion is slight or moderate. A seasonal high water table, caused by drainage that results from stream entrenchment, is at a depth of 4 to 6 feet. In some areas this soil is susceptible to occasional overflow.

This soil is suited to irrigated crops, but the areas are limited by size and shape. It is used mainly for livestock grazing and wildlife habitat. Capability units IIIw–120, irrigated, and VIw, dryland; Range Site NV 28–20 (Arid Flood Plain).

Kobeh Series

The Kobeh series consists of somewhat excessively drained soils that formed in alluvium. The alluvium derived mainly from limestone and sandstone but has some influence from andesite and volcanic ash. These soils are on old flood plains and alluvial fans. Slope ranges from 0 to 4 percent. The vegetation is big sagebrush and squirreltail. Elevation is 5,800 to 6,100 feet. Average annual precipitation is 8 to 10 inches, average annual air temperature is 41° to 45° F, and the frost-free season is 70 to 100 days.

In a representative profile the surface layer is grayish brown sandy loam and light brownish gray fine sandy loam about 7 inches thick. The next layer is pale brown gravelly fine sandy loam about 10 inches thick. Below this is pale brown gravelly sandy loam that is 30 percent hard silica-cemented nodules and is about 7 inches thick. It is underlain by light gray very gravelly sand to a depth of 60 inches.

Permeability is rapid. Effective rooting depth is 60 inches. Available water capacity is low.

Representative profile of Kobeh sandy loam, 0 to 2 percent slopes, in Eureka County, 1,400 feet south and 2,350 feet east of the northwest corner of sec. 8, T. 22 N., R. 53 E.:

A11—0 to 2 inches; grayish brown (10YR 5/2) sandy loam, very dark grayish brown (10YR 3/2) moist; massive; soft, very friable, nonsticky and nonplastic; many very fine roots; many very fine interstitial pores; 10 percent gravel one-half inch in diameter or smaller; slightly acid, abrupt smooth boundary.

A12—2 to 7 inches; light brownish gray (10YR 6/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; few fine and many very fine roots; many very fine interstitial and tubular pores; neutral; clear smooth boundary.

B2—7 to 17 inches; pale brown (10YR 6/3) gravelly fine sandy loam, dark grayish brown (10YR 4/2) moist; massive; soft, very friable, nonsticky and nonplastic; few medium and fine and many very fine roots; many very fine tubular and interstitial pores; 20 percent gravel one-half inch in diameter or smaller; neutral; clear smooth boundary.

C1si—17 to 24 inches; pale brown (10YR 6/3) gravelly light sandy loam, dark grayish brown (10YR 4/2) moist; massive; soft, very friable, nonsticky and nonplastic; many very fine roots; many very fine interstitial pores; 30 percent hard silica cemented durinodes; 30 percent gravel one-half inch to one inch in diameter; strongly alkaline; clear wavy boundary.

IIC2ca—24 to 40 inches; light gray (10YR 7/2) gravelly sand, light brownish gray (10YR 6/2) moist; single grained; loose, nonsticky and nonplastic pores; 50 percent gravel, mostly less than one inch in diameter; strongly effervescent; strongly alkaline; abrupt broken boundary.

IIC3—40 to 60 inches; light gray (10YR 7/2) very gravelly sand, light brownish gray (10YR 6/2) moist; single grained; loose, nonsticky and nonplastic; 60 percent gravel one inch or less in diameter.

The A1 horizon has weak or moderate, very thin to medium, platy structure or fine to medium, subangular blocky structure, or it is massive. The B2 horizon has weak, coarse or very coarse, prismatic structure or medium or coarse, angular blocky structure, or it is massive. Texture includes fine sandy loam, sandy loam, and loam modified by 10 to 30 percent gravel. In places there are strata containing 30 to 60 percent gravel as well as a buried A horizon. The C1si horizon in places is 20 to 70 percent hard or very hard, irregularly shaped, silica-lime cemented durinodes ½ inch to 6 inches in diameter or has discontinuous weakly cemented strata and pockets. Most of the pebbles are silica-lime coated on the underside.

KbA—Kobeh sandy loam, 0 to 2 percent slopes. This soil is in irregularly shaped areas of large and medium size that are generally elongated in a north-south direction on old flood plains. It has the profile described as representative of the series. Included in this soil in mapping, and making up about 15 percent of the acreage, are areas of Alhambra, Shipley, and Bruffy soils.

Runoff is slow, and the hazard of erosion is slight.

This soil is used mainly for alfalfa hay, pasture, and small grain (fig. 8). If not cultivated, it is used for livestock grazing and wildlife habitat. Capability unit IVs–115, irrigated, and VIIs, dryland; Range Site NV 28–21 (Semidesert Loamy Plain).

KgA—Kobeh gravelly sandy loam, 0 to 2 percent slopes. This soil is in irregularly shaped areas of large

Figure 8.—**Siberian wheatgrass on an experimental seeding plot on Kobeh sandy loam, 0 to 2 percent slopes.**

and medium size that are elongated in a north-south direction on old flood plains. It has a profile similar to that described as representative of the series, but the gravel content is higher and the profile is about 40 inches deep to gravelly sand. Included with this soil in mapping, and making up about 15 percent of the acreage, are areas of Alhambra soils, other Kobeh soils, and a loamy fine sand soil in long, narrow, wind-formed ridges 1 to 3 feet high.

Runoff is slow, and the hazard of erosion is slight.

This soil is used mainly for alfalfa hay, pasture, small grain, livestock grazing, and wildlife habitat. Capability units IVs–115, irrigated, and VIIs, dryland; Range Site NV 28–21 (Semidesert Loamy Plain).

KHB—Kobeh gravelly fine sandy loam, 2 to 4 percent slopes. This soil is in irregularly shaped areas of large and medium size on coalescing alluvial fans. It has a profile similar to that described as representative of the series, but the surface layer is gravelly fine sandy loam, gravel content of the profile is higher, and depth to gravelly sand is about 40 inches. Included with this soil in mapping, and making up about 15 percent of the acreage, are areas of Shipley, Rubyhill, Nayped, and other Kobeh soils.

Runoff is slow, and the hazard of erosion is slight.

This soil is suited to irrigated crops. It is used mainly for livestock grazing and wildlife habitat. Capability units IVe–45, irrigated, and VIIs, dryland; Range Site NV 28–21 (Semidesert Loamy Plain).

Kobeh Variant

The Kobeh series variant consists of well-drained soils that formed in alluvium from mixed rock sources. These soils are in areas on fan deltas. Slope ranges from 0 to 2 percent. The vegetation is mainly big sagebrush. Elevation is 5,800 to 6,000 feet. Average annual precipitation is 8 to 10 inches, average annual air temperature is 41° to 45° F, and the frost-free season is 70 to 100 days.

In a representative profile the surface layer is pale brown loamy fine sand about 3 inches thick. The next layer is pale brown sandy loam about 18 inches thick. Below this is light gray loamy fine sand to a depth of 60 inches.

Permeability is moderately rapid. Effective rooting depth is 60 inches. Available water capacity is low or moderate.

Representative profile of Kobeh sandy loam, sandy subsoil variant, in Eureka County, 2,300 feet north and 800 feet east of the southwest corner of sec. 32, T. 23 N., R. 53 E.:

A1—0 to 3 inches; pale brown (10YR 6/3) sandy loam, dark grayish brown (10YR 4/2) moist; weak very thick platy structure; soft, very friable, nonsticky and nonplastic; few fine and many very fine interstitial pores; neutral; abrupt smooth boundary.

B2—3 to 21 inches; pale brown (10YR 6/3) sandy loam, dark brown (10YR 3/3) moist; massive; soft, friable, slightly sticky and nonplastic; few fine and very fine roots; many very fine interstitial pores; occasional clay bridging between sand grains; mildly alkaline; abrupt smooth boundary.

IICsica—21 to 60 inches; light gray (10YR 7/2) loamy fine sand, brown (10YR 5/3) moist; single grained; loose, nonsticky and nonplastic; few fine and very fine roots; many very fine interstitial pores; about 20 percent hard silica-lime cemented durinodes in the upper 15 inches; strongly effervescent; strongly alkaline.

The A horizon is loamy fine or very fine sand, sandy loam, or fine sandy loam that is as much as 15 percent gravel. In some areas there are wind-laid deposits of loamy fine sand 2 to 3 inches deep. The B2 horizon is sandy loam or fine sandy loam that is as much as 20 percent gravel. The A1 and B2 horizons are neutral to mildly alkaline. The C horizon is stratified coarse to fine sand and loamy sand. The C horizon is moderately alkaline to strongly alkaline and strongly effervescent.

This soil differs from typical Kobeh soils in having less than 35 percent gravel by volume between depths of 10 and 40 inches.

Km—Kobeh sandy loam, sandy subsoil variant. This soil is in large, irregularly shaped areas on fan deltas. Included with this soil in mapping, and making up about 15 percent of the acreage, are areas of Alhambra soils, other Kobeh soils, and a loamy fine sand in long, narrow, wind-formed ridges 1 to 3 feet high.

Runoff is slow, and the hazard of erosion is slight.

This soil is suited to irrigated crops. It is used mainly for livestock grazing and wildlife habitat. Capability units IIIc–2, irrigated, and VIc, dryland; Range Site NV 28–21 (Semidesert Loamy Plain).

Labshaft Series

The Labshaft series consists of well-drained soils that formed in residuum from siliceous rocks, including chert, greenstone, and conglomerate. These soils are on hills and north-facing mountainsides. Slope ranges from 15 to 75 percent. The vegetation is pinyon, juniper, big sagebrush, Nevada ephedra, Sandberg bluegrass, and bluebunch wheatgrass. Elevation is 6,500 to 8,000 feet. Average annual precipitation is 10 to 14 inches, average annual air temperature is 42° to 45° F, and the frost-free season is 50 to 70 days.

In a representative profile the surface layer is grayish brown stony loam and gravelly loam about 12 inches thick. The next layer is yellowish brown gravelly sandy clay loam about 7 inches thick. Below this is siliceous conglomerate bedrock.

Permeability is moderate or moderately slow. Effective rooting depth is 10 to 20 inches. Available water capacity is very low.

Representative profile of Labshaft very stony loam in Eureka County, 3,300 feet south and 4,350 feet east of the northwest corner of sec. 5, T. 23 N., R. 52 E.:

A11—0 to 4 inches; grayish brown (10YR 5/2) very stony loam, very dark grayish brown (10YR 3/2) moist; moderate very fine granular structure; soft, friable, slightly sticky and slightly plastic; many coarse and medium and common fine and very fine roots; many very fine and fine interstitial pores; class 3 stoniness; 30 percent gravel and 20 percent cobbles; neutral; clear smooth boundary.

A12—4 to 12 inches; grayish brown (10YR 5/2) gravelly loam, dark brown (10YR 3/3) moist; massive; slightly hard, friable, sticky and slightly plastic; many coarse, medium, and very fine and common fine roots; few fine and many very fine tubular pores; 40 percent gravel and cobbles; neutral; clear wavy boundary.

B2—12 to 19 inches; yellowish brown (10YR 5/4) gravelly sandy clay loam, dark yellowish brown (10YR 4/4) moist; massive; slightly hard, friable, sticky and plastic; few coarse, many medium, and common fine and very fine roots; few fine and many very

fine tubular pores; 3 percent stones, 40 percent gravel and cobbles; neutral; abrupt irregular boundary.

R—19 inches; siliceous conglomerate bedrock.

The A horizon is gravelly to extremely stony very fine sandy loam or heavy loam. Thickness ranges from 6 to 14 inches. The B2 horizon is gravelly to very stony loam, clay loam, or sandy clay loam. It has blocky structure, or it is massive. Content of coarse fragments ranges from 40 to 70 percent. Depth to bedrock is 10 to 20 inches.

LAE—Labshaft-Locane association, steep. This association of steep soils is in large, elongated areas on low mountains. It is about 50 percent Labshaft very stony loam that has slopes of 30 to 50 percent and about 30 percent Locane extremely stony loam that has slopes of 30 to 50 percent. The Labshaft soil has northeast-facing slopes, and the Locane soil has southwest-facing slopes. The Labshaft soil has a profile similar to the one described as representative of the Labshaft series. The Locane soil has the profile described as representative of the Locane series. Included with these soils in mapping, and making up about 20 percent of the acreage, are areas of Devoy soils, stony to extremely stony soils that are more than 20 to 40 inches deep to bedrock, and Rock outcrop.

Runoff is rapid, and the hazard of erosion is severe.

These soils are not suited to irrigated crops. They are used mainly for livestock grazing and wildlife habitat. Capability unit VIIs, dryland; woodland suitability group 3x1.

LAF—Labshaft-Locane association, very steep. This association of very steep soils is in large, elongated areas on mountains. It is about 40 percent Labshaft very stony loam that has slopes of 50 to 75 percent and about 40 percent Locane extremely stony loam that has slopes of 50 to 75 percent. The Labshaft soil has northeast-facing slopes, and the Locane soil has southwest-facing slopes. The Labshaft soil has the profile described as representative of the Labshaft series. The Locane soil has a profile similar to the one described as representative of the Locane series. Included with these soils in mapping, and making up about 20 percent of the acreage, are areas of extremely stony loam soils that are more than 20 inches deep to bedrock, and Rock outcrop.

Runoff is rapid, and the hazard of erosion is severe.

These soils are not suited to irrigated crops. They are used mainly for limited livestock grazing and wildlife habitat. Capability unit VIIs, dryland; woodland suitability group 3x1.

LK—Labshaft-Rock outcrop complex. This complex of moderately steep soils and Rock outcrop is in large, irregularly shaped areas on hills. It is about 75 percent Labshaft stony loam that has slopes of 15 to 30 percent and about 15 percent Rock outcrop. The Labshaft soil is in areas between the Rock outcrops. The Rock outcrop is small knolls and scarps. Included with this complex in mapping, and making up about 10 percent of the acreage, are areas of a stony loam soil that is more than 20 inches deep to bedrock.

On the Labshaft soil, runoff is medium and the hazard of erosion is moderate.

This complex is not suited to irrigated crops. It is used mainly for livestock grazing and wildlife habitat. Capability unit VIIs, dryland; Labshaft part in woodland suitability group 3x1.

Locane Series

The Locane series consists of well-drained soils that formed in residuum from shale and siliceous conglomerate bedrock. These soils are on south-facing mountainsides. Slope ranges from 30 to 75 percent. The vegetation is big sagebrush, Nevada ephedra, pinyon, juniper, and some Sandberg bluegrass and bluebunch wheatgrass. Elevation is 6,500 to 8,000 feet. Average annual precipitation is 10 to 14 inches, average annual air temperature is 41° to 45° F, and the frost-free season is 50 to 70 days.

In a representative profile, the surface layer is light brownish gray extremely stony loam about 5 inches thick. The next layer is grayish brown and brown gravelly clay loam about 14 inches thick. Below this is siliceous conglomerate bedrock.

Permeability is moderately slow. Effective rooting depth is 10 to 20 inches. Available water capacity is very low.

The Locane soils are mapped only in Labshaft-Locane association, steep, and Labshaft-Locane association, very steep.

Representative profile of Locane extremely stony loam in an area of Labshaft-Locane association in Eureka County, 2,700 feet south and 4,500 feet east of the northwest corner of sec. 5, T. 23 N., R. 52 E.:

A1—0 to 5 inches; light brownish gray (10YR 6/2) extremely stony loam, dark grayish brown (10YR 4/2) moist; moderate fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots; many very fine and fine interstitial pores; class 3 stoniness; 45 percent gravel; neutral; abrupt smooth boundary.

B1t—5 to 8 inches; grayish brown (10YR 5/2) gravelly clay loam, very dark grayish brown (10YR 3/2) moist; moderate very fine granular structure; hard, friable, very sticky and very plastic; many very fine roots; many very fine and fine interstitial pores; 35 percent gravel; slightly acid; abrupt smooth boundary.

B2t—8 to 19 inches; brown (7.5YR 5/4) gravelly clay loam, dark brown (7.5YR 4/4) moist; massive; hard, firm, very sticky and very plastic; few very fine roots; few fine tubular pores; 35 percent gravel; slightly acid; abrupt wavy boundary.

R—19 inches; siliceous conglomerate bedrock; dark brown (10YR 3/2) stains at the Bt-bedrock interface.

The A horizon is gravelly to extremely stony loam and clay loam that is slightly hard to hard when dry. It has granular or platy structure. Stoniness is class 2 or 3. The Bt horizon has weak or moderate, blocky or subangular blocky structure, or it is massive. Reaction ranges from neutral to slightly acid. Content of coarse fragments ranges from 35 to 50 percent, by volume. Depth to bedrock ranges from 10 to 20 inches.

Lone Series

The Lone series consists of well-drained soils that formed in a thin loess mantle capping sands and gravel. Parent rocks are limestone, sandstone, shale, tuffs, and siliceous conglomerate and some volcanic ash. These soils are on intermediate and high lake terraces. Slope ranges from 0 to 8 percent. The vegetation is big sagebrush and some Sandberg bluegrass. Elevation is 5,900 to 6,000 feet. Average annual precipitation is 8 to 10 inches, average annual air temperature is 43° to 46° F, and the frost-free season is 70 to 100 days.

In a representative profile, the surface layer is light brownish gray gravelly loam about 4 inches thick. The next layer is pale brown loam about 10 inches thick. Below this is 7 inches of pale brown gravelly sandy loam. Next is 9 inches of dark gray very gravelly sand. This is underlain by a white, silica-lime cemented hardpan about 3 inches thick. Below the hardpan is dark gray gravelly sand to a depth of 60 inches.

Permeability is moderate above the hardpan. Effective rooting depth is 24 to 86 inches. Available water capacity is low.

Representative profile of Lone gravelly loam in an area of Lone-Rito association in Eureka County, 1,425 feet west and 60 feet south of the northeast corner of sec. 25, T. 21 N., R. 53 E.

A1—0 to 4 inches; light brownish gray (10YR 6/2) gravelly loam, dark grayish brown (10YR 4/2) moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; few fine and many very fine roots; few fine and many very fine vesicular pores; 15 percent fine gravel; neutral; abrupt smooth boundary.

B2—4 to 14 inches; pale brown (10YR 6/3) loam, dark brown (10YR 4/3) moist; weak medium and coarse subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; common medium, few fine, and many very fine roots; few fine and many very fine tubular and interstitial pores; 10 percent fine gravel; neutral; clear wavy boundary.

C1casi—14 to 21 inches; pale brown (10YR 6/3) gravelly sandy loam, dark grayish brown (10YR 4/2) moist; massive; soft, very friable, nonsticky and nonplastic; common medium, few fine, and common very fine roots; many very fine interstitial pores; 35 percent fine gravel; strongly effervescent; light gray and white (10YR 7/1 and 8/1) silica-lime pendants on the underside of gravel and in pockets; strongly alkaline; abrupt wavy boundary.

IIC2casi—21 to 30 inches; dark gray (10YR 4/1) very gravelly sand, very dark gray (10YR 3/4) moist; single grained; loose, nonsticky and nonplastic; common medium and fine and many very fine roots; many fine and very fine interstitial pores; 60 percent fine gravel; strongly effervescent; light gray and white (10YR 7/1, 8/1) silica-lime pendants on the underside of gravel and in pockets; strongly alkaline; abrupt wavy boundary.

IIC3sicam—30 to 33 inches; white (10YR 8/2), indurated duripan, pale brown (10YR 6/3) moist; light brown (7.5YR 6/3) organic stains, strong brown (7.5YR 4/5) moist; massive; extremely hard, extremely firm; mat of roots on the surface of this duripan; strongly effervescent; strongly alkaline; abrupt wavy boundary.

IIC4—33 to 60 inches; dark gray (10YR 4/1) gravelly sand, very dark gray (10YR 3/1) moist; single grained; loose, nonsticky and nonplastic; few very fine roots; many very fine interstitial pores; 45 percent gravel; slightly or strongly effervescent; strongly alkaline.

The A horizon has platy or fine granular structure, or it is massive. It is loam, fine sandy loam, and sandy loam that is 10 to 30 percent gravel. The B2 horizon has weak or moderate, medium or coarse, subangular blocky structure, or it is massive. It is loam or clay loam that is 0 to 20 percent gravel. The upper part of the C horizon ranges in texture from gravelly sandy loam to gravelly loamy sand and contains 20 to 40 percent fine gravel. The weighted average gravel content of the profile ranges from 20 to 35 percent. The duripan has from one to several layers of cementation. At least one layer is indurated and ranges from ⅛ inch to 6 inches in thickness. The others are weakly or strongly cemented.

LmA—Lone gravelly sandy loam, 0 to 2 percent slopes. This soil is in irregularly shaped areas of small and medium size on old, high lake terraces. It has a profile similar to that described as representative of the series, but the surface layer is gravelly sandy loam. Included with this soil in mapping, and making up about 20 percent of the acreage, are areas of Alhambra, Kobeh, Shipley, and Nayped soils.

Runoff is slow, and the hazard of erosion is slight.

This soil is poorly suited to irrigated crops. It is used mainly for livestock grazing and wildlife habitat. Capability units IVs–115, irrigated, and VIIs, dryland; Range Site NV 28–21 (Semidesert Loamy Plain).

LnB—Lone gravelly loam, undulating. This soil is in irregularly shaped areas of small and medium size on the tops of high lake terraces. Slopes range from 2 to 8 percent. This soil has a profile similar to that described as representative of the series, but in some places the hardpan is at a depth of about 20 inches. Included with this soil in mapping, and making up about 15 percent of the acreage, are areas of Alhambra and Kobeh soils and other gravelly loams that have discontinuous indurated layers and contain nodules.

Runoff is slow or medium, and the hazard of erosion is slight or moderate.

This soil is not suited to irrigated crops. It is used for livestock grazing and wildlife habitat. Capability units IVe–45, irrigated, and VIIs, dryland; Range Site NV 28–21 (Semidesert Loamy Plain).

LR—Lone-Rito association. This association is in long narrow bands parallel to the old shoreline on high lake terraces (fig. 9). In some places these terraces are overlain by alluvial fans. The association is about 30 percent Lone gravelly loam that has slopes of 4 to 8 percent; about 30 percent Credo gravelly loam, 4 to 8 percent slopes; and 30 percent Rito gravelly loam that has slopes of 4 to 8 percent. The Lone soil is on the higher parts of the lake terraces; the Credo soil is on the lower parts of the lake terraces; and the Rito soil is on alluvial fans. The Lone and Rito soils have the profiles described as representative of their respective series. Included with these soils in mapping, and making up about 10 percent of the acreage, are areas of soils that are light colored and have a surface layer of gravelly sandy loam.

Permeability is moderate in the Lone and Rito soils and moderately slow in the Credo soil. Available water capacity is low in the Lone and Rito soils and moderate in the Credo soil. Runoff is medium, and the hazard of erosion is moderate.

These soils are suited to irrigated crops, but size and shape of the areas limit their suitability. They are used mainly for livestock grazing and wildlife habitat. Lone and Rito parts in capability units IVe–45, irrigated, and VIIs, dryland, and Credo part in capability units IIIe–40, irrigated, and VIc, dryland; Range Site NV 28–21 (Semidesert Loamy Plain).

Mau Series

The Mau series consists of well-drained soils that formed in residuum and colluvium from andesite and basalt. These soils are on old volcanic cones and flows. Slope ranges from 15 to 30 percent. The vegetation is big sagebrush, low sagebrush, Sandberg bluegrass, and squirreltail. Elevation is 6,000 to 7,000 feet. Average

Figure 9.—**Vertical backcut in Lone-Rito association showing the wave sorting and bedding of these old lake terraces.**

annual precipitation is 8 to 12 inches, average annual air temperature is 42° to 45° F, and the frost-free season is 70 to 100 days.

In a representative profile the surface layer is light gray and light brownish gray stony heavy loam about 6 inches thick. The next layer is light brownish gray gravelly clay loam about 7 inches thick. Below this is dark brown very gravelly clay and very gravelly light clay about 15 inches thick. This is underlain by white very gravelly clay loam about 6 inches thick. Andesite bedrock is at a depth of 34 inches.

Permeability is slow or moderately slow. Effective rooting depth is 20 to 40 inches. Available water capacity is low.

Representative profile of Mau stony loam, 15 to 30 percent slopes, in Eureka County, 1,800 feet north and 3,050 feet east of the southwest corner of sec. 2, T. 26 N., R. 53 E.:

A1—0 to 6 inches; light gray and light brownish gray (10YR 6/1 and 6/2) stony heavy loam, very dark grayish brown (10YR 3/2) moist; moderate fine and very fine granular structure; soft, friable, slightly sticky and slightly plastic; many very fine interstitial pores; class 1 stoniness; 30 percent gravel; clear smooth boundary.

B1t—6 to 13 inches; light brownish gray (10YR 6/2) gravelly clay loam, dark grayish brown (10YR 4/2) moist; moderate very fine granular structure; slightly hard, friable, sticky and plastic; common medium and few fine and very fine roots; common very fine interstitial pores; 30 percent gravel; common thin clay films lining pores and on peds; neutral; clear wavy boundary.

B21t—13 to 18 inches; dark brown (10YR 4/3) very gravelly clay, dark brown (10YR 4/3) moist; strong fine and very fine angular blocky structure; very hard, firm, very sticky and very plastic; common medium and few fine and very fine roots; common very fine interstitial pores; 50 percent gravel; common thin clay films lining pores and on peds; neutral; gradual wavy boundary.

B22t—18 to 28 inches; dark brown (10YR 4/3) very gravelly light clay, dark brown (10YR 4/3) moist; strong medium and fine angular blocky structure; very hard, firm, very sticky and very plastic; few fine and very fine roots; common very fine interstitial pores and few very fine tubular pores; 60 percent gravel; common thin clay films on peds and in pores; neutral; clear wavy boundary.

C1sica—28 to 34 inches; white (10YR 8/2) very gravelly clay loam, light gray (10YR 7/2) moist; massive; very hard, firm, sticky and very plastic; few fine and very fine roots; 75 percent gravel; lime-silica coats on pebbles; strongly effervescent; strongly alkaline; abrupt wavy boundary.

R—34 inches, andesite bedrock coated with silica-lime in places.

The A horizon is stony or cobbly loam or clay loam. Stoniness includes class 1 and 2. The B2t horizon is gravelly or very gravelly clay or heavy clay loam. Content of coarse fragments is 45 to 60 percent. The C horizon is slightly to moderately lime and silica enriched. It is slightly to violently effervescent and moderately alkaline or strongly alkaline. The bedrock has discontinuous lime and silica coatings on the surface and in the fractures.

MAE—Mau stony loam, 15 to 30 percent slopes. This soil is in irregularly shaped areas of medium size on the sides of old volcanic cones and flows. Included with this soil in mapping, and making up about 20 percent of the acreage, are areas of other Mau soils that have slopes as steep as 50 percent and areas of Rock outcrop.

Runoff is medium or rapid, and the hazard of erosion is severe.

This soil is not suited to irrigated crops. It is used mainly for livestock grazing and wildlife habitat. Capability unit VIIe, dryland; Range Site NV 28–29 (Semidesert Loamy Slope).

Nayped Series

The Nayped series consists of well-drained soils that formed in alluvium from mixed parent rocks, including limestone, sandstone, shale, dolomite, and conglomerate. These soils are on alluvial fans. Slope ranges from 0 to 4 percent. The vegetation is big sagebrush, Sandberg bluegrass, and rabbitbrush. Elevation is 5,900 to 6,200 feet. Average annual precipitation is 8 to 10 inches, average annual air temperature is 43° to 45° F, and the frost-free season is 70 to 100 days.

In a representative profile the surface layer is light brownish gray to brown loam about 7 inches thick. Below this is 9 inches of pale brown loam, 25 inches of very pale brown and pale brown loam that has hard nodules, 13 inches of light gray very fine sandy loam that has silica and lime coatings, and 6 inches of light

yellowish brown loam that has a few small hard nodules.

Permeability is moderately slow. Effective rooting depth is 60 inches. Available water capacity is high.

Representative profile of Nayped loam, 0 to 2 percent slopes, in Eureka County, 2,450 feet south and 25 feet east of the northwest corner of sec. 16, T. 21 N., R. 54 E.:

Ap—0 to 4 inches; light brownish gray (10YR 6/2) loam, dark brown (10YR 3/3) moist; weak fine subangular blocky structure; slightly hard, friable, nonsticky and slightly plastic; many very fine roots; many very fine interstitial pores; moderately alkaline; clear smooth boundary.

A1—4 to 7 inches; brown (10YR 5/3) loam, dark brown (10YR 3/3) moist; weak thin platy structure; slightly hard, friable, slightly sticky and slightly plastic; common fine and many very fine roots; common very fine tubular pores; moderately alkaline; clear smooth boundary.

B2—7 to 16 inches; pale brown (10YR 6/3) loam, dark brown (10YR 4/3) moist; weak medium and coarse subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine roots; many very fine interstitial pores; moderately alkaline; abrupt irregular boundary.

C1sica—16 to 26 inches; very pale brown (10YR 7/4) loam, yellowish brown (10YR 5/4) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots; many very fine interstitial pores; 30 percent hard and firm durinodes; common lime and silica veins and coats; slightly effervescent; strongly alkaline; gradual wavy boundary.

C2sica—26 to 41 inches; pale brown (10YR 6/3) loam, dark brown (10YR 4/3) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; common fine roots; many very fine interstitial pores; 20 percent hard and firm durinodes; common silica-lime veins and coats; strongly effervescent; strongly alkaline; abrupt wavy boundary.

C3sica—41 to 54 inches; light gray (10YR 7/2) very fine sandy loam, brown (10YR 5/3) moist; massive; slightly hard, very friable, nonsticky and slightly plastic; common very fine roots; many very fine interstitial pores; common silica and lime veins and coats; strongly effervescent; strongly alkaline; abrupt wavy boundary.

C4sica—54 to 60 inches; light yellowish brown (10YR 6/4) loam, yellowish brown (10YR 5/4) moist; massive; soft, very friable, nonsticky and nonplastic; few very fine roots; common very fine interstitial pores; few small slightly hard and firm durinodes; strongly effervescent; strongly alkaline.

The A horizon has weak to strong, thin to thick, platy structure, or it has weak, subangular blocky structure where cultivated. The B horizon has weak to moderate, medium and coarse, subangular blocky or angular blocky structure, or it is massive. The C horizon is massive and contains 20 to 80 percent durinodes that are slightly hard to very hard and firm or very firm. The B and C horizons are loam, fine sandy loam, or very fine sandy loam, and some areas contain as much as 10 percent gravel. Reaction increases with depth from neutral to moderately alkaline in the surface layer to moderately alkaline or strongly alkaline in the C horizon.

NaB—Nayped loamy very fine sand, 2 to 4 percent slopes. This soil is in irregularly shaped areas of moderate size on alluvial fans. It has a profile similar to that described as representative of the series, but the surface layer is loamy very fine sand 5 to 8 inches thick. The profile is commonly stratified with fine sandy clay loam to loamy fine sand. Included with this soil in mapping, and making up about 15 percent of the acreage, are areas of Alhambra, Ratto, and Shipley soils.

Runoff is slow, and the hazard of erosion is moderate.

This soil is suited to irrigated crops. Small grain and alfalfa are the main crops. It is used mainly for livestock grazing and wildlife habitat. Capability units IIIe–40, irrigated, and VIc, dryland; Range Site NV 28–21 (Semidesert Loamy Plain).

NdA—Nayped loam, 0 to 2 percent slopes. This nearly level soil is in irregularly shaped areas of moderate size on alluvial fans. It has the profile described as representative of the series. Included with this soil in mapping, and making up about 15 percent of the acreage, are areas of Alhambra, Shipley, and Kobeh soils.

Runoff is slow, and the hazard of erosion is slight.

This soil is suited to irrigated crops. Small grain and alfalfa are the main crops. It is used mainly for irrigated crops, livestock grazing, and wildlife habitat. Capability units IIIc–2, irrigated, and VIc, dryland; Range Site NV 28–21 (Semidesert Loamy Plain).

NdB—Nayped loam, 2 to 4 percent slopes. This gently sloping soil is in irregularly shaped areas of medium and small size on alluvial fans. Included with this soil in mapping, and making up about 15 percent of the acreage, are areas of Alhambra, Kobeh, and Shipley soils.

Runoff is medium, and the hazard of erosion is slight.

This soil is suited to irrigated crops. Small grain and alfalfa are the main crops. This soil is used mainly for irrigated crops, livestock grazing, and wildlife habitat. Capability units IIIe–40, irrigated, and VIc, dryland; Range Site NV 28–21 (Semidesert Loamy Plain).

NK—Nayped-Kobeh association. This association of nearly level soils is in a large, irregularly shaped area on the toeslope of an alluvial fan. It is about 50 percent Nayped loam, 0 to 2 percent slopes, and about 40 percent Kobeh gravelly sandy loam, 0 to 2 percent slopes. The Nayped soil has a light brownish gray loamy surface layer, and the Kobeh soil has a dark-colored surface mulch and is mainly in drainageways. The Nayped soil has a profile similar to the one described as representative of the Nayped series. The Kobeh soil has a profile similar to that described as representative of the Kobeh series, but the surface layer is a gravelly sandy loam that has a gravelly surface mulch. Included with these soils in mapping, and making up about 10 percent of the acreage, are areas of Alhambra soils.

Permeability is moderately slow in the Nayped soil and rapid in the Kobeh soil. Available water capacity is high in the Nayped soil and low in the Kobeh soil. Runoff is slow, and the hazard of erosion is slight.

These soils are suited to irrigated crops. They are used mainly for livestock grazing and wildlife habitat. Nayped part in capability units IIIc–2, irrigated, and VIc, dryland, and Kobeh part in capability units IVs–115, irrigated, and VIIs, dryland; Range Site NV 28–21 (Semidesert Loamy Plain).

Nevka Series

The Nevka series consists of somewhat poorly drained, strongly saline-alkali-affected soils that formed in loamy alluvium. The alluvium derived

mainly from sedimentary and volcanic rock sources. These soils are on old flood plains or lake plains. Slope ranges from 0 to 2 percent. The vegetation is rubber rabbitbrush and saltgrass and some Great Basin wildrye and alkali sacaton. Elevation is 5,800 to 5,900 feet. Average annual precipitation is 8 to 10 inches, average annual air temperature is 42° to 45° F, and the frost-free season is 70 to 100 days.

In a representative profile, the upper 13 inches of the soil is light brownish gray silt loam. Below this is 11 inches of pinkish gray silt loam, 7 inches of very pale brown loam, 6 inches of white loam that has lime concretions, and 13 inches of light olive gray sandy loam that has brown mottles.

Permeability is moderate. Effective rooting depth is 50 inches or more. Available water capacity is high.

Representative profile of Nevka silt loam in Eureka County, 700 feet north and 700 feet east of the southwest corner of sec. 3, T. 22 N., R 54 E.:

A1—0 to 4 inches; light brownish gray (10YR 6/2) and light gray (10YR 7/2) silt loam, dark brown (10YR 4/3) moist; moderate very thin platy structure; slightly hard, friable, sticky and plastic; common very fine tubular pores; violently effervescent; strongly alkaline; abrupt smooth boundary.

C1—4 to 8 inches; light brownish gray (10YR 6/2) silt loam, dark grayish brown (10YR 4/2) moist; moderate fine and medium subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; common fine and very fine and few medium roots; common very fine tubular pores; violently effervescent; very strongly alkaline; clear smooth boundary.

C2—8 to 13 inches; light brownish gray (10YR 6/2) silt loam, dark brown (7.5YR 4/2) moist; weak fine and medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; few fine roots; few very fine tubular pores and many very fine interstitial pores; violently effervescent; very strongly alkaline; clear wavy boundary.

A1b—13 to 19 inches; pinkish gray (7.5YR 6/2) silt loam, dark brown (7.5YR 4/2) moist; weak medium and fine subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; few fine roots; few fine and very fine tubular pores and many very fine interstitial pores; violently effervescent; very strongly alkaline; clear wavy boundary.

ACb—19 to 24 inches; pinkish gray (7.5YR 6/2) silt loam, dark brown (7.5YR 4/2) moist; weak medium and coarse subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few fine and very fine roots; many very fine tubular and interstitial pores and few fine tubular pores; violently effervescent; very strongly alkaline; clear wavy boundary.

C3ca—24 to 31 inches; very pale brown (10YR 8/3) loam, pale brown (10YR 6/3) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few fine roots; many very fine and common fine tubular pores; few ½-inch lime concretions; violently effervescent; very strongly alkaline; abrupt wavy boundary.

C4ca—31 to 37 inches; white (10YR 8/2) loam, very pale brown (10YR 7/3) moist; massive; very hard, very firm, slightly sticky and slightly plastic; common very fine and few fine tubular pores; many cylindrical lime concretions 1 inch in diameter; violently effervescent; very strongly alkaline; abrupt wavy boundary.

IIC5—37 to 50 inches; light olive gray (5Y 6/2) sandy loam, olive (5Y 5/3) moist; common medium and large prominent brown (7.5Y 4/4) mottles when moist; massive; hard, friable, slightly sticky and slightly plastic; many very fine and fine interstitial pores and few tubular pores; violently effervescent; very strongly alkaline.

The profile is dominantly silt loam and some strata of loam, fine sandy loam or sandy loam. The upper few inches of the profile has reaction of pH 8.6 to 9.2, and below this reaction ranges from pH 9.2 to 9.6 with no discernible trend. The A1 horizon is massive or has platy structure and is slightly hard to hard. There are distinct mottles below a depth of 20 inches. The C horizon is massive or has subangular blocky structure and is soft to slightly hard. The Cca horizon is soft to slightly hard in the matrix and has 20 to 50 percent hard to extremely hard, cylindrical or irregularly shaped lime concretions ½ to 1 inch in diameter.

Ns—Nevka silt loam. This nearly level soil is in large, elongated areas on flood plains. Included with this soil in mapping, and making up about 15 percent of the acreage, are areas of Tonkin and Alhambra soils.

Runoff is slow or very slow, and the hazard of erosion is slight. A seasonal high water table is at a depth of 2½ to 3½ feet. This soil is strongly saline-alkali affected.

This soil is not suited to irrigated crops. It is used mainly for livestock grazing and wildlife habitat. Capability unit VIIw, dryland; Range Site NV 28–23 (Arid Loamy Bottomland, Saline-Alkali).

Overland Series

The Overland series consists of well-drained soils that formed in limestone residuum that includes some ashy loess. The soils are on south- and west-facing mountainsides. Slope ranges from 15 to 50 percent. The vegetation is juniper, pinyon, big sagebrush, and Sandberg bluegrass. Elevation is 6,000 to 7,500 feet. Average annual precipitation is 8 to 14 inches, average annual air temperature is 43° to 46° F, and the frost-free season is 50 to 100 days.

In a representative profile the surface layer is light brownish gray very gravelly and gravelly loam about 8 inches thick. Below this is 14 inches of very pale brown and light gray very gravelly loam. Limestone bedrock is at a depth of 22 inches.

Permeability is moderate. Effective rooting depth is 20 to 40 inches. Available water capacity is very low.

Overland soils have been mapped only in the Bartine-Overland association.

Representative profile of Overland very gravelly loam in an area of Bartine-Overland association in Eureka County, 1,200 feet west and 2,050 feet north of the southeast corner of sec. 31, T. 20 N., R. 52 E.:

A11—0 to 2 inches; light brownish gray (10YR 6/2) very gravelly loam, dark brown (10YR 3/3) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; many very fine vesicular pores; 80 percent gravel; strongly effervescent; strongly alkaline; abrupt smooth boundary.

A12—2 to 8 inches; light brownish gray (10YR 6/2) gravelly loam, dark brown (10YR 4/3) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; common fine and very fine roots; many fine and very fine tubular pores; 15 percent gravel; strongly effervescent; strongly alkaline; gradual smooth boundary.

C1sica—8 to 16 inches; very pale brown (10YR 7/3) very gravelly loam, dark brown (10YR 4/3) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few coarse and common medium, fine, and very fine roots; many fine and very fine

tubular pores; 45 percent gravel; silica-lime coatings on underside of pebbles; strongly effervescent; strongly alkaline; gradual smooth boundary.

C2sica—16 to 22 inches; light gray (10YR 7/2) very gravelly loam, grayish brown (10YR 5/2) moist; massive; soft, friable, slightly sticky and slightly plastic; few medium and common fine and very fine roots; many fine and very fine tubular pores; 50 percent gravel; silica and lime coatings on undersides of pebbles; violently effervescent; strongly alkaline; abrupt smooth boundary.

R—22 inches; limestone bedrock; solution pitting on part of the rock surface and coated with lime in other parts.

The profile is loam. Effervescence is slight to strong and reaction is pH 8.4 to 8.6 in the A horizon. The A horizon ranges from 5 to 12 inches in thickness. The C horizon has 35 to 70 percent, by volume, coarse fragments that include gravel, cobbles, and stones. Effervescence is strong or violent and reaction is pH 8.6 to 8.8. The thickness ranges from 10 to 28 inches. The weighted average of coarse fragments by volume ranges from 40 to 65 percent. The bedrock is solution-pitted and has coatings of lime and silica on part of the surface and in cracks.

Pedoli Series

The Pedoli series consists of well-drained soils that formed in gravelly alluvium from mixed rock sources. These soils are on alluvial fans and lake terraces. Slope ranges from 2 to 4 percent. The vegetation is big sagebrush, squirreltail, Nevada ephedra, and scattered Utah juniper. Elevation is 5,700 to 6,100 feet. Average annual precipitation is 8 to 10 inches, average annual air temperature is 43° to 45° F, and the frost-free season is 70 to 100 days.

In a representative profile the surface layer is pale brown gravelly fine sandy loam and brown gravelly loam about 6 inches thick. The next layer is light yellowish brown and very pale brown gravelly clay loam about 19 inches thick. Below this is very pale brown gravelly sandy loam and very gravelly loamy sand to a depth of 60 inches and more.

Permeability is moderately slow. Effective rooting depth is 60 inches. Available water capacity is low or moderate.

Representative profile of Pedoli gravelly fine sandy loam, 2 to 4 percent slopes, in Eureka County, in the north quarter-corner of sec. 33, T. 21 N., R. 54 E.:

A11—0 to 4 inches; pale brown (10YR 6/4) gravelly fine sandy loam, dark brown (10YR 4/3) moist; strong thick and very thick platy structures; soft, very friable, nonsticky and nonplastic; many very fine and fine and few medium vesicular pores; 15 percent gravel; neutral; abrupt smooth boundary.

A12—4 to 6 inches; brown (10YR 5/3) gravelly loam, dark brown (10YR 4/3) moist; moderate very fine and fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; common fine and very fine roots; common very fine and fine interstitial pores; 15 percent gravel; neutral; abrupt smooth boundary.

B2t—6 to 15 inches; light yellowish brown (10YR 6/4) gravelly clay loam, yellowish brown (10YR 5/4) moist; strong fine angular blocky structure; hard, firm, sticky and plastic; few very fine and fine and many medium roots; common very fine and fine interstitial pores and few fine tubular pores; 15 percent gravel; many thin and few moderately thick clay films in pores and on peds; moderately alkaline; abrupt smooth boundary.

B3ca—15 to 25 inches; very pale brown (10YR 7/4) and light yellowish brown (10YR 6/4) gravelly clay loam, yellowish brown (10YR 5/4) moist; strong fine and medium angular blocky structure; hard, friable, sticky and plastic; few very fine and fine roots; many very fine interstitial pores; 25 percent gravel; strongly effervescent; strongly alkaline; abrupt smooth boundary.

C1sica—25 to 35 inches; very pale brown (10YR 7/3) gravelly sandy loam, light yellowish brown (10YR 6/4) moist; massive; slightly hard, very friable, nonsticky and nonplastic; few very fine and fine roots; many very fine interstitial pores; 35 percent gravel; lime-silica coats on pebbles; violently effervescent; strongly alkaline; abrupt smooth boundary.

IIC2sica—35 to 60 inches; very pale brown (10YR 8/3) very gravelly loamy sand, light yellowish brown (10YR 6/4) moist; massive; soft, very friable, nonsticky and nonplastic; few very fine and fine roots; many very fine and fine interstitial pores; 60 percent gravel; lime-silica coats on pebbles; violently effervescent; strongly alkaline.

The A horizon is noneffervescent and is neutral in reaction. It ranges from 4 to 8 inches in thickness. The B horizon is gravelly loam or gravelly clay loam that is 10 to 25 percent gravel. It has angular or subangular blocky structure and is slightly hard or hard. The C horizon is gravelly or very gravelly sandy loam to gravelly loamy sand. It is massive and is soft to hard. In places it has a few soft lime concretions. The pebbles are lime-silica coated on the underside, and some durinodes are present. The C horizon is moderately alkaline or strongly alkaline and violently or strongly effervescent.

PeB—Pedoli gravelly fine sandy loam, 2 to 4 percent slopes. This soil is in irregularly shaped areas of moderate and large size on alluvial fans and lake terraces. Included with this soil in mapping, and making up about 15 percent of the acreage, are areas of Credo, Nayped, and Silverado soils.

Runoff is slow, and the hazard of erosion is slight.

In areas that are cultivated, small grain and alfalfa are the main crops. This soil is used mainly for livestock grazing and wildlife habitat. Capability units IIIe–40, irrigated, and VIc, dryland; Range Site NV 28–21 (Semidesert Loamy Plain).

Playas

Playas are slightly depressional, nearly level, undrained basins that lack surface outlets. The soil materials are generally stratified clay, silty clay, or silty clay loam and an occasional thin stratum of coarser material.

Infiltration and permeability are very slow. Rainfall and run-on flow onto the playas and are ponded. The water evaporates slowly and often leaves a salty crust on the surface.

Playas are usually barren, but in some areas they have a few scattered salt-tolerant plants. They are of no value for farming but may have recreational or esthetic value.

PL—Playas. This land type is in irregularly shaped areas of small and medium size and in a very large, oval area. The areas are generally in slightly depressional, nearly level, undrained basins that lack surface outlets. The soil material is mostly stratified clay, silty clay, or silty clay loam. It is strongly saline-alkali affected.

The natural drainage is very poor, and internal drainage is very slow. Water ponds on the surface; generally it is shallow and stands for short periods

early in spring. The water disappears slowly through evaporation or percolation, which frequently leaves salt crusts and deposits on the surface. The water table is at a depth of 1 foot to more than 5 feet.

This land type is generally barren and is of little use. It is not suited to crops, livestock grazing, or wildlife habitat. It may have some value for recreational use. Capability unit VIIIw, dryland.

PS—Playas-Dianev complex. This complex is in irregularly shaped areas of small and medium size around the edge of a large, oval playa. It is about 50 percent Playas and 40 percent Dianev silt loam that is moderately saline-alkali affected. The Playas are slightly depressional and nearly barren. The Dianev soil is in the slightly raised areas and supports vegetation. The Dianev part has a profile similar to that described as representative of the series, but the surface layer is silt loam and the soil is moderately saline-alkali affected. Included with these soils in mapping, and making up about 10 percent of the acreage, are areas of Bicondoa and Nevka soils.

Runoff is ponded on Playas and slow on the Dianev soil. The hazard of erosion is slight.

Areas of this complex are not suited to irrigated crops, because of their size and isolated occurrence. They are used mainly for limited livestock grazing and wildlife habitat. Capability unit VIIIw, dryland; Dianev part in Range Site NV 28–23 (Arid Loamy Bottomland, Saline-Alkali).

Ratto Series

The Ratto series consists of well-drained soils that formed in alluvium from mixed rock sources. The alluvium is strongly influenced by shale and volcanic ash. These soils are on old, alluvial fans. Slope ranges from 2 to 15 percent. The vegetation is big sagebrush, squirreltail, and scattered juniper trees. Elevation is 5,800 to 6,200 feet. Average annual precipitation is 8 to 10 inches, average annual air temperature is 44° to 46° F, and the frost-free season is 70 to 100 days.

In a representative profile the surface layer is variegated light gray, light brownish gray and pale brown gravelly clay loam about 4 inches thick. Below this is very pale brown, brown, yellowish brown, and light yellowish brown gravelly clay about 13 inches thick. Next is a pale brown hardpan about 12 inches thick. Below the hardpan, to a depth of 60 inches, is light gray and very pale brown very gravelly sand that is weakly cemented in thin strata and pockets and contains common, hard and very hard, cylindrical nodules.

Permeability is slow. Effective rooting depth is 12 to 20 inches. Available water capacity is very low.

Representative profile of Ratto gravelly fine sandy loam, 2 to 8 percent slopes, in Eureka County, 1,550 feet east of the southwest corner of sec 21, T. 21 N., R. 54 E.:

A1—0 to 3 inches; variegated light gray (10YR 7/2), light brownish gray (10YR 6/2) and pale-brown (10YR 6/3) gravelly fine sandy loam, dark yellowish brown (10YR 3/4) moist; weak medium platy structure; soft, very friable, nonsticky and nonplastic; few very fine roots; many interstitial pores; 15 percent gravel; neutral; abrupt irregular boundary.

B1—3 to 7 inches; variegated light gray (10YR 7/2), light brownish gray (10YR 6/2) and pale brown (10YR 6/3) gravelly clay loam, dark yellowish brown (10YR 4/4) moist; weak thin and very thin platy structure; slightly hard, friable, sticky and plastic; common fine, very fine, medium, and coarse roots; few fine and many very fine interstitial pores; 15 percent gravel; neutral; abrupt broken boundary.

B21t—7 to 12 inches; very pale brown (10YR 7/2) and brown (10YR 5/3) gravelly clay, dark yellowish brown (10YR 4/4) moist; strong medium prismatic structure; hard, firm, very sticky and very plastic; common fine, very fine, medium, and coarse roots; common fine and very fine interstitial pores; 15 percent gravel; common moderately thick clay films on peds and in pores; neutral; clear smooth boundary.

B22t—12 to 20 inches; yellowish brown (10YR 5/4) and light yellowish-brown (10YR 6/4) gravelly clay, dark yellowish-brown (10YR 4/4) moist; moderate coarse angular blocky structure; hard, firm, very sticky and very plastic; few roots; few fine and very fine tubular and interstitial pores; 30 percent gravel; common thin and moderately thick clay films in pores and on peds; effervescent on a few small flecks of pan material in lower part; neutral; abrupt smooth boundary.

C1sicam—20 to 34 inches; very pale brown (10YR 8/3 and 7/3) duripan, dark grayish brown (10YR 4/2) and dark brown (10YR 4/3) moist; massive; strongly cemented matrix is very hard and extremely hard, very firm and extremely firm, with common very thin (2 millimeters or less) continuous indurated silica laminae; few fine and very fine interstitial pores; coarse fragments coated with silica and lime; many medium (¼ to ½ inch in diameter) hard to extremely hard cylindrical silica-lime nodules; violently effervescent; strongly alkaline; abrupt smooth boundary.

IICsica—34 to 60 inches; light gray (10YR 7/2) and very pale brown (10YR 7/3) very gravelly sand, brown to dark brown (10YR 4/3) and dark grayish brown (10YR 4/2) moist; massive and single grained; very hard and loose, firm and loose, nonsticky and nonplastic; many very fine interstitial pores; 80 percent gravel; weakly cemented in thin strata and pockets; common hard to very hard cylindrical durinodes ½ to 1 inch in diameter; many medium distinct white (10YR 8/2) lime masses; violently effervescent; strongly alkaline.

Texture of the A horizon is gravelly fine sandy loam, very fine sandy loam, silt loam, silt, or light clay loam. The upper 7 inches of the profile has platy or granular structure and is soft or slightly hard when dry. The B2t horizon has prismatic or angular blocky structure. It is heavy clay loam or clay that is as much as 30 percent gravel. The Csicam horizon is massive and contains indurated lenses that have the appearance of plates. It is moderately alkaline or strongly alkaline, and strongly or violently effervescent. The IIC horizon is unconformable very gravelly or cobbly sand and loamy sand.

RAC—Ratto gravelly fine sandy loam, 2 to 8 percent slopes. This gently sloping to moderately sloping soil is in irregularly shaped areas of medium size on lower parts of old alluvial fans. It has the profile described as representative of the series. Included with this soil in mapping, and making up about 15 percent of the acreage, are areas of Pedoli and Holtle soils and soils that are similar to this Ratto soil but are more than 20 inches deep to the hardpan.

Runoff is slow, and the hazard of erosion is slight.

This soil is not suited to irrigated crops. It is used mainly for livestock grazing and wildlife habitat. Much of this soil has been seeded to crested wheatgrass. Capability unit VIIs, dryland; Range Site NV 28–29 (Semidesert Loamy Slope).

RCD—Ratto very stony loam, 4 to 15 percent slopes. This moderately sloping to strongly sloping soil is in irregularly shaped areas of medium size on the upper ends of alluvial fans. It has a profile similar to that described as representative of the series, but the surface layer is stony to very stony and depth to the hardpan is less than 12 inches in some places. Included with this soil in mapping, and making up about 15 percent of the acreage, are areas of Ratto soils that have a gravelly or cobbly surface layer and areas of Pedoli soils.

Runoff is medium, and the hazard of erosion is moderate.

This soil is not suited to irrigated crops. It is used mainly for livestock grazing and wildlife habitat. Capability unit VIIs, dryland; Range Site NV 28–29 (Semidesert Loamy Slope).

Ridit Series

The Ridit series consists of well-drained soils that formed in residuum from basalt and andesite that has additions of loess that is high in volcanic ash. These soils are in south- and west-facing areas on foothills. Slope ranges from 8 to 30 percent. The vegetation is big sagebrush, Indian ricegrass, squirreltail, bluebunch wheatgrass, and horsebrush. Elevation is 6,000 to 7,000 feet. Average annual precipitation is 8 to 12 inches, average annual air temperature is 42° to 45° F, and the frost-free season is 70 to 100 days.

In a representative profile the surface layer is light brownish gray gravelly loam and loam about 8 inches thick. The next layer is light brownish gray heavy loam about 7 inches thick. Below this is 16 inches of light brownish gray and pale brown very gravelly loam. This is underlain by a white and light gray hardpan about 3 inches thick. Andesite bedrock is at a depth of 34 inches.

Permeability is moderate. Effective rooting depth is 20 to 36 inches. Available water capacity is low.

Representative profile of Ridit gravelly loam in an area of Ridit-Alpha association in Eureka County, 1,250 feet west and 2,800 feet south of the northeast corner of sec. 2, T. 26 N., R. 54 E.:

A11—0 to 3 inches; light brownish gray (10YR 6/2) gravelly loam, very dark grayish brown (10YR 3/2) moist; moderate medium platy structure; slightly hard, very friable, slightly sticky and slightly plastic; common very fine roots; many very fine interstitial pores; 30 percent angular gravel mulch on surface; neutral; abrupt smooth boundary.

A12—3 to 8 inches; light brownish gray (10YR 6/2) loam, very dark grayish brown (10YR 3/2) moist; moderate fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few medium and fine and common very fine roots; many fine and very fine tubular and vesicular pores; 10 percent gravel; neutral; clear wavy boundary.

B2—8 to 15 inches; light brownish gray (10YR 6/2) heavy loam, dark grayish brown (10YR 4/2) moist; massive; slightly hard, friable, sticky and slightly plastic; few medium and common fine and very fine roots; few fine and many very fine tubular pores; 10 percent gravel; neutral; clear wavy boundary.

IIC1sica—15 to 21 inches; light brownish gray (10YR 6/2) very gravelly loam, brown (10YR 4/3) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; many medium, few fine, and common very fine roots; few fine and many very fine tubular pores; discontinuous unoriented silica laminae and durinodes; 55 percent gravel; silica-lime coatings on underside of pebbles; very slightly effervescent but strongly effervescent on coatings; moderately alkaline; abrupt smooth boundary.

IIC2sica—21 to 31 inches; pale brown (10YR 6/3) very gravelly loam, brown (10YR 4/3) moist; massive; slightly hard, friable, nonsticky and slightly plastic; few fine and common medium and very fine roots; few fine and many very fine tubular pores; 65 percent gravel; thin and moderately thick silica-lime coatings on underside of pebbles; strongly effervescent; strongly alkaline; abrupt smooth boundary.

IIC3sicam—31 to 34 inches; white (10YR 8/2) and light gray (10YR 7/2) indurated duripan, light gray (10YR 7/2) and brown (10YR 5/3) moist; massive; extremely hard, extremely firm; strongly effervescent; very strongly alkaline; abrupt smooth boundary.

R—34 inches; andesite bedrock.

Depth to the duripan ranges from 18 to 36 inches, and depth to bedrock ranges from 20 to 40 inches. The A1 horizon is 4 to 8 inches thick. The B2 horizon is loam or fine sandy loam. It has moderate or weak, medium or fine, subangular blocky structure, or it is massive. The duripan has one to several continuous, indurated silica-lime laminae 2 to 10 millimeters thick between weakly to strongly cemented layers.

RD—Ridit-Alpha association. This association is of rolling and hilly soils in large, irregularly shaped areas on foothills. It is about 60 percent Ridit gravelly loam that has slopes of 8 to 30 percent and about 30 percent Alpha loam that has slopes of 8 to 30 percent. The Ridit soil is on south- and west-facing side slopes and ridgetops, and the Alpha soil is on north- and east-facing side slopes. Included with these soils in mapping, and making up about 10 percent of the acreage, are areas of Holtle and Rubyhill soils.

Permeability is moderate in the Ridit soil and moderately slow in the Alpha soil. Available water capacity is low in the Ridit soil and high in the Alpha soil. Runoff is medium, and the hazard of erosion is moderate or severe.

This association is not suited to irrigated crops. It is used mainly for livestock grazing and wildlife habitat. Ridit part in capability unit VIIe, dryland, and Alpha part in capability unit VIe, dryland; Range Site NV 28–29 (Semidesert Loamy Slope).

Rito Series

The Rito series consists of well-drained soils that formed in mixed alluvium from limestone, dolomite, shale, and siliceous conglomerate. These soils are on alluvial fans and valley bottoms. Slope ranges from 4 to 8 percent. The vegetation is big sagebrush, Douglas rabbitbrush, and squirreltail. Elevation is 6,000 to 6,800 feet. Average annual precipitation is 8 to 12 inches, average annual air temperature is 43° to 45° F, and the frost-free season is 50 to 80 days.

In a representative profile the surface layer is grayish brown gravelly loam about 10 inches thick. The next layer is pale brown very gravelly loam about 20 inches thick. Below this is pale brown very gravelly sandy loam to a depth of 60 inches or more.

Permeability is moderate. Effective rooting depth is 60 inches. Available water capacity is low.

Rito soils have been mapped only in Lone-Rito association.

Representative profile of Rito gravelly loam in an area of Lone-Rito association in Eureka County, 1,800 feet north and 1,550 feet west of the southeast corner of sec. 15, T. 23 N., R. 54 E.:

A1—0 to 10 inches; grayish brown (10YR 5/2) gravelly loam, dark brown (10YR 3/3) moist; weak medium granular structure; soft, very friable, slightly sticky and slightly plastic; common very fine and few fine and very fine tubular pores; 15 percent gravel; neutral; clear smooth boundary.

B2—10 to 30 inches; pale brown (10YR 6/3) very gravelly loam, dark brown (10YR 3/3) moist; weak medium subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; common very fine and few fine and medium roots; many very fine interstitial pores and few fine and very fine tubular pores; 50 percent gravel; neutral; gradual smooth boundary.

Cca—30 to 60 inches; pale brown (10YR 6/3) very gravelly sandy loam, brown (10YR 4/3) moist; massive; soft, very friable, nonsticky and nonplastic; common very fine and few fine and medium roots; many very fine interstitial pores and few fine and very fine tubular pores; 60 percent gravel; strongly effervescent; moderately alkaline.

The A horizon has weak platy or weak to moderate medium granular structure. The B2 horizon has weak to strong, fine or medium, blocky or subangular blocky structure. It is dominantly very gravelly or gravelly loam but has gravelly sandy loam and gravelly light clay loam strata in some places. The A and B horizons are neutral and strongly or violently effervescent. The content of gravel between depths of 10 and 40 inches is 35 to 50 percent, but some layers have less than 35 percent gravel. The average clay content ranges from 18 to 25 percent. Below a depth of 30 to 40 inches, the profile is generally very gravelly and has 50 to 75 percent gravel and some cobbles. The Cca horizon is moderately alkaline or strongly alkaline.

Roca Series

The Roca series consists of well-drained soils that formed in residuum from shale, siliceous conglomerate, and sandstone. These soils are on south-facing low mountainsides. Slope ranges from 15 to 50 percent. The vegetation is big sagebrush and Sandberg bluegrass, and pinyon and juniper in fire-protected areas. Elevation is 6,000 to 7,500 feet. Average annual precipitation is 8 to 12 inches, average annual air temperature is 41° to 45° F, and the frost-free season is 50 to 100 days.

In a representative profile the surface layer is light brownish gray very stony loam about 4 inches thick. The next layer is light brownish gray gravelly clay loam about 4 inches thick. Below this is 16 inches of brown and strong brown gravelly clay. Shale bedrock is at a depth of 24 inches.

Permeability is very slow. Effective rooting depth is 20 to 40 inches. Available water capacity is low.

Roca soils have been mapped only in Fera-Roca association.

Representative profile of Roca very stony loam in an area of Fera-Roca association in Eureka County, 2,300 feet south and 900 feet west of the northeast corner of sec. 23, T. 24 N., R. 54 E.:

A1—0 to 4 inches; light brownish gray (10YR 6/2) very stony loam, dark brown (10YR 3/3) moist; weak fine granular structure; hard, friable, slightly sticky and plastic; many very fine roots; many very fine tubular pores; 40 percent gravel, 10 percent cobbles, and 5 percent stones, mostly shale fragments; neutral; abrupt smooth boundary.

B1—4 to 8 inches, light brownish gray (10YR 6/2) gravelly clay loam, dark brown (10YR 3/3) moist; moderate medium and fine granular structure; hard, friable, sticky and plastic; many very fine roots; many very fine tubular pores; 30 percent gravel, shale fragments; neutral; clear wavy boundary.

B2t—8 to 15 inches; brown (7.5YR 5/4) gravelly clay, strong brown (7.5YR 5/5) moist; strong medium and fine angular blocky structure; very hard, firm, very sticky and very plastic; common very fine roots; common very fine tubular pores; pressure cutans on nearly all vertical ped faces and on some horizontal ped faces; 35 percent gravel, shale fragments; neutral; clear wavy boundary.

B3t—15 to 24 inches; strong brown (7.5YR 5/6) gravelly clay, strong brown (7.5YR 5/6) moist; moderate medium and fine angular blocky structure; very hard, firm, very sticky and very plastic; few fine roots; common very fine tubular pores; common pressure cutans on vertical faces of peds; 45 percent gravel; white (2.5Y 8/2) weathered shale fragments; neutral; abrupt irregular boundary.

C—24 to 36 inches; weathered shale; strong brown (7.5YR 5/6) light clay, strong brown (7.5YR 5/6) moist, coating and filling fractures.

The surface is covered with about 50 percent gravel, 20 percent cobbles, and 10 percent stones. Reaction is slightly acid or neutral throughout, except where lime is in the lower part of the profile. The A horizon has granular or platy structure. The B2t horizon has moderate or strong, medium or fine, angular blocky structure that tends towards prismatic. It has 35 to 50 percent gravel that is dominantly shaly fragments. Depth to bedrock ranges from 20 to 40 inches.

Rock Outcrop

This miscellaneous land type consists of surface exposures of bedrock. Rock outcrop occurs throughout the uplands. A wide variety of rocks are included, but andesite, basalt, rhyolite, tuff, dacite, sandstone, and limestone are dominant. Included with Rock outcrop are other small areas of soils that are less than 4 inches deep over bedrock. Rock outcrop is on nearly level to extremely steep exposures, and it generally supports little or no vegetation, except in a few pockets of intervening soils or in fractures of the rock.

Rock outcrop is mapped only in Devoy-Rock outcrop complex, Labshaft-Rock outcrop complex, and Tica-Rock outcrop complex.

Runoff is very rapid, and the hazard of erosion is slight.

These areas have value mainly for wildlife habitat, recreation, watershed, or esthetic uses.

Rubyhill Series

The Rubyhill series consists of well-drained soils that formed in alluvium dominantly from limestone and quartzite. These soils are on old alluvial fans. Slope ranges from 0 to 8 percent. The vegetation is big sagebrush, Sandberg bluegrass, and occasional pinyon and juniper. Elevation is 5,600 to 6,300 feet. Average annual precipitation is 8 to 12 inches, average annual air temperature is 42° to 45° F, and the frost-free season is 70 to 100 days.

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

The next layer is pale brown loam about 17 inches thick. Below this is a very pale brown and variegated white and pale brown cemented hardpan to a depth of 50 inches.

Permeability is moderate. Effective rooting depth is 20 to 30 inches. Available water capacity is low.

Representative profile of Rubyhill fine sandy loam, 2 to 8 percent slopes, in Eureka County, 2,100 feet east and 1,100 feet north of the southwest corner of sec. 6, T. 21 N., R. 52 E.:

A1—0 to 4 inches; light brownish gray (10YR 6/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; weak thick platy structure; slightly hard, friable, nonsticky and nonplastic; few fine and common very fine roots; many very fine interstitial pores; neutral; abrupt wavy boundary.

B2—4 to 13 inches; pale brown (10YR 6/3) loam, dark brown (10YR 4/3) moist; weak medium and fine subangular blocky structure; slightly hard, friable, sticky and slightly plastic; many medium and few fine and very fine roots; few fine and many very fine tubular pores; mildly alkaline; clear wavy boundary.

B3—13 to 21 inches; pale brown (10YR 6/3) loam, dark brown (10YR 4/3) moist; massive; hard, friable, slightly sticky and slightly plastic; few medium fine and very fine roots; many very fine pores; mildly alkaline; abrupt wavy boundary.

C1sicam—21 to 31 inches; very pale brown (10YR 7/1), strongly cemented duripan, brown (10YR 5/3) moist; white (10YR 8/2) coats, light gray (10YR 7/2) moist; massive; very hard, very firm; very few fine and very fine roots oriented horizontally; many very fine interstitial pores; violently effervescent; strongly alkaline; clear wavy boundary.

C2sicam—31 to 42 inches; variegated white (10YR 8/2) and pale brown (10YR 6/3) strongly cemented duripan, light gray (10YR 7/2) and pale brown (10YR 6/3) moist; massive; very hard, very firm; many very fine interstitial pores; violently effervescent; strongly alkaline; clear wavy boundary.

C3sicam—42 to 50 inches; pale brown (10YR 6/3) strongly cemented duripan, dark brown (10YR 4/3) moist; massive; very hard, very firm; silica coatings on pebbles and silica bridging between sand grains; slightly effervescent; moderately alkaline.

The surface is covered by about 10 percent gravel. The A horizon is fine sandy loam to loam that contains 5 to 30 percent gravel. It has platy or granular structure and is soft or slightly hard. The B horizon is loam or light clay loam that is 20 to 35 percent gravel. Structure is blocky, or the horizon is massive. Consistence is slightly hard or hard. These soils are neutral to moderately alkaline and noneffervescent, except in places where a thin, weak horizon of carbonate accumulation is present in the lower part of the profile. The duripan is massive but platelike. It has a very hard or extremely hard matrix that has few to many, indurated, discontinuous laminae. Depth to the duripan is 20 to 30 inches, and it ranges from 18 to 30 inches in thickness.

RfA—Rubyhill fine sandy loam, 0 to 2 percent slopes. This soil is in areas of small and medium size on the old alluvial fans. Included with this soil in mapping, and making up about 15 percent of the acreage, are areas of Pedoli, Shipley, and Ratto soils.

Runoff is slow, and the hazard of erosion is slight.

This soil has limited suitability for alfalfa or small grain. It is used for irrigated crops, livestock grazing, and wildlife habitat. Capability units IVs–115, irrigated, and VIIs, dryland; Range Site NV 28–21 (Semidesert Loamy Plain).

RHC—Rubyhill fine sandy loam, 2 to 8 percent slopes. This gently sloping to moderately sloping soil is in irregularly shaped areas of large and medium size on old, dissected alluvial fans. It has the profile described as representative of the series. Included with this soil in mapping, and making up about 20 percent of the acreage, are areas of other Rubyhill soils and areas of Ratto soils.

Runoff is slow, and the hazard of erosion is slight.

This soil has limited suitability for alfalfa or small grain. It is used for irrigated crops, livestock grazing, and wildlife habitat. Capability units IVe–45, irrigated, and VIIs, dryland; Range Site NV 28–21 (Semidesert Loamy Plain).

RL—Rubyhill association. This association is in large, irregularly shaped areas on old, coalescing alluvial fans. It is about 60 percent Rubyhill loam that has slopes of 2 to 8 percent, and about 30 percent Rubyhill clay loam that is eroded and has slopes of 2 to 8 percent. The Rubyhill loam has a stable surface that is covered with vegetation. The eroded Rubyhill clay loam is gullied and either has a thin surface layer or has the subsoil exposed. The vegetation is very sparse. These soils have profiles similar to that described as representative of the series, but the surface layer is loam or clay loam. Included with these soils in mapping, and making up about 10 percent of the acreage, are areas of Pedoli and Holtle soils.

Runoff is slow on the Rubyhill loam and medium on the Rubyhill clay loam. The hazard of erosion is slight on the Rubyhill loam and moderate on the Rubyhill clay loam.

This association has limited suitability for alfalfa and small grain. It is used for irrigated crops, livestock grazing, and wildlife habitat. Capability units IVe–45, irrigated, and VIIs, dryland; Range Site NV 28–21 (Semidesert Loamy Plain).

Sader Series

The Sader series consists of somewhat poorly drained, saline-alkali affected soils that formed in lacustrine materials from mixed parent rock. These soils are on low lake terraces and lake plains. Slope ranges from 0 to 2 percent. The vegetation is rubber rabbitbrush, black greasewood, Basin wildrye, big sagebrush, and squirreltail. Elevation is 5,700 to 5,900 feet. Average annual precipitation is 8 to 10 inches, average annual air temperature is 43° to 46° F, and the frost-free season is 70 to 100 days.

In a representative profile the surface layer is light brownish gray and light gray loam about 5 inches thick. The next 5 inches is light gray heavy silty clay loam that has white lime coatings on peds. Below this is pale brown, very pale brown, and light gray silty clay and silty clay loam about 24 inches thick. This is underlain by light gray clay that has many salt and gypsum crystals in the lower part and extends to a depth of 60 inches or more.

Permeability is slow. Effective rooting depth is 60 inches or more. Available water capacity is high.

Representative profile of Sader loam in Eureka County, 1,100 feet east and 2,050 feet south of the northwest corner of sec. 16, T. 25 N., R. 53 E.:

A11—0 to 2 inches; light brownish gray (10YR 6/2) loam, very dark grayish brown (10YR 3/2) moist; moderate very fine granular structure; soft, very fri-

able, slightly sticky and slightly plastic; common very fine roots; many very fine interstitial pores; violently effervescent; strongly alkaline; abrupt smooth boundary.

A12—2 to 5 inches; light gray (10YR 7/2) loam, dark grayish brown (10YR 4/2) moist; strong very fine granular structure; soft, very friable, slightly sticky and slightly plastic; many very fine and few fine and medium roots; many very fine interstitial pores; violently effervescent; strongly alkaline; clear smooth boundary.

B1tsi—5 to 10 inches; light gray (10YR 7/2) heavy silty clay, light brownish gray (10YR 6/2) moist; moderate medium subangular blocky structure; hard, firm, very sticky and very plastic; many very fine, common fine, and few medium roots; common very fine and few fine tubular pores; 20 percent very hard and very firm durinodes; few thin clay films in pores; white (10YR 8/2) lime coats on ped surfaces; violently effervescent; strongly alkaline; clear wavy boundary.

B2t—10 to 15 inches; pale brown (10YR 6/3) silty clay, dark brown (10YR 4/3) moist; moderate fine and medium prismatic structure parting to medium and coarse subangular blocks; hard, firm, very sticky and very plastic; common very fine and few fine roots; common very fine tubular pores; dark brown (10YR 4/3), dry and moist, coatings on peds; common moderately thick clay films on peds and continuous thin clay films in pores; violently effervescent; very strongly alkaline; abrupt wavy boundary.

B3tca—15 to 25 inches; very pale brown (10YR 7/3) silty clay loam, brown (10YR 5/3) moist; moderate fine prismatic structure parting to medium subangular blocks; hard, friable, sticky and plastic; few fine and very fine roots; few very fine tubular pores; few thin clay films on peds; violently effervescent; strongly alkaline; clear wavy boundary.

C1ca—25 to 34 inches; light gray (2.5Y 7/2) silty clay loam, grayish brown (2.5Y 5/2) moist; weak medium prismatic structure parting to fine subangular blocks; slightly hard, friable, sticky and very plastic; few fine and very fine roots; many very fine interstitial pores; many medium faint very pale brown (10YR 7/3) lime segregations; violently effervescent; strongly alkaline; clear wavy boundary.

C2—34 to 43 inches; light gray (5Y 7/2) clay, olive (5Y 3/3) moist; many medium distinct brown (10YR 5/3), moist, iron mottles; moderate coarse prismatic structure parting to fine angular blocks; hard, friable, very sticky and very plastic; few fine tubular pores and common very fine interstitial pores; violently effervescent; very strongly alkaline; abrupt wavy boundary.

C3—43 to 60 inches; light gray (5Y 7/2) clay, olive (5Y 6/3) moist; moderate coarse prismatic structure parting to fine angular blocks; very hard, firm, very sticky and very plastic; many coarse white (10YR 8/1) salt and gypsum crystals on prism faces; violently effervescent; very strongly alkaline.

The A horizon is loam, silt loam, and silty clay loam, has platy or granular structure, and is soft or slightly hard. It is moderately alkaline to very strongly alkaline and slightly to violently effervescent. It is slightly to moderately affected by salt and alkali. The B2t horizon is hard or very hard when dry and is silty clay or heavy silty clay loam. It is slightly to violently effervescent. Exchangeable sodium ranges from 15 to 40 percent throughout the Bt horizon. The C horizon is mottled and high in soluble salts and in exchangeable sodium. It is silty clay loam, silty clay, and clay.

SA—Sader loam. This nearly level soil is in irregularly shaped areas of large and moderate size on low lake terraces and lake plains. It has the profile described as representative of the series. Included with this soil in mapping, and making up about 15 percent of the acreage, are areas of Dianev and Bicondoa soils.

Runoff is slow or ponded, and the hazard of erosion is slight. A seasonal high water table is at a depth of 3 to 5 feet. The soil is saline-alkali affected.

This soil is suited to irrigated crops if reclaimed. It is used mainly for livestock grazing and wildlife habitat. Capability units IIIw–124, irrigated, and VIw, dryland; Range Site NV 28–26 (Arid Salty Flat).

SD—Sader loam, occasionally flooded. This nearly level soil is in a large irregularly shaped area on a low lake terrace. It is susceptible to occasional flooding and has evidence of inundation. Included with this soil in mapping, and making up about 15 percent of the acreage, are areas of Bicondoa and Dianev soils and areas of other Sader soils that are not flooded.

Runoff is slow or ponded, and the hazard of erosion is slight. A seasonal high water table is at a depth of 3 to 5 feet. The soil is saline-alkali affected.

This soil is suited to irrigated crops if protected from flooding and if reclaimed. It is used mainly for livestock grazing and wildlife habitat. Capability units IIIw–124, irrigated, and VIw, dryland; Range Site NV 28–26 (Arid Salty Flat).

Sheege Series

The Sheege series consists of well-drained soils that formed in residuum from limestone and dolomite. These soils are on uplands and mountains. Slope ranges from 30 to 75 percent. The vegetation is mountain-mahogany, pinyon, juniper, black sagebrush, bitterbrush, mountain brome, Sandberg bluegrass, and squirreltail. Elevation is generally 7,500 to 10,000 feet, but these soils are as low as 6,200 feet on north-facing exposures. Average annual precipitation is 12 to 18 inches, average annual air temperature is 35° to 42° F, and the frost-free season is less than 50 days.

In a representative profile the upper 6 inches of the soil is grayish brown very cobbly loam. The next 11 inches is grayish brown very gravelly very fine sandy loam. Below this is limestone bedrock that has thin continuous lime coatings on the surface and in cracks.

Permeability is moderate. Effective rooting depth is 10 to 20 inches. Available water capacity is very low.

Representative profile of Sheege very cobbly loam in an area of Sheege-Croesus association in Eureka County, about 2,650 feet south of North Diamond Peak in the SE¼NW¼ of sec. 36, T. 25 N., R. 54 E.:

A11—0 to 6 inches; grayish brown (10YR 5/2) very cobbly loam, dark brown (10YR 3/3) moist; weak fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; many very fine and fine interstitial pores; thin lime coatings on underside of coarse fragments; violently effervescent; moderately alkaline; clear smooth boundary.

A12—6 to 17 inches; grayish brown (10YR 5/2) very gravelly very fine sandy loam, dark brown (10YR 3/3) moist; massive; soft, very friable, nonsticky and nonplastic; common very fine and fine roots; many fine and very fine interstitial pores; thin lime coatings on coarse fragments; violently effervescent; moderately alkaline; abrupt irregular boundary.

R—17 inches; limestone bedrock; thin continuous lime coating on surface and in cracks.

The profile is fine sandy loam to loam throughout and contains 35 to 60 percent angular limestone gravel, cobbles,

or stones. Structure is granular and subangular blocky, or the soil is massive. The profile is moderately alkaline or strongly alkaline and strongly or violently effervescent. Bedrock generally has a thin lime coating, but it is solution-pitted in places. The surface is covered with about 80 percent gravel and cobbles.

SE—Sheege-Croesus association. This association of steep to very steep soils is in large, elongated areas on mountains (fig. 10). It is about 50 percent Sheege very cobbly loam that has slopes of 30 to 75 percent and about 30 percent Croesus gravelly loam that has slopes of 30 to 50 percent. The Sheege soil is on the steep to very steep convex mountainsides, and the Croesus soil is in concave basins on high mountainsides. Included with these soils in mapping, and making up about 20 percent of the acreage, are areas of a gravelly loam soil that is similar to Croesus soils but that is more than 40 inches deep over bedrock and areas of Rock outcrop.

Permeability is moderate. Available water capacity is very low. Runoff is rapid, and the hazard of erosion is severe.

This association is not suited to irrigated crops. It is used mainly for livestock grazing and wildlife habitat. Sheege part in capability unit VIIs, dryland, and Croesus part in capability unit VIIe, dryland; woodland suitability group 3x2.

Shipley Series

The Shipley series consists of well-drained soils that formed in mixed alluvial and lacustrine material. These soils are on alluvial fans and lake terraces. Slope ranges from 0 to 4 percent. The vegetation is common winterfat, big sagebrush, rubber rabbitbrush, Sandberg bluegrass, saltgrass, and greasewood. Elevation is 5,800 to 6,100 feet. Average annual precipitation is 8 to 10 inches, average annual air temperature is 42° to 45° F, and the frost-free season is 70 to 100 days.

In a representative profile, the upper 18 inches of the soil is light brownish gray and light gray silt loam. Below this is light gray very fine sandy loam to a depth of 60 inches.

Permeability is moderate. Effective rooting depth is 60 inches. Available water capacity is high.

Representative profile of Shipley silt loam, 0 to 2 percent slopes, in Eureka County, 1,200 feet north and 1,500 feet west of the southeast corner of sec. 15, T. 20 N., R. 53 E.:

A1—0 to 3 inches; light brownish gray (10YR 6/2) silt loam, dark grayish brown (10YR 4/2) moist; strong very thick platy structure; soft, very friable, slightly sticky and slightly plastic; few very fine roots; many very fine vesicular pores; violently effervescent; moderately alkaline; abrupt smooth boundary.

C1—3 to 14 inches; light gray (10YR 7/2) silt loam, dark brown (10YR 4/2) moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; few fine and common very fine roots; common very fine tubular pores; violently effervescent; strongly alkaline; clear smooth boundary.

***Figure 10.*—Typical area of Sheege-Croesus association.**

C2—14 to 18 inches; light gray (10YR 7/2) silt loam, dark brown (10YR 4/3) moist; massive; slightly hard, friable, nonsticky and nonplastic; common very fine and few fine roots; many very fine interstitial pores and common very fine and few fine tubular pores; 10 percent hard cylindrical durinodes ½ to ¾ inch in diameter; violently effervescent; strongly alkaline; gradual wavy boundary.

C3—18 to 60 inches; light gray (10YR 7/2) very fine sandy loam, dark brown (10YR 4/3) moist; massive; soft, very friable, nonsticky and nonplastic; common very fine and few fine roots; many very fine interstitial pores; violently effervescent; strongly alkaline.

The profile is calcareous throughout. Reaction ranges from moderately alkaline to very strongly alkaline with no distinct trend. The profile is dominantly silt loam or very fine sandy loam. In some areas there is minor stratification of loam, fine sandy loam, or sandy loam above a depth of 40 inches. The profile is normally nongravelly, but any one stratum can contain as much as 35 percent gravel. In some areas the soil overlies sand or gravel, or both, below a depth of 40 inches. In some places, any stratum below a depth of 15 inches contains as much as 20 percent slightly hard or hard, brittle durinodes ½ to 1 inch in diameter. Some areas have lime segregations of fine and medium size below a depth of 24 inches. The A1 horizon is either massive or has strong or moderate, very thin to medium, platy structure. Consistence ranges from soft to hard. The C horizon is normally massive, but in places it has weak, platy or subangular blocky structure. Consistence ranges from soft to slightly hard.

SfB—Shipley fine sandy loam, 2 to 4 percent slopes. This soil is in irregularly shaped areas of small and medium size on high lake terraces. It has a profile similar to that described as representative of the series, but the upper 20 inches is fine sandy loam. Included with this soil in mapping, and making up about 15 percent of the acreage, are areas of other Shipley soils and areas of Hayeston and Silverado soils.

Runoff is slow, and the hazard of erosion is moderate.

This soil is suited to irrigated crops. It is used mainly for livestock grazing and wildlife habitat. Capability units IIIe–40, irrigated, and VIc, dryland; Range Site NV 28–21 (Semidesert Loamy Plain).

ShA—Shipley silt loam, 0 to 2 percent slopes. This nearly level soil is in irregularly shaped areas of small and medium size on flood plains. It has the profile described as representative of the series. Included with this soil in mapping, and making up about 15 percent of the acreage, are areas of Alhambra and Kobeh soils. Also included are areas of a silt loam that is similar to this Shipley soil but that has a dark surface layer 2 to 8 inches thick.

Runoff is slow, and the hazard of erosion is slight.

This soil is suited to irrigated crops. It is used mainly for irrigated crops, livestock grazing, and wildlife habitat. Capability units IIIc–2, irrigated, and VIc, dryland; Range Site NV 28–25 (Semidesert Silty Plain, Winterfat).

SlA—Shipley silt loam, moderately saline-alkali, 0 to 2 percent slopes. This soil is in large, irregularly shaped areas on alluvial fans. It has a profile similar to that described as representative of the series, but the upper 10 to 16 inches is moderately saline-alkali affected. Included with this soil in mapping, and making up about 10 percent of the acreage, are areas of Alhambra and Kobeh soils.

Runoff is slow, and the hazard of erosion is slight. A seasonal high water table is at a depth of 3½ to 5 feet.

This soil is suited to irrigated crops if reclaimed. It is used mainly for livestock grazing and wildlife habitat. Capability units IIIw–121, irrigated, and VIw, dryland; Range Site NV 28–23 (Arid Loamy Bottomland, Saline-Alkali).

SMA—Shipley silt loam, occasionally flooded, 0 to 2 percent slopes. This soil is in a large, irregular area on an alluvial fan. It has a profile similar to that described as representative of the series, but silty material has been deposited on the surface. The soil is susceptible to occasional overflow. Included with this soil in mapping, and making up about 15 percent of the acreage, are areas of Dianev soils and areas of other Shipley soils that are not flooded.

Runoff is slow, and the hazard of erosion is slight.

This soil is suited to irrigated crops. It is used mainly for livestock grazing and wildlife habitat. Capability units IIIw–120, irrigated, and VIw, dryland; Range Site NV 28–21 (Semidesert Loamy Plain).

Shipley Variant

The Shipley variant consists of well-drained soils that formed in mixed alluvium. These soils are on alluvial fans. Slope ranges from 0 to 2 percent. The vegetation is big sagebrush and squirreltail. Elevation is 5,800 to 6,100 feet. Average annual precipitation is 8 to 10 inches, average annual air temperature is 42° to 45° F, and the frost-free season is 70 to 100 days.

In a representative profile, the surface layer is very pale brown silt loam about 4 inches thick. The next layer is very pale brown very fine sandy loam about 28 inches thick. Below this is very pale brown very gravelly loamy fine sand to a depth of 60 inches.

Permeability is moderate. Effective rooting depth is 60 inches or more. Available water capacity is moderate.

Representative profile of Shipley silt loam, sandy subsoil variant, in an area of Shipley complex in Eureka County 2,300 feet west and 300 feet north of the southeast corner of sec. 32, T. 20 N., R. 53 E.:

A1—0 to 4 inches; very pale brown (10YR 7/3) silt loam, brown (10YR 4/3) moist; moderate thick and very thick platy structure; soft, very friable, nonsticky and nonplastic; no roots; many very fine interstitial pores; violently effervescent; strongly alkaline; abrupt smooth boundary.

C1—4 to 32 inches; very pale brown (10YR 7/3) silt loam, yellowish brown (10YR 5/4) moist; massive; nonsticky and nonplastic; common coarse, medium, fine, and very fine roots; many interstitial pores; violently effervescent; strongly alkaline; abrupt smooth boundary.

IIC2—32 to 60 inches; very pale brown (10YR 7/3) very gravelly loamy fine sand, yellowish brown (10YR 5/4) moist; single grained; loose, nonsticky and nonplastic; very few very fine roots; many fine interstitial pores; violently effervescent; strongly alkaline.

The A horizon is fine and very fine sandy loam or silt loam. The C horizon ranges in value from 6 to 7 when dry, and 4 to 6 when moist and has chroma of 2 to 4. It is fine and very fine sandy loam or silt loam. The IIC horizon ranges in texture from very gravelly sand to very gravelly very fine sandy loam, and it is 35 to 75 percent gravel. It is commonly stratified. The profile is strongly alkaline and strongly to violently effervescent, but in places it is neutral to mildly alkaline and noneffervescent to a depth of 6 inches.

Sn—Shipley complex. This complex is in irregularly shaped areas of small and medium size on alluvial fans. It is about 60 percent Shipley silt loam, sandy subsoil variant, and about 30 percent Shipley silt loam, 0 to 2 percent slopes. The Shipley variant soil is on slightly higher positions on alluvial fans. The Shipley soil is on flood plains. Included with these soils in mapping, and making up about 10 percent of the acreage, are areas of Alhambra and Kobeh soils.

Permeability is moderate. Effective rooting depth is 60 inches. Available water capacity is moderate in the Shipley variant soil and high in the Shipley soil. Runoff is slow, and the hazard of erosion is slight.

This complex is used mainly for irrigated crops, livestock grazing, and wildlife habitat. Capability units IIIc–2, irrigated, and VIc, dryland; Shipley variant part in Range Site NV 28–21 (Semidesert Loamy Plain) and Shipley part in Range Site NV 28–25 (Semidesert Silty Plain, Winterfat).

Silverado Series

The Silverado series consists of well-drained soils that formed in coarse-textured alluvium from mixed rock sources. These sources have a high content of siliceous material, and the alluvium has been influenced by tuff and volcanic ash. These soils are on lake terraces, benches, and alluvial fans. Slope ranges from 0 to 15 percent but is mainly 0 to 4 percent. The vegetation is big sagebrush, squirreltail, Douglas rabbitbrush, shadscale, and bud sagebrush. Elevation is 5,900 to 6,300 feet. Average annual precipitation is 8 to 10 inches, average annual air temperature is 42° to 45° F, and the frost-free season is 70 to 100 days.

In a representative profile the surface layer is grayish brown gravelly loamy coarse sand and light brownish gray sandy loam about 6 inches thick. The next layer is brown sandy loam about 7 inches thick. Below this is 19 inches of pale brown and light brownish gray weakly cemented gravelly sandy loam. This is underlain by light gray gravelly coarse sand to a depth of 60 inches.

Permeability is moderately rapid. Effective rooting depth is 60 inches or more. Available water capacity is low.

Representative profile of Silverado sandy loam, 0 to 2 percent slopes, in Eureka County, 200 feet south and 100 feet east of the northwest corner of sec. 33, T. 21 N., R. 53 E.:

A11—0 to 2 inches; grayish brown (10YR 5/2) gravelly loamy coarse sand, very dark grayish brown (10YR 3/2) moist; single grained; loose, nonsticky and nonplastic; few fine and common very fine roots; common very fine interstitial pores; slightly acid; abrupt broken boundary.

A12—2 to 6 inches; light brownish gray (10YR 6/2) sandy loam, dark grayish brown (10YR 4/2) moist; massive; slightly hard, friable, nonsticky and slightly plastic; few very fine roots; few fine and many very fine vesicular pores; 10 percent gravel; neutral; abrupt smooth boundary.

B2—6 to 13 inches; brown (10YR 5/3) sandy loam, dark brown (10YR 4/3) moist; weak medium subangular blocky structure; slightly hard, friable, nonsticky and slightly plastic; few medium and fine and common very fine roots; few fine and many very fine tubular and interstitial pores; 15 percent gravel; neutral; clear wavy boundary.

C1si—13 to 24 inches; pale brown (10YR 6/3) gravelly sandy loam, dark brown (10YR 4/3) moist; massive; hard, firm, brittle; few medium and fine and common very fine roots; few fine and common very fine tubular and interstitial pores; 25 percent gravel; weakly cemented with common very thin silica bridges between sand grains and few very thin discontinuous silica laminae; neutral; gradual smooth boundary.

C2si—24 to 32 inches; light brownish gray (10YR 6/2) gravelly sandy loam, dark brown (10YR 4/3) moist; massive; slightly hard, friable, nonsticky and nonplastic; few medium and fine and common very fine roots; few fine and common very fine tubular and interstitial pores; 25 percent gravel; 20 percent durinodes ¼ to 1-inch in diameter; neutral; clear smooth boundary.

IIC3sica—32 to 60 inches; light gray (10YR 7/2) gravelly coarse sand, dark brown (10YR 4/3) moist; single grained; loose, nonsticky and nonplastic; few medium and fine and many very fine roots; common fine and many very fine interstitial pores; 45 percent gravel; slightly effervescent, except in discontinuous areas ½ to 2 inches thick in the upper part; strongly alkaline.

The surface is generally covered with about 50 percent gravel and cobbles. The A horizon is silt loam, very fine sandy loam, or gravelly sandy loam. Between depths of 10 and 40 inches the profile is somewhat stratified, but it generally grades to coarser textures with depth. The upper part of the profile, including the B horizon, is sandy loam. The texture grades to light sandy loam, loamy sand, sand, or coarse sand in the lower part of the profile. The average texture between depths of 10 and 40 inches is sandy loam or gravelly sandy loam. The weakly cemented Csi horizon has few, common, discontinuous, horizontal and vertical, silica-cemented laminae and is as much as 20 percent durinodes. None to common pendants are on coarse fragments in the noncemented part. The part of the C horizon below a depth of 40 inches is sand or coarse sand and is commonly gravelly. The Csica horizon is moderately alkaline or strongly alkaline and slightly or strongly effervescent.

SoA—Silverado sandy loam, 0 to 2 percent slopes. This soil is in small, irregularly shaped areas on old lake terraces and alluvial fans. It has the profile described as representative of the series. Included with this soil in mapping, and making up about 10 percent of the acreage, are areas of Kobeh and Lone soils.

Runoff is slow, and the hazard of erosion is slight.

This soil is used mainly for irrigated small grain and alfalfa, livestock grazing, and wildlife habitat. Capability units IVs–115, irrigated, and VIIs, dryland; Range Site NV 28–21 (Semidesert Loamy Plain).

SoB—Silverado sandy loam, 2 to 4 percent slopes. This soil is in small, irregularly shaped areas on lake terraces and alluvial fans. Included with this soil in mapping, and making up about 10 percent of the acreage, are areas of Kobeh soils and other Silverado soils.

Runoff is slow, and the hazard of erosion is slight or moderate.

This soil is suited to irrigated crops. It is used mainly for livestock grazing and wildlife habitat. Capability units IVe–45, irrigated, and VIIs, dryland; Range Site NV 28–21 (Semidesert Loamy Plain).

SRD—Silverado gravelly sandy loam, 4 to 15 percent slopes. This soil is in small, elongated areas on sides of old dissected terraces. It has a profile similar to that described as representative of the series, but the surface layer is gravelly. Included with this soil in mapping, and making up about 15 percent of the acreage, are areas of Silverado soils that have slopes of more than 15 percent or less than 4 percent.

Runoff is slow, and the hazard of erosion is moderate.

This soil is suited to irrigated crops. It is used mainly for livestock grazing and wildlife habitat. Capability units IVe–45, irrigated, and VIIs, dryland; Range Site NV 28–21 (Semidesert Loamy Plain).

StA—Silverado silt loam, occasionally flooded, 0 to 2 percent slopes. This soil is in small, irregularly shaped areas on lake terraces at the base of alluvial fans. These areas receive runoff from higher lying areas. This soil has a profile similar to that described as representative of the series, but the surface is covered with recently deposited silt loam or very fine sandy loam. This soil is susceptible to occasional flooding. Included with this soil in mapping, and making up about 15 percent of the acreage, are areas of other Silverado soils.

Runoff is slow, and the hazard of erosion is slight.

This soil is suited to irrigated crops. It is used mainly for livestock grazing and wildlife habitat. Capability units IVw–120, irrigated, and VIIw, dryland; Range Site NV 28–21 (Semidesert Loamy Plain).

Siri Series

The Siri series consists of well-drained steep soils that formed in residuum that weathered from quartzite, sandstone, and limestone and has some loess influence. These soils are on foothills. Slope ranges from 30 to 50 percent. The vegetation is big sagebrush, Sandberg bluegrass, squirreltail, and Douglas rabbitbrush. Elevation is 6,000 to 7,200 feet. Average annual precipitation is 8 to 12 inches, average annual air temperature is 43° to 46° F, and the frost-free season is 50 to 70 days.

In a representative profile the upper 11 inches of the soil is light brownish gray and light gray very gravelly loam. The next 23 inches is light gray very gravelly loam that is 50 to 60 percent gravel that has silica-lime pendants on the undersides. Below this, to a depth of 60 inches, is light gray very gravelly heavy loam that is 70 percent gravel.

Permeability is moderate. Effective rooting depth is 60 inches or more. Available water capacity is low.

Representative profile of Siri very gravelly loam, 30 to 50 percent slopes, in Eureka County, 400 feet south and 400 feet west of the northeast corner of sec. 28, T. 25 N., R. 54 E.:

A1—0 to 5 inches; light brownish gray (10YR 6/2) very gravelly loam, dark grayish brown (10YR 4/2) moist; moderate medium and fine granular structure; soft, friable, slightly sticky and slightly plastic; many medium and common fine and very fine roots; many fine and very fine interstitial pores; 50 percent gravel; slightly effervescent; moderately alkaline; clear smooth boundary.

B2—5 to 11 inches; light gray (10YR 7/2) very gravelly loam, dark grayish brown (10YR 4/2) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few coarse and medium and common very fine roots; few fine and many very fine tubular pores; 60 percent gravel; slightly effervescent; moderately alkaline; clear smooth boundary.

C1sica—11 to 23 inches; light gray (10YR 7/2) very gravelly loam, brown (10YR 5/3) moist; massive; hard, friable, slightly sticky and slightly plastic; few fine and common very fine roots; many very fine tubular pores; 50 percent gravel; silica and lime pendants on underside of pebbles; violently effervescent; strongly alkaline; gradual smooth boundary.

C2sica—23 to 34 inches; light gray (10YR 7/2) very gravelly loam, brown (10YR 5/3) moist; massive; hard, friable, slightly sticky and slightly plastic; few fine and very fine roots; many very fine tubular pores; 65 percent gravel; silica and lime pendants on underside of pebbles; violently effervescent; strongly alkaline; clear smooth boundary.

C3—34 to 60 inches, light gray (10YR 7/2) very gravelly heavy loam, dark brown (10YR 4/3) moist; massive; hard, friable, slightly sticky and slightly plastic; few very fine roots; 70 percent gravel; strongly effervescent; strongly alkaline.

The soil surface is covered with about 90 percent gravel, cobbles, and stones. The A horizon is loam or sandy loam that contains 35 to 80 percent angular gravel and cobbles. It has platy or granular structure, or it is massive. The B2 horizon is sandy loam or loam that contains 35 to 80 percent angular gravel and cobbles. It has subangular blocky structure, or it is massive. The solum is moderately alkaline or strongly alkaline and slightly or moderately effervescent. The C horizon is slightly hard or hard. The Csica horizon ranges from 12 to 30 inches in thickness and has lime and silica pendants on the underside of pebbles and cobbles. The profile has 50 to 80 percent coarse fragments.

SUF—Siri very gravelly loam, 30 to 50 percent slopes. This steep soil is in long, narrow areas on foothills. Included with this soil in mapping, and making up about 15 percent of the acreage, are areas of Overland and Bartine soils and Rock outcrop.

Runoff is medium, and the hazard of erosion is severe.

This soil is not suited to irrigated crops. It is used mainly for livestock grazing and wildlife habitat. Capability unit VIIs, dryland; Range Site NV 28–29 (Semidesert Loamy Slope).

Stampede Series

The Stampede series consists of well-drained soils that formed in material from mixed rocks dominated by tuffs. These soils are on high terraces. Slope ranges from 2 to 4 percent. The vegetation is big sagebrush, bluebunch wheatgrass, Thurber's needlegrass, squirreltail, Basin wildrye, and Douglas rabbitbrush. Elevation is 6,300 to 6,500 feet. Average annual precipitation is 10 to 12 inches, average annual air temperature is 42° to 45° F, and the frost-free season is 70 to 100 days.

In a representative profile the surface layer is light gray loam and grayish brown clay loam about 6 inches thick. The next layer is grayish brown gravelly heavy clay loam about 4 inches thick. Below this is brown clay about 13 inches thick. This is underlain by a variegated white and light yellowish brown, strongly silica-lime cemented hardpan to a depth of 50 inches or more.

Permeability is very slow. Effective rooting depth is 20 to 32 inches. Available water capacity is low.

Representative profile of Stampede loam, 2 to 4 percent slopes, in Eureka County, 1,575 feet west and 500 feet south of the northeast corner of sec. 15, T. 27 N., R. 53 E.:

A11—0 to 2 inches; light gray (10YR 7/2) loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure; soft, friable, slightly sticky and slightly plastic; many coarse, medium, and very fine and common fine roots; many very fine interstitial pores; neutral; abrupt smooth boundary.

A12—2 to 6 inches; grayish brown (10YR 5/2) clay loam; very dark grayish brown (10YR 3/2) moist; moderate medium and fine granular structure; slightly hard, firm, slightly sticky and slightly plastic; many coarse, medium, and very fine and common fine roots; few fine and common very fine pores; few thin clay films in pores; neutral; clear smooth boundary.

B1t—6 to 10 inches; grayish brown (10YR 5/2) gravelly heavy clay loam, dark grayish brown (10YR 4/2) and very dark grayish brown (10YR 3/2) moist; strong medium and fine angular blocky structure; hard, friable, very sticky and very plastic; many very fine, common fine, and few medium roots; many very fine tubular pores; few thin clay films in pores and on peds; slightly acid; abrupt wavy boundary.

B2t—10 to 18 inches; brown (10YR 5/3) clay, dark brown (10YR 4/3) moist; strong medium prismatic structure; very hard, very firm, very sticky and very plastic; many medium, few fine, and common very fine roots; common very fine tubular pores; few slickensides and many pressure cutans on peds; slightly acid; clear wavy boundary.

B3t—18 to 23 inches; brown (10YR 5/3) clay, dark brown (10YR 4/3) moist; moderate medium subangular blocky structure; very hard, friable, very sticky and very plastic; many medium, few fine, and common very fine roots; many very fine pores; many dark yellowish brown (10YR 4/4) clay coatings; continuous moderately thick clay films; neutral; abrupt wavy boundary.

C1sicam—23 to 37 inches; variegated white (10YR 8/2) and light yellowish brown (10YR 6/4) indurated duripan, very pale brown (10YR 8/3) and light yellowish brown (10YR 6/4) moist; massive; very hard, firm, nonsticky and nonplastic; no roots; many fine pores; common moderately thick clay films on fracture surfaces and continuous moderately thick clay films in pores; thin laminar silica coating on pan and as lenses, giving duripan a platelike appearance; violently effervescent; strongly alkaline; abrupt smooth boundary.

C2sicam—37 to 50 inches; variegated very pale brown (10YR 8/3 and 7/4) and pale brown (10YR 6/3) strongly cemented pan, very pale brown (10YR 7/3) and dark grayish brown (10YR 4/2) moist; massive; very hard, firm, nonsticky and nonplastic; no roots; many very fine pores; lime segregated in bands; violently effervescent; mildly alkaline.

The soil surface is covered with about 10 percent gravel. The upper part of the A horizon has weak to moderate, medium to thick, platy structure or medium, subangular blocky structure, or it is massive. The lower part has moderate to strong, fine to medium, granular or subangular blocky structure. The B horizon is sandy clay, heavy clay loam, clay, or gravelly clay. It has strong, medium to coarse, prismatic structure or fine, angular to subangular blocky structure. The B3t horizon is lacking in some places where the indurated duripan is less than 22 inches deep. Reaction of the profile above the duripan ranges from slightly acid to neutral. The hardpan is slightly to strongly effervescent, and it contains many violently effervescent lime coatings on the upper parts or in fractures. Reaction ranges from mildly alkaline to moderately alkaline.

SVB—Stampede loam, 2 to 4 percent slopes. This soil is in a small, irregularly shaped area on a high terrace. Included with this soil in mapping, and making up about 15 percent of the acreage, are areas of Ratto, Pedoli, and Bobs soils.

Runoff is medium, and the hazard of erosion is slight. The soil is not suited to irrigated crops. It is used mainly for livestock grazing and wildlife habitat. Capability unit VIIs, dryland; Range Site NV 28–29 (Semidesert Loamy Slopes).

Tahquats Series

The Tahquats series consists of well-drained soils that formed in alluvium from shale, sandstone, and conglomerate material. These soils are on old alluvial fans and foot slopes. Slope ranges from 4 to 15 percent. The vegetation is big sagebrush, rabbitbrush, and cheatgrass. Elevation is 6,800 to 7,800 feet. Average annual precipitation is 10 to 14 inches, average annual air temperature is 41° to 45° F, and the frost-free season is 50 to 70 days.

In a representative profile the upper 7 inches of the soil is brown stony loam. The next 17 inches is brown gravelly clay loam. Below this is brown very gravelly and stony heavy clay loam to a depth of 60 inches or more.

Permeability is moderately slow. Effective rooting depth is 60 inches or more. Available water capacity is low or moderate.

Representative profile of Tahquats stony loam, 4 to 15 percent slopes, in Eureka County, about 10 miles northeast of the town of Eureka, 800 feet south and 1,000 feet east of the northwest corner of sec. 12, T. 20 N., R. 54 E.:

A1—0 to 7 inches; brown (10YR 5/3) stony loam, dark brown (10YR 3/3) moist; weak coarse granular structure; slightly hard, friable, nonsticky and slightly plastic; many very fine and few fine and medium roots; many very fine and few fine interstitial pores; stones on the surface average about 20 feet apart; medium acid; abrupt smooth boundary.

A3—7 to 15 inches; brown (10YR 5/3) gravelly light clay loam, dark brown (10YR 3/3) moist; moderate fine and very fine angular blocky structure; hard, friable, sticky and plastic; many very fine roots; many very fine and few fine interstitial pores; 20 percent gravel; medium acid; clear smooth boundary.

B21t—15 to 24 inches; brown (7.5YR 5/4) gravelly heavy clay loam, dark brown (7.5YR 4/4) moist; strong fine angular blocky structure; hard, friable, sticky and plastic; common very fine and few fine roots; common very fine and fine tubular pores; 20 percent gravel; many thin clay films on peds; slightly acid; abrupt smooth boundary.

IIB22t—24 to 60 inches; brown (7.5YR 5/4) very gravelly and stony heavy clay loam, dark brown (7.5YR 4/4) moist; massive; hard, friable, sticky and plastic; very few fine and very fine roots; 60 percent gravel; many moderately thick clay films on peds and in pores; slightly acid.

The soil surface is covered with about 45 percent gravel and some cobbles and stones. The A horizon has granular or subangular blocky structure and is soft or slightly hard. It is gravelly or stony loam to clay loam. Thickness ranges from 12 to 16 inches. The Bt horizon dominantly has angular or subangular blocky structure, but in some places where gravel and stone content is lowest, it has weak, prismatic structure. It is hard or very hard when dry. It is gravelly to stony clay loam or clay. Coarse fragments in the Bt horizon consist of gravel, cobbles, and stones that range from 40 to 70 percent and generally increase with depth. The profile ranges from medium acid to neutral throughout. Reaction generally increases slightly with depth.

TAD—Tahquats stony loam, 4 to 15 percent slopes. This soil is in large, irregularly shaped areas on alluvial fans and mountain foot slopes. Included with this soil in mapping, and making up about 15 percent of the acreage, are areas of Devoy and Fairydell soils.

Runoff is medium, and the hazard of erosion is moderate.

This soil is not suited to irrigated crops. It is used mainly for livestock grazing and wildlife habitat. Capability unit VIIs, dryland; Range Site NV 28–29 (Semidesert Loamy Slopes).

Tica Series

The Tica series consists of well-drained soils that formed in residuum from andesite. These soils are on foothills and mountains. Slope ranges from 30 to 50 percent. The vegetation is pinyon and juniper and an understory of low sagebrush, bluebunch wheatgrass, squirreltail, bitterbrush, and snowberry. Elevation is 7,000 to 8,500 feet. Average annual precipitation is 12 to 16 inches, average annual air temperature is 39° to 45° F, and the frost-free season is 50 to 70 days.

In a representative profile the surface layer is dark grayish brown very stony loam about 7 inches thick. The next layer is brown very gravelly sandy clay loam and very gravelly clay about 11 inches thick. Below this is andesite bedrock.

Permeability is slow. Effective rooting depth is 10 to 20 inches. Available water capacity is very low.

Representative profile of Tica very stony loam, 30 to 50 percent slopes, in Eureka County, 600 feet north of the southwest corner of sec. 17, T. 19 N., R. 54 E.:

A1—0 to 7 inches; dark grayish brown (10YR 4/2) very stony loam, very dark brown (10YR 2/2) moist; moderate fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; many medium, fine, and very fine roots; many fine and very fine interstitial pores; neutral; clear wavy boundary.

B1t—7 to 12 inches; brown (10YR 5/3) very gravelly sandy clay loam, very dark brown (10YR 2/2) moist; moderate fine subangular blocky structure; hard, friable, sticky and plastic; many medium, fine, and very fine roots; many fine and very fine tubular pores; few clay films on ped faces and in pores; neutral; clear wavy boundary.

B2t—12 to 18 inches; brown (10YR 5/3) very gravelly clay; light brown (10YR 3/3) moist; weak fine subangular blocky structure; hard, friable, very sticky and very plastic; many medium and common fine and very fine roots; many fine and very fine tubular pores; many thin and few moderately thick clay films on ped faces and in pores; neutral; abrupt irregular boundary.

R—18 inches; andesite bedrock; clay films coating the surface of the bedrock and in cracks.

The soil surface is covered with about 40 percent gravel and cobbles and 10 percent stones. The profile is 10 to 20 inches thick over andesite bedrock. Coarse fragments are angular andesite gravel, cobbles, and stones. The A horizon is gravelly, cobbly, or very stony loam, clay loam, or sandy clay loam. It is slightly acid to neutral. The B horizon is very gravelly or cobbly clay to heavy clay loam. It is neutral to slightly acid. It is 6 to 16 inches thick and has moderate to strong, fine to coarse, angular or subangular blocky structure, depending on stone or gravel content.

TCF—Tica very stony loam, 30 to 50 percent slopes. This soil is in large, irregularly shaped areas on foothills and mountainsides. It has the profile described as representative of the series. Included with this soil in mapping, and making up about 15 percent of the acreage, are areas of Devoy soils and Rock outcrop.

Runoff is rapid, and the hazard of erosion is severe.

This soil is not suited to irrigated crops. It is used mainly for livestock grazing and wildlife habitat. Capability unit VIIs, dryland; woodland suitability group 3x1.

TK—Tica-Rock outcrop complex. This complex of steep soils and rock outcrop is in large, irregularly shaped areas on mountainsides. It is about 60 percent Tica very stony loam, 30 to 50 percent slopes, and 30 percent Rock outcrop. The Rock outcrop is small, very steep to vertical cliffs and is essentially barren. Included with these soils in mapping, and making up about 10 percent of the acreage, are areas of Devoy soils.

Runoff is rapid, and the hazard of erosion is high.

This complex is used mainly for livestock grazing and wildlife habitat. Capability unit VIIs, dryland; Tica part in woodland suitability group 3x1.

Tonkin Series

The Tonkin series consists of well drained and moderately well drained soils that formed in alluvium mainly from shale, quartzite, conglomerate, limestone, and siliceous rocks. These soils are on low alluvial terraces or lake plains. Slope ranges from 0 to 2 percent. The vegetation is big sagebrush, squirreltail, rabbitbrush, greasewood, and saltgrass. Elevation is 5,800 to 5,900 feet. Average annual precipitation is 8 to 10 inches, average annual air temperature is 41° to 43° F, and the frost-free season is 80 to 100 days.

In a representative profile the upper 15 inches of the soil is grayish brown, light brownish gray, and light gray fine sandy loam and loam. The next 17 inches is light gray light sandy clay loam that is weakly silica cemented. Below this is 7 inches of light gray fine sandy loam that has lime concretions and masses. This is underlain by light gray loamy fine sand that has slightly hard nodules and extends to a depth of 60 inches.

Permeability is moderate or moderately slow. Effective rooting depth is 60 inches or more. Available water capacity is moderate to high.

Representative profile of Tonkin fine sandy loam in Eureka County, 800 feet west and 20 feet south of the northeast corner of sec. 9, T. 22 N., R. 54 E.:

A11—0 to 2 inches; grayish brown (10YR 5/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; massive; soft, very friable, slightly sticky and plastic; few fine and common very fine roots; many very fine tubular and vesicular pores; very slightly effervescent; strongly alkaline; abrupt smooth boundary.

A12—2 to 7 inches; light brownish gray (10YR 6/2) loam, dark brown (10YR 4/3) moist; massive; soft, very friable, slightly sticky and plastic; common medium, few fine, and many very fine roots; many very fine tubular pores; strongly effervescent; strongly alkaline; abrupt smooth boundary.

C1—7 to 15 inches; light gray (10YR 7/2) loam, brown (10YR 5/3) moist; massive; soft, very friable, slightly sticky and slightly plastic; common medium, few fine, and many very fine roots; many very fine tubular pores; strongly effervescent; strongly alkaline; abrupt smooth boundary.

C2sica—15 to 32 inches; light gray (10YR 7/2) light sandy clay loam, brown (10YR 5/3) moist; massive; slightly hard, very friable, sticky and plastic; many fine and very fine roots in mats and in noncemented areas; discontinuous weakly silica cemented in 70 percent of the horizon with pink (5YR 8/3) coats

that are light reddish brown (5YR 6/4) moist; cemented part is very hard, firm, and brittle; violently effervescent; very strongly alkaline; abrupt wavy boundary.

C3ca—32 to 39 inches, light gray (10YR 7/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; massive; soft, very friable, nonsticky and nonplastic; common very fine roots concentrated in pockets; many very fine interstitial pores; noneffervescent but strongly effervescent in lime concretions and masses 1 to 5 millimeters in diameter; very strongly alkaline; abrupt wavy boundary.

C4sica—39 to 60 inches; light gray (10YR 7/2) loamy fine sand, dark grayish brown (10YR 4/2) moist; massive; soft, very friable, nonsticky and nonplastic; common very fine roots; 50 percent slightly hard durinodes; strongly effervescent; very strongly alkaline.

The A horizon has platy structure, or it is massive. It is effervescent throughout. The C horizon is somewhat stratified with sandy loam, fine sandy loam, clay loam, or sandy clay loam and has a weighted average clay content of 18 to 25 percent. Depth to silica-cemented horizons ranges from 12 to 20 inches. The Csica horizon consists of silica-cemented durinodes in a friable matrix, and discontinuous weakly cemented areas and pockets that occupy 40 to 70 percent of the volume of at least some part of the horizon. The Cca and Csica horizons have 15 to 30 percent calcium carbonate equivalent and from 5 to 15 percent more lime than underlying horizons. The part of the C horizon below a depth of 40 inches is dominantly loamy fine sand or sandy loam and in places contains as much as 25 percent fine gravel.

Tn—Tonkin fine sandy loam. This soil is in irregularly shaped areas of small and medium size on alluvial terraces and lake plains. It has the profile described as representative of the series. Included with this soil in mapping, and making up about 10 percent of the acreage, are areas of Nevka, Nayped, and other Tonkin soils.

Runoff is slow, and the hazard of erosion is slight.

This soil is used mainly for irrigated crops, livestock grazing, and wildlife habitat. Capability units IIIc–2, irrigated, and VIc, dryland; Range Site NV 28–21 (Semidesert Loamy Plain).

To—Tonkin fine sandy loam, slightly wet. This soil is in irregularly shaped areas of small and medium size on alluvial terraces and lake plains. It has a profile similar to that described as representative of the series, but the upper 6 to 12 inches is slightly saline-alkali affected; this soil is moderately well drained. Included with this soil in mapping, and making up about 15 percent of the acreage, are areas of Nevka and Nayped soils.

Runoff is slow, and the hazard of erosion is slight. A seasonal high water table is at a depth of 3½ to 5 feet.

This soil is used mainly for irrigated crops, livestock grazing, and wildlife habitat. Capability units IIIw–121, irrigated, and VIw, dryland; Range Site NV 28–23 (Arid Loamy Bottomland, Saline-Alkali).

Umil Series

The Umil series consists of well-drained soils that formed in alluvium mainly from limestone, dolomite, and mixed igneous material. These soils are on old alluvial fans and terraces. Slope ranges from 2 to 50 percent. The vegetation is black sagebrush, Douglas rabbitbrush, horsebrush, big sagebrush, Sandberg bluegrass, and squirreltail. Elevation is 6,000 to 6,600 feet. Average annual precipitation is 8 to 12 inches, average annual air temperature is 42° to 45° F, and the frost-free season is 70 to 100 days.

In a representative profile the surface layer is light brownish gray loam about 3 inches thick. The next layer is light brownish gray and light gray loam about 8 inches thick. Below this is a white, indurated, silica-lime cemented hardpan about 23 inches thick. Below the hardpan is light gray, weakly cemented very gravelly very fine sand to a depth of 60 inches.

Permeability is moderately rapid. Effective rooting depth is 7 to 14 inches. Available water capacity is very low.

Representative profile of Umil loam, 2 to 4 percent slopes, in Eureka County, 1,600 feet east of the northwest corner of sec. 12, T. 19 N., R. 53 E.:

A1—0 to 3 inches; light brownish gray (10YR 6/2) loam, very dark grayish brown (10YR 3/2) moist; moderate thick and very thick platy structure; soft, friable, slightly sticky and slightly plastic; many very fine and fine vesicular pores; neutral; abrupt smooth boundary.

B21—3 to 6 inches; light brownish gray (10YR 6/2) loam, dark grayish brown (10YR 4/2) moist; weak fine and very fine angular and subangular blocky structure; slightly hard, friable, slighty sticky and slightly plastic; common very fine and fine roots; many very fine and few fine interstitial pores; slightly effervescent; mildly alkaline; abrupt smooth boundary.

B22ca—6 to 11 inches; light gray (10YR 7/2) loam, dark brown (10YR 4/3) moist; moderate very fine angular blocky structure; hard, friable, slightly sticky and slightly plastic; common very fine, fine, and medium roots; many very fine and few fine interstitial pores; violently effervescent; moderately alkaline; abrupt smooth boundary.

C1sicam—11 to 34 inches; white (10YR 8/1) indurated duripan; light yellowish brown (10YR 6/4) and brownish yellow (10YR 6/6 and 6/8) silica pendants; massive; extremely hard, extremely firm; very few very fine and fine roots in mats on plates; many very fine interstitial pores; violently effervescent; strongly alkaline; abrupt smooth boundary.

IIC2sicam—34 to 60 inches; light gray (10YR 7/2), weakly cemented very gravelly very fine sand and many, thin, very pale brown (10YR 7/3), continuous, indurated laminae; massive; matrix hard, firm, nonsticky and nonplastic, laminae extremely hard and extremely firm; many very fine and fine interstitial pores; strongly effervescent; strongly alkaline.

The surface is covered with about 10 percent gravel and cobbles. The A horizon is loam that is 18 to 24 percent clay and contains 10 to 30 percent gravel. It has weak or moderate, platy or granular structure and is soft or slightly hard when dry. The B2 horizon is loam or clay loam that contains 10 to 50 percent gravel. Structure is weak or moderate subangular or angular blocky, or the horizon is massive. It is slightly hard or hard when dry. Weighted average gravel content is 35 percent or less. The duripan (fig. 11) is massive but appears platy, and it is extremely hard and extremely firm in one or more continuous laminae. Thickness of the soil and depth to duripan range from 7 to 14 inches. Reaction increases with depth and ranges from neutral or mildly alkaline in the A horizon to moderately alkaline or strongly alkaline in the lower part of the B2 horizon.

UMB—Umil loam, 2 to 4 percent slopes. This soil is in large, irregularly shaped areas on old alluvial fans. It has the profile described as representative of the series. Included with this soil in mapping, and making up about 15 percent of the acreage, are areas

Figure 11.—An old cut showing the pan in a Umil soil.

of soils that are similar to this Umil soil but that have a discontinuous hardpan and areas of Holtle and Shipley soils.

Runoff is medium, and the hazard of erosion is moderate.

This soil is not suited to irrigated crops. It is used mainly for livestock grazing and wildlife habitat. Capability unit VIIs, dryland; Range Site NV 28–22 (Semidesert Shallow Loamy Slope).

US—Umil association. This association is in large, irregularly shaped areas that are on gently sloping old alluvial fans that are dissected deeply and have moderately steep to steep sides. It is about 60 percent Umil loam, 2 to 4 percent slopes, and 30 percent Umil cobbly loam that has slopes of 15 to 50 percent. The Umil cobbly loam is on the side slopes. The Umil loam has a profile similar to the one described as representative of the series. The Umil cobbly loam has a profile similar to that described as representative of the series, but it is cobbly. Included with these soils in mapping, and making up about 10 percent of the acreage, are areas of Holtle soils and soils that are similar to the Umil soils but that have a discontinuous hardpan.

Runoff is medium on the Umil loam and rapid on the Umil cobbly loam. The hazard of erosion is moderate on the Umil loam and severe on the Umil cobbly loam.

This association is not suited to irrigated crops. It is used mainly for livestock grazing and wildlife habitat. Capability unit VIIs, dryland; Range Site NV 28–22 (Semidesert Shallow Loamy Slope).

Vinsad Series

The Vinsad series consists of somewhat poorly drained, strongly saline soils that formed in loess and mixed lacustrine material. These soils are on lake plains and low lake terraces. Slope ranges from 0 to 2 percent. The vegetation is greasewood, saltgrass, alkali sacaton, and rubber rabbitbrush. Elevation is 5,600 to 6,200 feet. Average annual precipitation is 8 to 10 inches, average annual air temperature is 43° to 47° F, and the frost-free season is 70 to 100 days.

In a representative profile the surface layer is light gray very fine sandy loam about 2 inches thick. The next 40 inches is variegated white and light gray very fine sandy loam that is about 3 percent salt. Below this, to a depth of 60 inches, is very pale brown and

light brownish gray silty clay loam that is about 1 percent salt.

Permeability is moderate or moderately slow above the unconformable lacustrine material and slow to very slow in the underlying lacustrine material. Effective rooting depth is 60 inches or more. Available water capacity is high.

Representative profile of Vinsad very fine sandy loam in Eureka County, 1,500 feet east and 1,700 feet north of the southeast corner of sec. 8, T. 26 N., R. 54 E.:

A1—0 to 2 inches; light gray (2.5Y 7/2) very fine sandy loam, light brownish gray (2.5Y 6/2) moist; moderate very fine and fine subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; many very fine and fine interstitial pores and few very fine tubular pores; strongly effervescent; neutral; abrupt wavy boundary.

C1sa—2 to 36 inches; variegated white (10YR 8/2 and N 8/0) and light gray (2.5Y 7/2) very fine sandy loam, pale brown (10YR 6/3), white (2.5Y 8/2), and pale yellow (2.5Y 8/4) moist; massive; soft and hard, friable and firm, nonsticky and slightly plastic; many very fine and few fine roots; few very fine tubular pores and many very fine interstitial pores; 3.1 percent salt; noneffervescent to strongly effervescent; neutral; abrupt wavy boundary.

C2sa—36 to 42 inches; light gray (2.5Y 7/2) and white (N 8/0) very fine sandy loam, dark brown (10YR 4/3) and pale brown (10YR 6/3) moist; massive; very hard, very firm; very few very fine roots; few very fine tubular pores and common very fine and fine interstitial pores; 3.4 percent salt; noneffervescent to strongly effervescent; neutral; abrupt wavy boundary.

IIC3—42 to 60 inches; very pale brown (2.5Y 6/2) and light brownish gray (10YR 7/3) silty clay loam, dark brown (10YR 4/3) moist; moderate fine and very fine angular blocky structure; very hard and soft, firm and friable, slightly sticky and slightly plastic; very few very fine roots; few very fine tubular pores and common fine and very fine interstitial pores; 1.2 percent salt; noneffervescent to strongly effervescent; moderately alkaline.

The profile is calcareous throughout except in areas of extreme salt concentration. Reaction is neutral to strongly alkaline depending on the nature of the salts present. The A horizon has moderate or strong, thick and medium, platy structure or very fine and fine, subangular blocky structure. It is very fine sandy loam and silt loam. The C1sa horizon has weak or moderate, fine or medium, subangular blocky structure, or it is massive. It is silt loam, very fine sandy loam, and loam. Consistence is soft or slightly hard when dry, but it contains hard or very hard salt masses and nodules. The weakly cemented C2sa horizon is similar to the C1sa horizon in color and texture, but it is massive and it is very hard or extremely hard when dry and firm or very firm when moist. The Csa horizon ranges from 30 to 48 inches in thickness and contains 2 to 4 percent salt. The unconformable lacustrine material (IIC3 horizon) is silty clay loam or silty clay, contains 0.1 to 1.5 percent salt, and has few salt nodules in some places. Depth to the lacustrine deposits ranges from 36 to 48 inches.

VN—Vinsad very fine sandy loam. This soil is in a large, irregularly shaped area on the lake plain and low lake terraces. Included with this soil in mapping, and making up about 20 percent of the acreage, are areas of Shipley, Dianev, and Sader soils.

Runoff is slow, and the hazard of erosion is slight. A seasonal high water table is at a depth of 30 to 36 inches. This soil is strongly saline affected.

This soil is not suited to irrigated crops. It is used mainly for livestock grazing and wildlife habitat. Capability unit VIIw, dryland; Range Site NV 28–26 (Arid Salty Flat).

Use and Management of the Soils

This section first discusses the use and management of the soils for crops. Next it describes the system of capability classification and the management of the soils by capability units. Then it discusses the use and management of the soils for range, wildlife, windbreaks, and woodland. Finally it describes the use of the soils for engineering works.

Crops

The aim of good land use is to produce the greatest amount of needed crops while protecting and improving the soil. To achieve this, the land must be protected according to its needs and used within its capabilities. This can be done by growing plants that are well suited to the soil, applying soil management practices that protect the soil, and keeping the soil in good physical condition.

In this section the principal soil management practices are generally described. Although the soils in the survey area differ in management needs, certain practices apply to all the soils that are cultivated.

Conservation cropping systems

A conservation cropping system is a system for growing crops in combination with needed cultural and management measures. If soil-improving crops and practices more than offset the soil-depleting crops and soil-deteriorating practices, then the combination is a good conservation cropping system.

Soil-improving practices that are used in conservation cropping systems include the use of rotations that contain grasses and legumes, the return of crop residue to the soil, proper tillage, adequate fertilization, weed and pest control measures, and all other good management practices.

Several cropping systems are used in the survey area. A typical one is alfalfa grown for about 8 to 10 years followed by small grain for 2 years. The crop residue of the small grain is returned to the soil, and tillage is reduced to only those operations that are necessary.

Crop residue management

Plant residue adds organic matter, which is the life of the soil. Crop residue management is using plant residue left in cultivated fields; the practice is needed on all soils in the survey area. The residue is incorporated into the soil or left on the surface during that part of the year when erosion may occur. A major benefit of organic matter in the soil is its influence on the development and stabilization of good soil structure and its relationship to the general soil physical environment, which influences crop growth.

It is particularly important that organic matter be continuously returned to the soil. The easiest and most common way to add organic matter to the soil is to return plant residue. Unless sufficient crop residue is returned to the soil, the physical condition of the soil

declines, soil compaction starts, and slower water infiltration and poorer aeration results.

Erosion control

Erosion control prevents the excessive wearing away of the soil by wind, running water, and other geological agents (figs. 12 and 13). The protection of the surface layer is important because it contains most of the organic matter and generally is more fertile than the subsoil. Erosion can be reduced by using cover crops to protect the surface during windy or stormy periods; by leveling for irrigation in fall or early in spring and then seeding immediately; and by leveling to the proper grade and applying water at the proper rate.

Addition of plant nutrients

Most of the irrigated soils used for crops in this survey area respond well to fertilizer. The specific fertilizer needed depends on the kind of crop grown and the nutrient level of the soil. Applying a combination fertilizer that contains nitrogen and phosphate increases production of small grain and aids in establishing alfalfa. Thereafter, alfalfa benefits from phosphate applied every 2 years for the life of the stand, except where the soil contains enough phosphorus. Some crops need a combination fertilizer in two applications, the first applied at planting time and the second applied as topdressing before the second irrigation.

Barnyard manure adds some nitrogen, phosphate, and potassium to the soil and promotes good tilth. If available, it can be used with good results before planting small grain.

Figure 12.—Deposition of material along a fence line.

Figure 13.—Dust blowing off cultivated soils.

Irrigation and water management

Irrigation water management is regulation of the application of irrigation water to ensure high crop production and minimum soil and water losses. It is needed on all irrigated soils. Good management means applying water according to the crop needs and at rates and amounts consistent with the characteristics of the soil.

Efficient delivery of water to an area is the first step in supplying the moisture needed by growing crops. A good distribution system has enough capacity to meet the needs of the crops irrigated, is so located and controlled that seepage losses are negligible, and carries the required flow safely.

Next, the water must be delivered from the distribution system to the individual fields. An efficient system for transporting water on a farm or a ranch is so designed and constructed that it carries the required flow without excessive seepage and without causing erosion. Control structures are needed to facilitate the handling of water.

The design of an irrigation system is governed by the method of irrigation to be used, the amount of land leveling needed, and the expected efficiency in applying water. In this survey area three common methods of irrigation can be used.

Border irrigation, the most common, consists of applying water to strips of varying width that are separated by low dikes or border ridges. It is suitable on fields in close-growing crops. It can be effectively used on all soils that can be leveled and have a basic water intake rate of not more than 3 inches per hour.

Furrow irrigation consists of applying water downslope in small furrows 2 to 12 inches deep. The length and spacing of the furrows depend on soil texture and the kind of crop. Furrow irrigation is suitable on fields in row crops. It can be used on all soils except those that have a high intake rate and poor lateral movement of water.

Sprinkler irrigation is commonly used where the soil is sloping and leveling is not feasible. It is the application of water to the soil by a system of pipes

and sprinkler heads. A sprinkler system either is self-moving or is moved by hand between settings. These systems are most effective where the soil has a high infiltration rate and leveling is not practical.

If irrigation water is to be applied efficiently the available water capacity of the soil, the rate that water enters and moves through the soil, and the amount of water required by the crop need to be known. Most crops should be irrigated when 40 to 50 percent of the available moisture has been depleted from the top half of the root zone of the plant. Forty-eight hours after irrigation a soil check can be made to determine if the desired moisture was added.

Drainage

Drainage is not a serious problem in most of this survey area. The water table is generally far below the root zone. There are a few exceptions, such as the Bicondoa-Dianev association. These soils developed below springs under poorly drained conditions. In soils that are inadequately drained, soluble salts and alkali accumulate and retard or prevent the growth of crops. These soils have poor soil aeration, which reduces plant growth and increases susceptibility of plants to disease.

The Bicondoa and Dianev soils are difficult to drain because of their position in the lowest part of an undrained basin. Some improvement of these soils can be effected through water management of the springs.

Managing saline-alkali soils

Most soils in arid and subarid regions contain at least small quantities of soluble salts and alkali. Because rainfall is low and evaporation is high, percolating rainfall is insufficient to leach salts out of the root zone. In some soils the salts and alkali are highly concentrated and limit or prevent the growth of crops.

In addition, many low-lying areas receive salty water as run-on or seepage. Surface evaporation of such water generally results in a further increase of soluble salts on or in the soils. In some areas that have a high water table, water may rise in the soil by capillary action and carry dissolved salts with it. Soluble salts are readily dissolved in soil water and may move to any part of the profile.

A soil that contains excessive amounts of soluble salts but not alkali is called a saline soil. One that contains excessive exchangeable sodium is called an alkali soil. A soil that contains both excess soluble salts and alkali is a saline-alkali soil.

Saline-alkali phases of several of the soils have been mapped. The mapping unit name does not give the degree to which these soils are affected nor does it indicate that the soil contains both salt and alkali, but this information is given in the mapping unit description. Three saline-alkali classes are generally used as soil phases:

1. Soils free of excess salts and alkali contain less than 0.15 percent salts; the conductivity of the saturation extract is less than 4 millimhos per centimeter at 25° C; and the proportion of exchangeable sodium is less than 15 percent.
2. Slightly saline-alkali soils contain 0.15 to 0.35 percent salts, or the conductivity of the saturation extract is 4 to 8 millimhos per centimeter at 25° C; and the proportion of exchangeable sodium is 15 to 20 percent in soils that have moderately coarse, medium, moderately fine, and fine texture.
3. Strongly saline-alkali soils contain more than 0.65 percent salts, or the conductivity of the saturation extract is greater than 15 millimhos per centimeter at 25° C; and the proportion of exchangeable sodium is greater than 25 percent in soils that have moderately coarse, medium, moderately fine, and fine texture.

Although a distinct gap occurs between the second and the third classes, an intermediate or moderate class is generally not needed in this area because a very small proportion of the samples analyzed was moderately saline-alkali.

Soils differ in the kinds of salt they contain and in the practices needed for improvement. For this reason, each soil may require individual treatment. In dealing with the problem, however, some general guidelines can be given.

A good supply of water and adequate drainage must be provided to reclaim any saline-alkali affected soil. Two methods of applying water are commonly used. One method is to have the land leveled to form flat basins and then pond the water in the basins. The other method requires that the land be leveled to a uniform grade and then flooded between border dikes. If there is adequate drainage and large amounts of water are used, the soluble salts can be leached out of the root zone using either method. The process is more difficult if a soil contains an excessive amount of exchangeable sodium. In addition to drainage and leaching, other practices are needed for the improvement of alkali soils.

Chemical amendments used to replace sodium are gypsum and its various forms including gypsite, anhydrite, and selenite, as well as elemental sulfur, sulfuric acid, iron sulfate, and aluminum sulfate. Any of these amendments can be successfully used, although some react faster than others. Cost and availability generally determine the choice. The amount of amendment needed for improving a soil can be determined by laboratory analysis of soil samples, which indicates the amounts of sodium that must be replaced if the soil is to be improved.

Since the amount of soluble salts and alkali may vary within short distances, the sampling shows only the average concentration in a field. If some alkali spots are left after the first treatment, these can be corrected the following year. An estimate of the amount of amendment needed should not be based on an analysis of the spots most strongly alkali, because the estimate would be two to five times greater than the amount actually needed.

The relative effect of various amendments can be determined from the following comparison of amounts equivalent to 1 ton of sulfur: sulfuric acid, 3.06 tons; gypsum, 5.38 tons; iron sulfate, 8.69 tons; and aluminum sulfate, 6.94 tons. Iron sulfate and aluminum sulfate act quickly, but high cost prohibits their general use.

An alternative to reclamation through use of large quantities of gypsum is the seeding of salt- and alkali-tolerant grasses. Among the well suited grasses

are tall wheatgrass, western wheatgrass, and alta fescue (Gores fescue). These grasses can grow in relatively strong concentrations of both soluble salts and alkali.

In using grass to improve an area, the most serious problem is establishing a stand. A high concentration of salts delays germination, limiting the absorption of water; seeds may not germinate after the first irrigation or even after a second or third. Seeds that fail to germinate eventually rot.

The second stage in establishing grass is the growth of seedlings upward through the soil. If a saline-alkali soil dries out, it tends to bake and crust. When the surface is seriously encrusted, seedlings cannot break through and they die.

Frequent light irrigations can be used to reduce the salt accumulation around the seeds and to prevent crusting. The soil may need irrigating every 3 to 5 days until the crop has grown to a height of 3 to 5 inches. Applying a small amount of gypsum or sulfur, generally 2 to 4 tons per acre, will help to prevent crusting and thereby allow seedlings to emerge.

Proper pasture management

Proper pasture management is grazing pasture at a rate that will maintain grasses and legumes of high quality. This can be accomplished by adjusting stocking rates or season of use to favor maximum growth and survival.

A common method of pasture management is to use several pastures with a rotation system that allows adequate regrowth in each. Care should be taken to keep the livestock off the pastures when they are wet. If livestock are allowed to graze on wet pasture the soil is compacted, the water intake rate is decreased, and the structure is destroyed. The pastures should have proper irrigation water management and proper drainage. Increased yields can be obtained by using commercial fertilizer and barnyard manure, if available. Weeds generally can be controlled by mowing. It is best to spread the droppings of manure with a drag each spring.

Capability grouping

Capability grouping shows, in a general way, the suitability of soils for most kinds of field crops. The groups are made according to the limitations of the soils when used for field crops, the risk of damage when they are so used, and the way they respond to treatment. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils; does not consider possible but unlikely major reclamation projects; and does not apply to rice, cranberries, horticultural crops, or other crops requiring special management.

Those familiar with the capability classification can infer from it much about the behavior of soils when used for other purposes, but this classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for range, forest trees, or engineering.

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

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

- Class I soils have few limitations that restrict their use. (None in this survey area.)
- Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices. (None in this survey area.)
- Class III soils have severe limitations that reduce the choice of plants, require special conservation practices, or both.
- Class IV soils have very severe limitations that reduce the choice of plants, require very careful management, or both.
- Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use largely to pasture, range, woodland, or wildlife habitat. (None in this survey area.)
- Class VI soils have severe limitations that make them generally unsuited to cultivation and limit their use largely to pasture, range, woodland, or wildlife habitat.
- Class VII soils have very severe limitations that make them unsuited to cultivation and that restrict their use largely to pasture, range, woodland, or wildlife habitat.
- Class VIII soils and landforms have limitations that preclude their use for commercial plants and restrict their use to recreation, wildlife habitat, water supply, or esthetic purposes.

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

In class I there are no subclasses, because the soils of this class have few limitations. Class V can contain, at the most, only the subclasses indicated by *w*, *s*, and *c*, because the soils in class V are subject to little or no erosion, though they have other limitations that restrict their use largely to pasture, range, woodland, wildlife habitat, or recreation.

CAPABILITY UNITS are soil groups within the subclasses. The soils in one capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity and other responses to management. Thus, the capability unit is a convenient grouping for making many statements about management of soils. Capability units are generally designated by adding an Arabic numeral to the subclass symbol, for example, IIe–4 or IIIe–6. Thus, in one symbol, the Roman numeral designates the capability class, or degree of limi-

tation; the small letter indicates the subclass, or kind of limitation, as defined in the foregoing paragraph; and the Arabic numeral specifically identifies the capability unit within each subclass.

Management by capability units

The capability classification of the soils in this survey area is based on several assumptions:

1. The production of cultivated crops is not feasible without irrigation.
2. An adequate quantity of high-quality water is available for the soils placed in irrigated capability units.
3. The salt and alkali content can feasibly be reduced to the level described in the individual capability description.
4. Protection against overflow and flooding can feasibly be developed for the soils placed in irrigated capability units.
5. Removal of stones is not feasible unless specifically stated otherwise in the capability unit description.

Most of the soils in Diamond Valley Area have been placed in both an irrigated capability unit, showing the potential within the aforementioned assumptions, and a dryland capability unit. A soil that has not been placed in an irrigated capability unit is not considered suitable for irrigation under these assumptions.

Both soils of a soil complex have been placed in a single capability unit. The description of the capability unit will not fit each component soil of the complex individually. Therefore, it is very important that the description of the mapping unit for each complex as well as the capability unit description be referred to in making management decisions.

If a high level of production is to be sustained, all irrigated land must be managed under a conservation cropping system. The actual practices applied in a conservation cropping system are determined by the requirements specified in the capability unit description, the preference of the individual farmer or rancher, and the resources available to the farmer or rancher.

In the following pages each of the capability units in Diamond Valley Area is described, and suggestions for the use and management of the soils in each unit are given. The units are not numbered consecutively, because not all the units in the statewide system are represented in this area. The capability classification of each soil is given in the "Guide to Mapping Units."

CAPABILITY UNIT IIIe–40, IRRIGATED

This unit consists of very deep, well-drained soils. The surface layer is fine sandy loam, fine sand, or loam; the subsoil is clay loam, loam, or very fine sandy loam that contains as much as 35 percent gravel; and below a depth of 30 to 40 inches the soils are loam to very gravelly sand. Slope is 0 to 8 percent.

Permeability is moderately slow to moderate. Available water capacity is low to high. Effective rooting depth is 60 inches. Runoff is slow or medium, and the hazard of erosion is slight or moderate.

These soils are used for irrigated crops, grazing, and wildlife habitat. Suitable irrigated crops are alfalfa, small grain, and irrigated pasture. The soils are suitable for plants that are adapted to the climate.

The potential for accelerated water erosion limits the use of these soils for irrigated crops. Irrigation water management, irrigation systems, pasture and hayland planting, pasture and hayland management, land leveling or smoothing, and field ditches are needed to offset or minimize the limitations.

CAPABILITY UNIT IIIw–120, IRRIGATED

This unit consists of very deep, mostly well-drained soils that are occasionally flooded. The surface layer is loam and silt loam; the subsoil is loam, silt loam, and silty clay loam; and the substratum is gravelly sandy clay, gravelly loam, loam, very fine sandy loam, and gravelly fine sandy loam. Slope is generally 0 to 2 percent, but it is as much as 4 percent. Also in this unit is a drained phase of a poorly drained soil.

Permeability is moderate or moderately slow. Available water capacity is moderate or high. Effective rooting depth is 60 inches. Runoff is slow, and the hazard of erosion is slight. These soils are occasionally flooded, and deposition can occur.

These soils are used for irrigated crops, pasture, and wildlife habitat. Suitable irrigated crops are alfalfa, small grain, and irrigated pasture. The soils are suitable for plants that are adapted to the climate.

Flooding limits the use of these soils for irrigated crops. Protection from flooding and deposition is needed to offset or minimize the limitations. Irrigation water management, irrigation systems, and pasture and hayland planting and management are also applicable to these soils.

CAPABILITY UNIT IIIw–121, IRRIGATED

This unit consists of very deep, mostly moderately well drained soils that are slightly wet and slightly to moderately saline-alkali affected. The surface layer is fine sandy loam, loam, or silt loam; the subsoil is very fine sandy loam, loam, silt loam, or sandy clay loam; and the substratum is very fine sandy loam, fine sandy loam, or loamy fine sand. Slope is 0 to 2 percent.

Permeability is moderate or moderately slow. Available water capacity is moderate or high. Effective rooting depth is 60 inches. Runoff is slow, and the hazard of erosion is slight.

These soils are used for irrigated crops, grazing, and wildlife habitat. Suitable irrigated crops are alfalfa, small grain, and irrigated pasture. The soils are suitable for plants that are adapted to the climate.

A water table between depths of 3½ and 5 feet and the saline-alkali condition limit the use of these soils for irrigated crops. Drainage and reclamation are needed to offset or minimize the limitations. Irrigation water management, irrigation systems, and pasture and hayland planting and management are also applicable to these soils.

CAPABILITY UNIT IIIw–124, IRRIGATED

This unit consists of very deep, somewhat poorly drained soils. The surface layer is loam, and the subsoil and substratum are silty clay loam, silty clay, and clay. Slope is 0 to 2 percent.

Permeability is slow or very slow. Available water

capacity is high. Effective rooting depth is 60 inches. Runoff is slow or ponded, and the hazard of erosion is slight. A seasonal high water table is at a depth of 3 to 5 feet. The soils are slightly saline-alkali affected and in places are occasionally flooded.

These soils are used for grazing and wildlife habitat, but they are suitable for irrigated crops if irrigation water is made available. Suitable irrigated crops are sweet clover, alfalfa, small grain, and irrigated pasture. The soils are suitable for plants that are adapted to the climate.

Permeability, drainage, salt and alkali, and flooding limit the use of these soils for irrigated crops. Planting of deep-rooted legumes, turning under all crop residue, vertical mulching, drainage and toxic salt reclamation, and protection from flooding are needed to offset or minimize the limitations. Irrigation water management, irrigation systems, and pasture and hayland planting and management are also applicable to these soils.

CAPABILITY UNIT IIIs–111, IRRIGATED

This unit consists only of Dianev silt loam, a very deep, moderately well-drained soil. The surface layer is silt loam or silty clay loam, and the subsoil and substratum are silty clay loam. Slope is 0 to 2 percent.

Permeability is slow to very slow. Available water capacity is high. Effective rooting depth is 60 inches. Runoff is slow, and the hazard of erosion is slight. A seasonal high water table is at a depth of 2½ to 6 feet.

This soil is used for irrigated crops, grazing, and wildlife habitat. Suitable irrigated crops are sweet clover, alfalfa, small grain, and irrigated pasture. The soil is suitable for plants that are adapted to the climate.

Permeability limits the use of this soil for irrigated crops. Planting deep-rooted legumes, turning under all crop residue, and vertical mulching are needed to offset or minimize the limitations. Irrigation water management, irrigation systems, and pasture and hayland planting and management are also applicable to this soil.

CAPABILITY UNIT IIIs–115, IRRIGATED

This unit consists only of Hamacer loamy fine sand, 0 to 2 percent slopes, a very deep, somewhat excessively drained soil. The surface layer is loamy fine sand, the subsoil is fine sand, and the substratum is loamy fine sand and fine sand. Slope is 0 to 2 percent. Average annual precipitation is 8 to 10 inches, and the frost-free season is 70 to 100 days.

Permeability is rapid. Available water capacity is low. Effective rooting depth is 60 inches. Runoff is slow, and the hazard of soil blowing is moderate to severe.

This soil is used for irrigated crops, grazing, and wildlife habitat. Suitable irrigated crops are alfalfa, small grain, and irrigated pasture. The soil is suited to plants that are adapted to the climate.

Low available water capacity and coarse texture limit the use of this soil for irrigated crops. Irrigation water management, irrigation systems, and pasture and hayland plantings are needed to offset or minimize the limitations.

CAPABILITY UNIT IIIc–2, IRRIGATED

This unit consists of very deep, well-drained soils. The surface layer is silt loam, loam, fine sandy loam, and sandy loam. The subsoil and substratum are very fine sandy loam, sandy clay loam, loam, sandy loam, loamy fine sand, sand, and coarse sand that in places contains gravel. Slope is 0 to 2 percent. Average annual precipitation is 8 to 12 inches, and the frost-free season is 70 to 100 days.

Permeability is moderately slow to moderately rapid. Available water capacity is medium or high. Effective rooting depth is 60 inches. Runoff is slow, and the hazard of erosion is slight.

These soils are used for irrigated crops where irrigation water is available. They are otherwise used for livestock grazing and wildlife habitat.

The short growing season and hazard of frost any time during the growing season limit the use of these soils. Varieties for planting that mature early or that are frost tolerant are needed to offset or minimize the limitations. Irrigation water management, irrigation systems, and land leveling or smoothing are also applicable to these soils.

CAPABILITY UNIT IVe–45, IRRIGATED

This unit consists of moderately deep and deep, well-drained and somewhat excessively drained soils. The surface layer is sandy loam, gravelly sandy loam, gravelly loam, clay loam, and fine sandy loam; the subsoil is gravelly loam and gravelly sandy loam; and the substratum is gravelly or very gravelly sandy loam, fine sandy loam, loamy fine sand, sand, and coarse sand, or a strongly cemented duripan. Slope is 2 to 15 percent.

Permeability is moderate to rapid. Available water capacity is low. Effective rooting depth is 20 to 60 inches. Runoff is slow or medium, and the hazard of erosion is slight or moderate.

These soils are used for grazing and wildlife habitat but are suitable for irrigated crops if irrigation water is available. Suitable irrigated crops are alfalfa, small grain, and irrigated pasture. The soils are suitable for plants that are adapted to the climate.

The hazard of erosion and low available water capacity limit the use of these soils for irrigated crops. Pasture and hayland planting and management are needed to offset or minimize the limitations. Irrigation water management and irrigation systems are also applicable to these soils.

CAPABILITY UNIT IVw–120, IRRIGATED

This unit consists only of Silverado silt loam occasionally flooded, 0 to 2 percent slopes, a deep, well-drained soil. The surface layer is silt loam and very fine sandy loam; the subsoil is sandy loam and gravelly sandy loam; and the substratum is gravelly sandy loam and gravelly coarse sand. Slope is 0 to 2 percent. Average annual precipitation is 8 to 10 inches, and the frost-free season is 70 to 100 days.

Permeability is moderately rapid. Available water capacity is low. Effective rooting depth is 60 inches. Runoff is slow, and the hazard of erosion is slight. This soil is occasionally flooded, and deposition does occur.

This soil is suitable for irrigated crops. It is used for grazing and wildlife habitat. Suitable irrigated crops are alfalfa, small grain, and irrigated pasture plants.

The soil is suitable for plants that are adapted to the climate.

Flooding and low available water capacity limit the use of this soil for irrigated crops. Protection from flooding by use of dikes or flood water diversions is needed to offset or minimize the limitations. Irrigation water management, irrigation systems, and pasture and hayland planting and management are also applicable to this soil.

CAPABILITY UNIT IVs–115, IRRIGATED

This unit consists of deep, well-drained and somewhat excessively drained, droughty soils. The surface layer is fine sandy loam, sandy loam, gravelly sandy loam, loam, gravelly loam, and silt loam; the subsoil is gravelly fine sandy loam, gravelly sandy loam, sandy loam, loam, and silt loam; and the substratum is sandy loam, gravelly sandy loam, very fine sandy loam, gravelly fine sandy loam, gravelly sand, and gravelly coarse sand. Slope is 0 to 2 percent. Average annual precipitation is 8 to 10 inches, and the frost-free season is 70 to 100 days.

Permeability is moderately slow to moderately rapid. Available water capacity is low to high. Effective rooting depth is 60 inches. Runoff is slow, and the hazard of erosion is slight.

Coarse texture and low available water capacity limit the use of these soils for irrigated crops. Irrigation water management, irrigation systems, and pasture and hayland plantings are needed to offset or minimize the limitations.

These soils are used for limited irrigated crops, pasture, and wildlife habitat. Suitable irrigated crops are alfalfa, small grain, and pasture plants. The soils are suited to plants that are adapted to the climate.

Coarse texture and low available water capacity limit the use of these soils for irrigated crops. Irrigation water management, irrigation systems, and pasture and hayland plantings are needed to offset or minimize the limitations.

CAPABILITY UNIT IVs–116, IRRIGATED

This unit consists of very deep, well-drained and somewhat excessively drained, slightly to moderately saline-alkali affected soils of Alhambra-Kobeh complex, saline. The surface layer is fine sandy loam; the subsoil is gravelly fine sandy loam, gravelly sandy loam, sandy loam and fine sandy loam; and the substratum is sandy loam, gravelly sand, and very gravelly sand. Slope is 0 to 2 percent. Average annual precipitation is 8 to 10 inches, and the frost-free season is 70 to 100 days.

Permeability is moderately rapid and rapid. Available water capacity is moderate and low. Effective rooting depth is 60 inches. Runoff is slow, and the hazard of erosion is slight.

These soils are used for limited irrigated crops, pasture, and wildlife habitat. Suitable irrigated crops are alfalfa, small grain, and irrigated pasture. The soils are suited to plants that are adapted to the climate.

Coarse texture, low available water capacity, and saline-alkali conditions limit the use of these soils for irrigated crops. Irrigation water management, irrigation systems, and pasture and hayland plantings are needed to offset or minimize the limitations. Leaching and conditioning by reclamation are also beneficial on these soils.

CAPABILITY UNIT VIe, DRYLAND

This unit consists of deep and very deep, well-drained soils. The surface layer is loam and gravelly loam, the subsoil is gravelly loam and clay loam, and the substratum is very gravelly loam and clay loam. Slope ranges from 8 to 30 percent. Average annual precipitation is 8 to 16 inches, and the frost-free season is 50 to 100 days.

Permeability is moderate and moderately slow. Available water capacity is moderate or high. Effective rooting depth is 40 to 60 inches or more. Runoff is medium, and the hazard of erosion is moderate or severe.

These soils are used for livestock grazing, woodland, and wildlife habitat. They are suitable for seeding.

Slope limits the use of these soils. Proper grazing management and, where needed, range seeding and brush management will offset or minimize the limitations.

CAPABILITY UNIT VIw, DRYLAND

This unit consists of very deep, well-drained to poorly drained soils that are occasionally flooded and slightly to moderately saline-alkali affected. The surface layer is silt loam, loam, or fine sandy loam; the subsoil is sandy clay loam, silty clay loam, silt loam, loam, and very fine sandy loam that generally contains gravel; and the substratum is sand, loam, very fine sandy loam, loamy fine sand, or clay that commonly contains gravel. Slope ranges from 0 to 4 percent. Average annual precipitation is 8 to 12 inches, and the frost-free season is 70 to 100 days.

Permeability is very slow to moderately rapid. Available water capacity is low to high. Effective rooting depth is 60 inches. Runoff is ponded to medium, and the hazard of erosion is slight to moderate. A water table is present in places at a depth of 3 to 5 feet.

These soils are used for livestock grazing and wildlife habitat.

Salinity and alkalinity, the high water table, and occasional flooding limit the use of these soils. Reduction of toxic salts, drainage, and protection from flooding are needed to offset or minimize the limitations. Proper grazing use and not grazing when the surface is wet will prevent puddling and improve the present stand of vegetation.

CAPABILITY UNIT VIs, DRYLAND

This unit consists of very deep, moderately well-drained to somewhat excessively drained soils. The surface layer is silt loam, loamy fine sand, and gravelly loam; the subsoil is gravelly clay, gravelly clay loam, silty clay loam, loamy fine sand, and fine sand; and the substratum is gravelly clay, silty clay loam, gravelly fine sandy loam, and fine sand. Slope ranges from 0 to 15 percent. Average annual precipitation is 8 to 12 inches, and the frost-free season is 70 to 100 days.

Permeability is very slow, slow, and rapid. Available water capacity is low to high. Effective rooting depth is 60 inches. Runoff is slow or medium, and the hazard of erosion is slight or moderate.

These soils are used for livestock grazing and wildlife habitat.

Permeability and available water capacity limit the use of these soils. Proper grazing management and, where needed, range seeding and brush management offset or minimize the limitations.

CAPABILITY UNIT VIc, DRYLAND

This unit consists of very deep, well-drained to somewhat excessively drained soils. The surface layer is sandy loam, fine sandy loam, loam, and silt loam that in places contains gravel; the subsoil is sandy loam, fine sandy loam, very fine sandy loam, loam, sandy clay loam, clay loam, and clay that is as much as 60 percent gravel or cobbles; and the substratum is coarse sand, loamy sand, loamy fine sand, very fine sandy loam, sandy clay loam, and clay loam that is as much as 75 percent gravel or cobbles. Slope is mostly 0 to 4 percent, but it is as much as 8 percent. Average annual precipitation is 8 to 14 inches, and the frost-free season is 70 to 100 days.

Permeability is moderately rapid to moderately slow. Available water capacity is low to high. Effective rooting depth is 60 inches. Runoff is slow to medium, and the hazard of erosion is slight to moderate.

These soils are used mainly for livestock grazing and wildlife habitat.

The short growing season and insufficient precipitation limit the use of these soils for livestock grazing. Management practices that maintain or improve the present stand of vegetation are needed to offset or minimize the limitations. The soils are suitable for range seeding and brush management where needed.

CAPABILITY UNIT VIIe, DRYLAND

This unit consists of shallow to moderately deep, well-drained soils. The surface layer is gravelly loam, stony loam, and shaly loam; the subsoil is loam, very gravelly loam, very gravelly coarse sandy loam, gravelly clay loam, and shaly loam; and the underlying bedrock is limestone, andesite, shale, and tuffs. Slope ranges from 8 to 75 percent. Average annual precipitation is 10 to 18 inches, and the frost-free season is less than 50 days to 100 days.

Permeability is moderate or slow. Available water capacity is low to very low. Effective rooting depth is 13 to 40 inches. Runoff is medium or rapid, and the hazard of erosion is moderate or severe.

These soils are used for livestock grazing and wildlife habitat. They are not suited to seeding.

Steepness of slopes, depth of soil, and low available water capacity limit the use of these soils. Proper grazing use and, where needed and feasible, brush management are needed to offset or minimize the limitations.

CAPABILITY UNIT VIIw, DRYLAND

This unit consists of deep and very deep, somewhat poorly drained and poorly drained soils that are strongly saline-alkali affected. The surface layer is very fine sandy loam, loam, silt loam, or silty clay loam; the subsoil is very fine sandy loam, silt loam, silty clay, clay loam, or silty clay loam; and the substratum is sandy loam, very fine sandy loam, loam, clay loam, silty clay, or silty clay loam. Slope is 0 to 2 percent. Average annual precipitation is 8 to 10 inches, and the frost-free season is 70 to 100 days.

Permeability is moderate to very slow. Available water capacity is high. Effective rooting depth is 60 inches. Runoff is slow, very slow, or ponded; and the hazard of erosion is slight. A water table is present at or near the surface during most of the year.

These soils are used for livestock grazing and wildlife habitat. They are not suited to range seeding.

Salinity and alkalinity, a high water table, and ponding of water on the surface limit the use of these soils. Reduction of toxic salts and drainage are needed to offset or to minimize the limitations. Proper grazing practices, such as not grazing when the surface is too wet, prevent puddling of these soils.

CAPABILITY UNIT VIIs, DRYLAND

This unit consists of very deep to shallow, excessively drained to well-drained soils. The surface layer is sandy loam, fine sandy loam, loam, and silt loam that in places contains gravel, cobbles, or stones. The subsoil and substratum are coarse sand, sand, sandy loam, fine sandy loam, very fine sandy loam, sandy clay loam, loam, silt loam, clay loam, sandy clay, or clay that in places contains gravel, cobbles, or stones. Slope ranges from 0 to 75 percent. Average annual precipitation is 8 to 16 inches, and the frost-free season is less than 50 days to 100 days.

Permeability is very slow to rapid. Available water capacity is very low to moderate. Effective rooting depth is from less than 10 to 60 inches. Runoff is slow to rapid, and the hazard of erosion is slight to severe.

These soils are used for livestock grazing and wildlife habitat. They are generally not suited to range seeding.

Gravel, cobbles and stones, steepness of slopes, and droughtiness limit the use of these soils. Proper grazing use, management of brush and grazing land where needed, and mechanical treatment where slopes and stones permit can offset or minimize the limitations.

CAPABILITY UNIT VIIIe, DRYLAND

This unit consists of the Badland part of Gabel-Badland association. Badland is nearly barren or barren, highly variable soil material that is mostly on severely eroded faces of alluvial terraces. Slope is steep to extremely steep except on rough broken land, which generally has gentle slopes and severe gullying. Average annual precipitation is 8 to 14 inches, and the frost-free season is 70 to 100 days.

Runoff is very rapid, and the hazard of erosion is severe.

This land is of no value for irrigated crops or livestock grazing. It is used for limited wildlife habitat and has esthetic value.

CAPABILITY UNIT VIIIw, DRYLAND

This unit consists of Playas. The surface layer is generally clay but is as coarse as sand in some places. Underlying layers are mostly highly stratified sand, silt, and clay. Playas are generally strongly saline-alkali affected and are often ponded. They receive ad-

ditional water from the surrounding areas and are subject to flooding. Shallow lakes commonly form and remain until the water evaporates. Playas are mostly barren and have little potential for plants.

The soils in this unit are not suited to cultivated crops or grazing. They are limited for recreation and wildlife habitat.

CAPABILITY UNIT VIIIs, DRYLAND

This unit consists of barren or nearly barren exposures of bedrock, randomly mixed with soils that are shallow or very shallow over bedrock. Slope is nearly level to extremely steep, but is dominantly moderately steep to extremely steep. These soils are on hills, canyon faces, and mountains.

Runoff is rapid or very rapid, and the hazard of erosion is severe.

This land is of no value for irrigated crops. It is used for limited livestock grazing, wildlife habitat, and watershed. It has esthetic value.

Estimated yields

Table 4 lists average yields per acre of alfalfa hay, irrigated pasture, wheat, barley, Greenar intermediate wheatgrass seed, Regar bromegrass seed, and Latar orchardgrass seed that can be expected on selected irrigated soils in the Diamond Valley Area under average to good management.[3]

The estimates were prepared cooperatively by the Soil Conservation Service, the Central Nevada Field Experiment Station, the Nevada Cooperative Extension Service, and selected farmers and ranchers.

Several important variable factors should be kept in mind when using this table. First, the yield figures are estimates or predictions rather than proven facts, but they are considered reliable enough to be valuable. Second, the estimates are of average yields that may be expected over a period of years. Yields may be above or below the average in any given year. Third, there are variations in yields among areas of the same soil. Fourth, past management of a soil affects its response to new management practices. Fifth, new crop varieties and improved farming practices are likely to affect future yields. Sixth, the availability of competent management and labor on the farm may differ.

Farmers who obtain the sustained yields given in the table follow the practices given in their conservation plan, which includes practices described in the section "Use and Management of the Soils." Briefly, this involves—

1. A conservation cropping system.
2. Crop residue use.
3. Erosion control.
4. Addition of plant nutrients.
5. Insect and weed control.
6. Irrigation water management.
7. Pasture and hayland management.
8. Management of saline-alkali soils.

[3] This does not reflect the effect of the occasional frost (once in 4 to 6 years) occurring during the growing season of June, July, and August. This frost is severe enough to cause total or partial crop failure.

Range [4]

Range is land on which the climax, or natural potential, plant community is dominated by grasses, grasslike plants, forbs, and shrubs. There are several types of range, including prairies, shrublands, savannas, and natural wet meadows. Range is used mainly for grazing by domestic livestock and wild herbivores; however, properly managed range also provides other benefits to society, including wildlife habitat, recreation, watershed, ground-water recharge, historic and cultural sites, natural areas, beauty, and clean air and water.

Range management is manipulating range to obtain optimum, sustained production of forage for livestock and wildlife, as well as other range products and values, while maintaining the basic range resources.

Range sites and range condition classes

Soils that have the capacity to produce the same kinds, amounts, and proportions of range plants are grouped into range sites. A range site is the product of all environmental factors responsible for its development.

A plant community existing within a range site that has not undergone abnormal disturbance is the potential, or climax, plant community, for that site. Climax plant communities are not precise or fixed in their composition but vary, within reasonable limits, from year to year and from place to place.

Abnormal disturbance such as overuse by livestock, excessive burning, erosion, or plowing results in changes in the climax plant community or even complete destruction if disturbance is drastic enough. When the range site has not deteriorated significantly under such disturbance, secondary plant succession progresses in the direction of the natural potential, or climax, plant community for the site.

Four range condition classes are used to indicate the degree of departure from the potential, or climax, vegetation brought about by grazing or other uses. The classes show the present condition of the native vegetation on a range site in relation to the native vegetation that could grow there.

A range is in excellent condition if 76 to 100 percent of the vegetation is of the same kind as that in the climax stand. It is in good condition if 51 to 75 percent; in fair condition if 26 to 50 percent; and in poor condition if less than 25 percent.

When changes occur in the climax plant community because of use by livestock or disturbance, some plant species will increase and others will decrease. Which species increase or decrease depends on the grazing animal, season of use, and the degree of use. By comparing the composition of the present plant community to the potential plant community, it is possible to see how individual species have increased while others decreased. Plants not present in the climax community, which show up in the present plant community, are invaders for the site.

The composition of climax and present plant communities, together with other range site information,

[4] This section was prepared by HARLAN ARNOLD and A. DEAN CHAMRAD, range conservationists, Soil Conservation Service.

TABLE 4.—*Estimated average yields per acre of principal crops on selected irrigated soils*

Soil name	Alfalfa hay	Irrigated pasture	Wheat	Barley	Greenar seed	Regar seed	Latar seed
	Tons	*Tons*	*Bu*	*Bu*	*Lb*	*Lb*	*Lb*
Alhambra fine sandy loam	4	4	48	53	450	275	225
Alhambra silt loam	4	4	48	53	450	275	225
Alhambra silt loam, silty substratum	4	4	60	65	400	250	200
Bruffy silt loam	4	5	50	60	450	275	225
Bruffy silt loam, alkali	4	5	50	60	450	275	225
Credo fine sandy loam	4	5	50	60	450	275	225
Dianev silt loam	3	5	----	50	450	275	225
Hamacer loamy fine sand	4	4	48	53	400	250	200
Holtle loam	4	4	60	65	400	250	200
Kobeh sandy loam, 0 to 2 percent slopes	4	4	48	53	450	275	225
Kobeh gravelly sandy loam, 0 to 2 percent slopes	4	4	48	53	400	250	200
Kobeh sandy loam, sandy subsoil variant	4	5	50	60	450	275	225
Lone gravelly sandy loam, 0 to 2 percent slopes	----	4	----	----	----	----	----
Nayped loam, 0 to 2 percent slopes	4	4	60	65	400	250	200
Rubyhill fine sandy loam, 0 to 2 percent slopes	----	4	----	----	----	----	----
Shipley silt loam, 0 to 2 percent slopes	4	4	60	65	400	250	200
Shipley silt loam, sandy subsoil variant, 0 to 2 percent slopes	4	5	50	60	450	275	225
Silverado sandy loam, 0 to 2 percent slopes	4	4	48	53	450	275	225
Tonkin fine sandy loam	4	4	60	65	400	250	200
Tonkin fine sandy loam, slightly wet	3	5	----	50	450	275	225

provides the basis for selecting range management systems.

Management programs on range generally try to increase desirable plants and restore range to as near climax condition as possible. Some programs are designed to create or maintain plant communities somewhat removed from the climax to fit specific needs in the grazing program, to provide for wildlife habitat, or for other benefits. Any management objective should be compatible with conservation objectives.

Descriptions of the range sites

In the following pages, the 10 range sites in Diamond Valley Area are briefly described and the climax plants and principal invaders on the sites are named. Also given is an estimate of the potential annual yield expressed in terms of excellent condition, unless otherwise identified, for favorable and unfavorable seasons. These yields are given as the normal high and low rather than the extremes. Yields are the total annual production of air-dry herbage, which includes the current year's growth of leaves, stems, twigs, and fruit of all plants on the site. Not all of this herbage is usable by livestock. The site for each soil can be determined by referring to the "Guide to Mapping Units" at the back of this soil survey.

RANGE SITE NV 28–20 (ARID FLOOD PLAIN)

This range site is on flood plains, basins, bottoms, and flats that receive extra water from run-in or a high water table, or both. Slopes are 0 to 4 percent. Elevation is 5,800 to 7,000 feet. Average annual precipitation is 8 to 12 inches, average annual air temperature is 42° to 46° F, and frost-free season is 70 to 100 days.

These soils are very deep and well-drained to poorly drained. The surface layer is medium textured, and the lower layers are medium textured and moderately fine textured. Permeability is moderate or moderately slow. Available water capacity is high. Runoff is slow or medium, and the hazard of erosion is slight.

The potential plant community is grasses, mainly basin wildrye and alkali sacaton, and occasional shrubs and understory species of mainly cool-season grasses and a few forbs. The composition, by weight, of the potential plant community is 50 to 80 percent grasses, 5 to 15 percent forbs, and 10 to 20 percent shrubs. The main grasses are basin wildrye, which makes up 30 to 50 percent of the community, and alkali sacaton, which makes up 10 to 15 percent. The community is also 5 to 10 percent wheatgrass, 5 to 15 percent alkaligrass, bluebunch wheatgrass, and needleandthread. The forbs include arrowgrass, blue-eyed-grass, iris, and annual forbs. The shrubs include big sagebrush, rubber rabbitbrush, fourwing saltbush, willows, rose, and ephedras.

If this site is in excellent condition, the total annual yield of air-dry herbage ranges from about 2,000 pounds per acre in favorable years to about 1,000 pounds per acre in unfavorable years.

If this site is abused by overuse or is otherwise disturbed, big sagebrush and rubber rabbitbrush increase. If deterioration continues, Russian-thistle, halogeton, and other annuals invade and dominate the site along with rubber rabbitbrush, and gullies form.

Good grazing management is essential to improving and maintaining desirable range condition. Where all

remnants of desirable vegetation have been destroyed, range seeding is fairly successful. Brush management is needed, if the site is in poor or fair condition. Contour furrows and diversions may be needed together with brush management and range seeding to retard runoff and erosion.

RANGE SITE NV 28–21 (SEMIDESERT LOAMY PLAIN)

This site is on old flood plains, fans, and lake terraces. Slopes are 0 to 15 percent. Elevation is 5,700 to 6,800 feet. Average annual precipitation is 8 to 12 inches, average annual air temperature is 41° to 46° F, and the frost-free season is 50 to 100 days.

These soils are somewhat excessively drained to well drained. The surface layer is moderately coarse textured to medium textured and the subsoil and substratum are moderately fine textured to moderately coarse textured. Permeability is slow to rapid. Available water capacity is low to high. Runoff is slow to medium, and the hazard of erosion is slight to moderate. Effective rooting depth is 20 to 60 inches.

The potential plant community is big sagebrush and an understory of bunchgrasses and forbs. The composition, by weight, is about 60 percent grasses, 15 percent forbs, and 25 percent shrubs. The main grasses are bluebunch wheatgrass, squirreltail, basin wildrye, Indian ricegrass, Sandberg bluegrass, and needleandthread; each makes up 5 to 10 percent of the total community. Slender wheatgrass, blue grama, galleta, Salina wildrye, and annual grasses together make up another 5 to 10 percent. The forbs include aster, phlox, buckwheat, and annual forbs; they make up 5 to 15 percent of the community. Of the shrubs, big sagebrush makes up 15 to 20 percent of the total community and Douglas rabbitbrush, black sagebrush, winterfat, ephedra, fourwing saltbush, and spiny hopsage make up the other 5 to 10 percent. Traces of pinyon and bitterbrush are in some areas.

If this site is in excellent condition, the total annual yield of air-dry herbage ranges from about 1,000 pounds per acre in favorable years to 500 pounds per acre in unfavorable years.

If the range condition deteriorates, big sagebrush and Douglas rabbitbrush increase and halogeton and Russian-thistle invade the site. Following fire or other severe disturbance, cheatgrass, mustard, Russian-thistle and halogeton invade.

All soils in this range site are suited to range seeding when needed; results are good to fair. Brush management is needed if range is in poor or fair condition; sufficient remnants of desirable grasses must be present. Contour furrows and diversions together with brush management and range seeding are needed in places to retard runoff and erosion. Good grazing management is essential to improving and maintaining range condition.

RANGE SITE NV 28–22 (SEMIDESERT SHALLOW LOAMY SLOPE)

This range site is on old, high fans, terraces, plains, and foothills. Slopes are 4 to 50 percent. Elevation is 5,500 to 7,000 feet. Average annual precipitation is 8 to 12 inches, average annual air temperature is 42° to 47° F, and the frost-free season is 70 to 100 days.

These soils are well drained and shallow or moderately deep. The surface layer is medium textured and contains gravel or cobbles. The subsoil is medium textured to moderately fine textured and has a restrictive hardpan or bedrock at a depth of 7 to 40 inches. Permeability is moderately rapid to slow. Available water capacity is low to very low. Runoff is medium to rapid, and the hazard of erosion is moderate or severe. Effective rooting depth is 7 to 40 inches.

The potential plant community is black sagebrush and an understory of bunchgrasses and low-growing forbs. The composition is about 50 percent grasses, 15 percent forbs, and 35 percent shrubs. The main grasses are bluebunch wheatgrass, Sandberg bluegrass, Indian ricegrass, galleta, needleandthread, and squirreltail; each makes up 5 to 10 percent of the community. Annual grasses, Saline wildrye, and blue grama together make up another 5 to 10 percent. Forbs, phlox, buckwheat, aster, and annuals make up 10 to 15 percent of the community. Of the shrubs, blacksage makes up 15 to 25 percent of the total community, and winterfat, ephedra, Douglas rabbitbrush, big sagebrush, fourwing saltbush, spiny hopsage, and bitterbrush together make up the other 10 to 20 percent.

If this site is in excellent condition, the total annual yield of air-dry herbage is about 800 pounds per acre in favorable years and 400 pounds per acre in unfavorable years.

If the range condition deteriorates, Douglas rabbitbrush, and in some cases pinyon and juniper, increase. Russian-thistle, halogeton, and other annuals invade. If the site is in poor condition or if there has been fire or severe disturbance, cheatgrass, mustard, Russian-thistle, and halogeton may dominate.

This site is not suited to range seeding, because of droughtiness and steep slopes. Brush management is needed if range is in poor or fair condition; sufficient remnants of desirable grasses must be present. Good grazing management improves and maintains range condition.

RANGE SITE NV 28–23 (ARID LOAMY BOTTOMLAND, SALINE-ALKALI)

This range site is on flats, on bottoms, and in depressions. Slopes range from 0 to 4 percent but generally are 0 to 2 percent. Elevation is 5,800 to 6,100 feet. Average annual precipitation is 8 to 12 inches, average annual air temperature is 41° to 47° F, and the frost-free season is 70 to 100 days.

These soils are very deep and well drained to somewhat poorly drained. They are moderately fine textured to fine textured throughout. Permeability is very slow to moderately rapid. Available water capacity is moderate or high. Runoff is slow, and the hazard of erosion is slight. These soils are slightly to strongly saline-alkali affected. They receive extra water as run-in from adjacent areas or from an intermittent high water table, or both.

The potential plant community is dominated by alkali sacaton and scattered rubber rabbitbrush. The composition, by weight, is about 70 percent grasses, 10 percent forbs, and 20 percent shrubs. Of the grasses, alkali sacaton makes up 25 to 35 percent of the total community and Western wheatgrass, Basin wildrye, and saltgrass each make up another 5 to 10 percent.

Grasslike plants, such as sedges and rushes, make up 5 to 15 percent. Other grasses, such as squirreltail, bluegrasses, alkaligrass, and slender wheatgrass, make up 5 to 10 percent. The forbs, arrowgrass, aster, blue-eyed-grass, horsetail, and annuals make up 5 to 10 percent. Of the shrubs, rubber rabbitbrush makes up 5 to 10 percent of the total community and big sagebrush, fourwing saltbush, black greasewood, rose, and willow make up the other 5 to 10 percent.

If this site is in excellent condition, the total annual yield of air-dry herbage is about 1,500 pounds per acre in favorable years, and about 900 pounds per acre in unfavorable years.

If range condition deteriorates, black greasewood, rubber rabbitbrush, and big sagebrush increase. Other species such as halogeton, mustards, and annuals invade or increase. Alkali sacaton may initially increase, but then it decreases as vegetation continues to deteriorate.

Good grazing management is essential to improving and maintaining desirable range condition. Brush management is needed if the site is in fair to poor condition, but sufficient remnants of desirable species should be present for natural revegetation or range seeding should follow. Range seeding is generally marginal to impractical, depending on degree of salinity and alkalinity.

RANGE SITE NV 28–24 (SEMIDESERT SILTY PLAIN)

This range site is on nearly level plains and flats and in basins and valleys. Slopes are 0 to 2 percent. Elevation is 5,800 to 5,900 feet. Average annual precipitation is 8 to 10 inches, average annual air temperature is 43° to 45° F, and the frost-free season is 70 to 100 days.

The soils are very deep and well drained. The surface layer is silty, the subsoil is moderately fine textured or medium textured, and the substratum is sand or gravel. Permeability is moderately slow. Available water capacity is moderate. Runoff is slow, and the hazard of erosion is slight. These soils tend to be droughty, and small amounts of salt and alkali are commonly present.

The potential plant community is dominated by shrubs, mainly shadscale and black sagebrush, and an understory of grasses, such as Indian ricegrass, squirreltail, galleta, and dropseeds. The composition, by weight, is about 40 percent grasses, 10 percent forbs, and 50 percent shrubs. Of the grasses, squirreltail, Indian ricegrass, needleandthread, and galleta each make up 5 to 10 percent of the total community; basin wildrye, bluebunch wheatgrass, dropseeds, and annuals make up another 5 to 15 percent. Forbs, phlox, globemallow, buckwheat, and annuals make up 5 to 10 percent of the community. Of the shrubs, shadscale makes up 15 to 25 percent and black sagebrush, winterfat, and bud sagebrush each make up 10 to 15 percent of the total community. Douglas rabbitbrush, Nevada ephedra, and spiny hopsage make up the other 5 to 10 percent.

If this site is in excellent condition, the total annual yield of air-dry herbage is about 700 pounds per acre in favorable years and about 400 pounds per acre in unfavorable years.

If range condition deteriorates, shadscale and Douglas rabbitbrush increase. Bluebunch wheatgrass, basin wildrye, Indian ricegrass, and galleta are reduced or eliminated from the plant community. If deterioration is severe, winterfat, bud sagebrush, and spiny hopsage are reduced.

This site is not suitable for range seeding. Brush management is generally not feasible, because of droughtiness and salinity and alkalinity. Good grazing management is the most feasible practice to improve and maintain desirable range vegetation.

RANGE SITE NV 28–25 (SEMIDESERT SILTY PLAIN, WINTERFAT)

This range site is on nearly level flats, in basins, and on plains. Slopes are 0 to 2 percent. Elevation is 5,800 to 6,100 feet. Average annual precipitation is 8 to 10 inches, average annual air temperature is 42° to 45° F, and the frost-free season is 70 to 100 days.

These soils are very deep and well drained. The profile is medium textured and high in silt. Permeability is moderate. Available water capacity is high. Runoff is slow, and the hazard of erosion is slight. These soils tend to disperse and puddle. They are high in lime, especially in the substratum.

The potential plant community is dominated by shrubs, mainly winterfat. Associated grasses include squirreltail, Indian ricegrass, and Sandberg bluegrass. The composition, by weight, is about 25 percent grasses, 5 percent forbs, and 70 percent shrubs. Of the grasses, Indian ricegrass, Sandberg bluegrass, and squirreltail each make up about 5 to 10 percent of the total community and needleandthread, galleta, and bluebunch wheatgrass together make up about 5 to 10 percent. Phlox, globemallow, and other forbs make up about 1 to 5 percent. Of the shrubs, winterfat makes up 40 to 50 percent of the total community. Black sagebrush, bud sagebrush, ephedra, and Douglas rabbitbrush each make up 5 to 10 percent, and spiny hopsage makes up the other 0 to 5 percent.

If this site is in excellent condition, the total annual yield of air-dry herbage is about 700 pounds per acre in favorable years and about 400 pounds per acre in unfavorable years.

If range condition deteriorates, winterfat and bud sagebrush decrease, Douglas rabbitbrush increases, and perennial grasses disappear. Severe deterioration results in decrease of black sagebrush and overall thinning of all perennial species, with voids filled by annuals.

Good grazing management is the most feasible practice to improve a deteriorated plant community and to maintain desirable range condition. This site is not suited to range seeding or brush management because of droughtiness. The tendency of the surface layer to disperse and puddle is detrimental to seedling establishment.

RANGE SITE NV 28–26 (ARID SALTY FLAT)

This range site is on nearly level flats, on bottoms, and in depressions. Slopes are 0 to 2 percent. Elevation is 5,500 to 7,000 feet. Average annual precipitation is 8 to 10 inches, average annual air temperature is 42° to 47° F, and the frost-free season is 70 to 100 days.

The soils are very deep and well drained to somewhat

poorly drained. The surface layer is medium textured to moderately fine textured, the subsoil is moderately coarse textured to moderately fine textured, and the substratum is coarse textured to moderately fine textured. Permeability is very slow to moderately rapid. Available water capacity is low to high. Runoff is slow or ponded, and the hazard of erosion is slight. These soils are slightly to strongly saline-alkali affected. They receive extra water from run-in or a high water table, or both.

The potential plant community is dominated by black greasewood and an understory of salt- and alkali-tolerant grasses. The composition, by weight, is about 30 percent grasses, 10 percent forbs, and 60 percent shrubs. Of the grasses, alkali sacaton and saltgrass each make up 5 to 10 percent of the total community and alkali bluegrass, squirreltail, alkaligrass, sedges, and rushes together make up 5 to 15 percent. The forbs, arrowgrass, iris, pickleweed, blue-eyed-grass, seepweed, and annuals make up 5 to 10 percent. Of the shrubs, black greasewood makes up 30 to 40 percent of the total community and rubber rabbitbrush makes up 10 to 20 percent. Big sagebrush, shadscale, and fourwing saltbush together make up the other 5 to 10 percent.

If this site is in excellent condition, the total annual yield of air-dry herbage is 500 pounds per acre in favorable years and about 200 pounds per acre in unfavorable years.

If the range condition deteriorates, perennial grasses and forbs quickly disappear from the plant community and annuals, black greasewood, and rubber rabbitbrush increase. Disturbances that remove the dominant shrubs result in nearly barren areas occupied by halogeton, Russian-thistle, and annual seepweed.

Because of severe salinity and alkalinity, this site is not suited to range seeding or brush management. Desirable range conditions are maintained by use of good grazing management.

RANGE SITE NV 28–27 (ARID SALINE MEADOW)

This range site is on plains, terraces, and lowland flats. Slopes are 0 to 2 percent. Elevation is 5,770 to 6,050 feet. Average annual precipitation is 8 to 10 inches, average annual air temperature is 45° to 46° F, and the frost-free season is 70 to 100 days.

Only the Bicondoa part of Bicondoa-Dianev association is in this range site. This soil is deep and poorly drained. The surface layer is medium textured or moderately fine textured and is underlain by moderately fine textured material. Permeability is slow. Available water capacity is high. Runoff is slow or ponded, and the hazard of erosion is slight. The water table is generally above a depth of 3 feet. The soil receives additional moisture from springs, seeps, and run-in from other areas.

The potential plant community is dominated by salt-tolerant grasses, sedges, and rushes, mostly alkali sacaton and inland saltgrass. The composition, by weight, is about 80 percent grasses, sedges, and rushes, 10 percent forbs, and 10 percent shrubs. Grasses include alkali sacaton, which makes up 20 to 30 percent of the community. Inland saltgrass makes up 10 to 20 percent; common reed, alkali cordgrass, and basin wildrye together make up 5 to 15 percent; and sedges and rushes make up 10 to 20 percent. Forbs, iris, pickleweed, suaeda, and annuals make up 5 to 15 percent. Of the shrubs, rubber rabbitbrush, black greasewood, willows, and roses make up 5 to 15 percent.

If this site is in excellent condition, the total annual yield of air-dry herbage is about 1,700 pounds per acre in favorable years and about 1,000 pounds per acre in unfavorable years.

If range condition deteriorates, rubber rabbitbrush, black greasewood, suaeda, and annuals increase and dominate. Alkali cordgrass and basin wildrye are generally replaced completely, but alkali sacaton and inland saltgrass persist in limited amounts.

Good grazing management is essential to maintaining desirable range condition. Selective brush management is desirable if species remnants are present. The site is generally not suitable for range seeding, because of salinity. However, selective seeding with salt-tolerant species adapted to a high water table should be considered if the site is severely depleted.

RANGE SITE NV 28–28 (SEMIDESERT SANDY PLAIN)

This range site is on flats, plains, and fans. Slopes are 0 to 2 percent. Elevation is 5,800 to 6,100 feet. Average annual precipitation is 8 to 12 inches, average annual air temperature is 42° to 45° F, and the frost-free season is 70 to 100 days.

Only Hamacer loamy fine sand, 0 to 2 percent slopes, is in this range site. This soil is deep and somewhat excessively drained. The profile is coarse textured throughout. Permeability is rapid. Available water capacity is low. Runoff is slow, and the hazard of soil blowing is moderate or severe.

The potential plant community is characterized by codominance of grasses and shrubs, mainly spiny hopsage, big sagebrush, beardless bluebunch wheatgrass, and Indian ricegrass. The composition, by weight, is about 40 percent grasses, 10 percent forbs, and 50 percent shrubs. The dominant grasses are needleandthread, beardless bluebunch wheatgrass, and Indian ricegrass; each makes up 5 to 10 percent. Squirreltail, Sandberg bluegrass, and annuals make up 5 to 15 percent. Forbs, globemallow, princesplume, buckwheats, and annuals make up 5 to 15 percent. Of the shrubs, spiny hopsage makes up 10 to 20 percent; big sagebrush makes up 10 to 15 percent; horsebrushes, fourwing saltbush, and Douglas rabbitbrush make up 5 to 10 percent each; and winterfat makes up 1 to 5 percent.

If this site is in excellent condition, the total annual yield of air-dry herbage is about 1,000 pounds per acre in favorable growing years and about 600 pounds per acre in unfavorable years.

If range condition deteriorates, perennial grasses, such as beardless bluebunch wheatgrass, needleandthread, and Indian ricegrass decrease and shrubs such as horsebrushes, big sagebrush, and Douglas rabbitbrush increase. Annual grasses and forbs increase as the site deteriorates.

Good grazing management is essential to maintaining desirable range condition or to improving the range condition. The soil in this range site is suited to selective brush management where remnants of desirable species are present. Range seeding is suited where remnants of desirable vegetation have been destroyed.

RANGE SITE NV 28–29 (SEMIDESERT LOAMY SLOPE)

This range site is on benches, fans, terraces, and foot slopes. Slopes are 2 to 50 percent. Elevation is 5,500 to 7,200 feet. Average annual precipitation is 8 to 12 inches, average annual air temperature is 42° to 47° F, and the frost-free season is 50 to 100 days.

These soils are shallow and very deep and well drained. The surface layer is gravelly, stony, and cobbly and is moderately coarse textured, medium textured, and moderately fine textured. The subsoil and substratum are medium textured to fine textured and contain gravel. A duripan or bedrock, or both, underlie most of these soils at a depth of about 30 inches. Permeability is moderate to very slow. Available water capacity is very low to high. Runoff is slow to rapid, and the hazard of erosion is slight to severe.

The potential plant community is characterized by codominance of shrubs and grasses, mainly big sagebrush and basin wildrye. The composition, by weight, is about 50 percent grasses, 10 percent forbs, and 40 percent shrubs. Dominant grasses are basin wildrye, bluebunch wheatgrass, needleandthread, Sandberg bluegrass, Indian ricegrass, and squirreltail; each makes up 5 to 10 percent. Salina wildrye, galleta, and slender wheatgrass make up 5 to 10 percent. Forbs are aster, phlox, globemallow, buckwheat, and annuals; they make up 5 to 10 percent. The community is 15 to 20 percent big sagebrush, 5 to 10 percent each winterfat and ephedras, and 5 to 15 percent fourwing saltbush, spiny hopsage, black sagebrush, and Douglas rabbitbrush.

If this site is in excellent condition, the total annual yield of air-dry herbage is 800 pounds per acre in favorable years and about 500 pounds per acre in unfavorable years.

If range condition deteriorates, big sagebrush and Douglas rabbitbrush increase and the main grasses, including Basin wildrye, bluebunch wheatgrass, and needleandthread, decrease. Winterfat, fourwing saltbush, and spiny hopsage may also decrease under continuous heavy grazing.

Good grazing management is essential to maintaining desirable range condition or to improving range condition. Selective brush management is sometimes needed if sufficient remnants of desirable species are present. The site is suitable for range seeding on the more gentle slopes where all remnants of desirable species are destroyed.

Wildlife

Soils directly influence the kinds and amounts of vegetation and amounts of water available, and in this way they indirectly influence the wildlife that inhabit an area. Proper management of water and vegetation to produce suitable habitat is the most effective way to maintain and improve wildlife populations. Knowing the properties of soils makes it possible to group them according to their potential for producing habitat that furnishes food and cover for wildlife.

Soil properties that affect the productivity of wildlife habitat are (1) thickness of the soil, (2) texture of the surface layer, (3) available water capacity, (4) water supplying capacity, (5) wetness, (6) stoniness or rockiness, (7) flood hazard, (8) slope, (9) permeability to air and water, and (10) salinity and alkalinity.

In table 5, the soils are rated according to their suitability for growing plants useful to wildlife or their suitability for ponding water. The ratings are based on soil properties and the potential of these soils to produce wildlife habitat. The ratings do not take into account such factors as present use of the soils or present distribution of wildlife and people. Therefore, selection of a site for the development of wildlife habitat will require inspection at the site.

Six general plant groups and water development groups, called *elements of wildlife habitat,* are used in rating the soils:

Grain and seed crops are annual grain-producing plants such as wheat, barley, and oats.

Domestic grasses and legumes are perennial domestic grasses and legumes that are planted to provide wildlife food and cover. Included in this group are alfalfa, clover, brome, intermediate wheatgrass, crested wheatgrass, and orchardgrass.

Wild herbaceous plants are native or naturally established grasses and forbs that provide food and cover for wildlife. Included are basin wildrye, cheatgrass, Nevada bluegrass, and Indian ricegrass.

Shrubs are shrubby plants that provide cover or produce buds, twigs, or foliage used as food by wildlife. Examples are mountain-mahogany, bitterbrush, snowberry, sagebrush, Russian-olive, serviceberry, chokecherry, fourwing saltgrass, shadscale, winterfat, and horsebrush.

Wetland plants are annual and perennial herbaceous plants of moist to wet sites, exclusive of submerged or floating aquatics, that provide food or cover for wetland forms of wildlife. Typical plants are rushes, sedges, saltgrass, cattail, pickleweed, and alkali sacaton.

Shallow-water areas are areas of surface water that have an average depth of less than 5 feet. They may be natural wet areas or those created by dams, levees, or water-control devices in streams or marshes. Examples are muskrat marshes, waterfowl and resting areas, wildlife watering developments, and beaver ponds.

Soils are rated according to their suitability to produce habitat elements. Soil suitability is expressed by an adjective rating as follows:

The rating is *good* if there are few or no soil limitations. Wildlife habitat can be easily improved, maintained, or created.

The rating is *fair* if soil limitations are moderate. Wildlife habitat can be improved, maintained, or created, but soil limitations affect habitat development or management.

The rating is *poor* if soil limitations are severe. Wildlife habitat can be improved, maintained, or created, but habitat management may be difficult and expensive and requires intensive effort.

The rating is *very poor* if it is impractical to attempt to improve, maintain, or create wildlife habitat. Unsatisfactory results are probable.

Habitat elements are used to determine the suitability of a soil for producing various kinds of wildlife habitat. Three kinds of wildlife habitat were con-

sidered. The potential for woodland habitat was not developed, because of the general inability of the soils to support woodland vegetation. Scattered pinyon-juniper clumps were included in the rating for rangeland habitat.

The rating for each type of habitat is based on the suitability of the soils for producing those habitat elements that are important components of each habitat type. Each soil in the survey area has been rated for its suitability for improvement, maintenance, or creation of each of the habitat elements and each kind of wildlife habitat.

Open-land habitat consists mainly of cropland, pastures, meadows, lawns, and other areas overgrown with grasses, forbs, shrubs, and vines. Examples of birds and mammals common to these areas are Hungarian partridge, mourning dove, songbirds, and rabbits. Habitat elements that are important components of open-land habitat are grain and seed crops, domestic grasses and legumes, wild herbaceous plants, and shrubs.

Wetland habitat is swampy, marshy, or open-water areas. Examples of birds and mammals common to these areas are ducks, geese, shore birds, and muskrat. Habitat elements that are important components of wetland habitat are wetland plants and shallow-water areas.

Rangeland habitat consists of natural or improved range. Examples of birds and mammals common to these areas are chukar, sage grouse, songbirds, deer, mountain lion, pronghorn antelope, peregrine falcon, golden eagle, and bald eagle. Habitat elements that are important components of rangeland habitat are wild herbaceous plants and shrubs.

Table 6 lists the birds and mammals common to the Diamond Valley Area and shows habitat types of major and minor importance to each species.

Wildlife suitability groups

A wildlife suitability group consists of soils that have similar ratings for each of the habitat elements and have the same suitability to produce each of the wildlife habitat types.

In Nevada, wildlife suitability groups are designated by a four-number symbol representing the rating for each kind of wildlife habitat. The *first* numeral is for open-land habitat; the *second* numeral is for woodland habitat; the *third* numeral is for wetland habitat; and the *fourth* numeral is for rangeland habitat. Number 1 is good; 2 is fair; 3 is poor; and 4 is very poor. For example, wildlife suitability group 3–42 is poor for open-land habitat, not rated for woodland habitat, very poor for wetland habitat, and fair for rangeland habitat. Irrigated wildlife suitability groups have a letter "I" following the numeral symbol.

The soils of this survey area have been placed in 12 suitability groups, which are described in the following paragraphs. The wildlife suitability group for each soil is given in table 5 and in the "Guide to Mapping Units" at the back of this survey.

WILDLIFE SUITABILITY GROUP 2–12I

The soils in this group are very deep and well drained to somewhat poorly drained. The surface layer is loam, fine sandy loam, or sandy loam. Slope is less than 2 percent. Permeability is very slow to moderate, and available water capacity is moderate to high. The water table is between depths of 24 and 60 inches. These soils are nonaffected to strongly saline-alkali affected. Some areas occasionally receive beneficial overflow.

Elevation ranges from 5,700 to 5,900 feet. Average annual precipitation is 8 to 10 inches, average annual air temperature is 41° to 46° F, and the frost-free season is 70 to 100 days.

The native vegetation is mainly big sagebrush, Great Basin wildrye, rubber rabbitbrush, saltgrass, and greasewood.

WILDLIFE SUITABILITY GROUP 2–31I

The soils in this group are very deep and moderately well drained to somewhat poorly drained. The surface layer is silt loam or loam. Slope ranges from 0 to 4 percent. Permeability is very slow to moderately slow, and available water capacity is high. The water table is between depths of 30 and 72 inches.

Elevation ranges from 5,700 to 7,000 feet. Average annual precipitation is 8 to 12 inches, average annual air temperature is 43° to 46° F, and the frost-free season is 70 to 100 days.

The native vegetation is mainly big sagebrush, rubber rabbitbrush, Great Basin wildrye, bluejoint ryegrass, and squirreltail.

WILDLIFE SUITABILITY GROUP 2–33I

The soils in this group are very deep and well drained. The surface layer is silt loam or fine sandy loam. Slope ranges from 0 to 2 percent. Permeability is moderate or moderately rapid, and available water capacity is moderate. The soils are moderately saline-alkali affected.

Elevation ranges from 5,800 to 6,100 feet. Average annual precipitation is 8 to 10 inches, average annual air temperature is 42° to 45° F, and the frost-free season is 70 to 100 days.

The native vegetation is mainly big sagebrush, saltgrass, Great Basin wildrye, and alkali sacaton.

WILDLIFE SUITABILITY GROUP 2–41I

The soils in this group are moderately deep to very deep and well drained and somewhat excessively drained. The surface layer is loam, silt loam, sandy loam, fine sandy loam, or loamy very fine sand that in places contains gravel. Slope ranges from 0 to 8 percent. Permeability is moderately slow to rapid, and available water capacity is low to high. Some of the soils are slightly saline-alkali affected.

Elevation ranges from 5,700 to 6,800 feet. Average annual precipitation is 8 to 12 inches, average annual air temperature is 41° to 46° F, and the frost-free season is 70 to 100 days.

The native vegetation is mainly big sagebrush, rubber rabbitbrush, Great Basin wildrye, bluegrass, and squirreltail.

WILDLIFE SUITABILITY GROUP 2–42I

The soils in this group are very deep and well drained or somewhat excessively drained. The surface layer is silt loam and sandy loam. Slope is 0 to 2 percent. Permeability is moderately slow to rapid, and available water capacity is low or moderate. These

TABLE 5.—*Suitability of the*

Soil series and map symbol [1]	Wildlife suitability group		Elements of wildlife habitat	
	Irrigated symbol	Dryland symbol	Grain and seed crops	Grasses and legumes
Alhambra:				
Ab, AbC, Ac, Ad.	2–41I	----------	Fair ----------	Fair ----------
	----------	3–43	Poor ----------	Poor ----------
Ah.	----------	[2] 4–44	Very poor ------	Very poor ------
Ak.	3–42I	----------	Poor ----------	Poor ----------
	----------	4–44	Very poor ------	Very poor ------
Am.	[2] 2–33I	----------	Fair ----------	Fair ----------
	----------	4–44	Very poor ------	Very poor ------
As.	2–41I	----------	Fair ----------	Fair ----------
	----------	3–43	Poor ----------	Poor ----------
Alpha. Mapped only with Ridit soils.	----------	3–43	Poor ----------	Poor ----------
Atrypa: AT, AY. For Hopeka part of AY, see Hopeka series.	----------	4–43	Very poor ------	Very poor ------
Bartine: BA, BC. For Siri part of BC and Overland part of BA, see Siri and Overland series.	----------	4–43	Very poor ------	Very poor ------
Bicondoa: BD. For Dianev part, see Dianev series, unit DO.	----------	3–13	Very poor ------	Poor ----------
Bobs: BGD.	----------	4–44	Very poor ------	Very poor ------
Bruffy:				
Br, Bs.	[2] 2–41I	----------	Fair ----------	Fair ----------
	----------	3–43	Poor ----------	Poor ----------
Bu.	2–42I	----------	Fair ----------	Fair ----------
	----------	4–44	Very poor ------	Very poor ------
Credo: CfB, CgC.	[2] 2–41I	----------	Fair ----------	Good ----------
	----------	3–43	Poor ----------	Poor ----------
Croesus: CS. For Sheege part, see Sheege series.	----------	4–43	Very poor ------	Very poor ------
Cyan: CY.	----------	4–43	Very poor ------	Very poor ------
Devoy: DC, DE. Rock outcrop part of DC not rated.	----------	4–43	Very poor ------	Very poor ------
Dianev:				
DN.	2–31I	----------	Fair ----------	Fair ----------
	----------	3–33	Poor ----------	Poor ----------
DO.	----------	[2] 4–23	Very poor ------	Very poor ------
Fairydell: FAE.	----------	4–43	Very poor ------	Very poor ------
Fera: FR.	----------	4–43	Very poor ------	Very poor ------
Fusulina: FU. For Sheege part, see Sheege series.	----------	4–44	Very poor ------	Very poor ------
Gabel: GAE, GB.	----------	4–44	Very poor ------	Very poor ------
Hamacer: HaA.	[2] 2–41I	----------	Fair ----------	Good ----------
	----------	4–43	Very poor ------	Very poor ------
Handy: HDD.	----------	3–43	Poor ----------	Poor ----------
Hayeston: HE. For Silverado part, see Silverado series.	2–41I	----------	Poor ----------	Fair ----------
	----------	4–44	Very poor ------	Very poor ------

soils for wildlife habitat

Elements of wildlife habitat—Continued				Kinds of wildlife		
Wild herbaceous plants	Shrubs	Wetland plants	Shallow water developments	Open-land	Wetland	Rangeland
Good Poor	Good Poor	Poor Poor	Very poor Very poor	Fair Poor	Very poor Very poor	Good. Poor.
Very poor	Very poor	Poor	Poor	Very poor	Poor	Very poor.
Fair Very poor	Fair Very poor	Very poor Very poor	Very poor Very poor	Poor Very poor	Very poor Very poor	Fair. Very poor.
Very poor Very poor	Very poor Very poor	Poor Very poor	Poor Very poor	Fair Very poor	Poor Very poor	Very poor. Very poor.
Good Poor	Good Poor	Poor Poor	Very poor Very poor	Fair Poor	Very poor Very poor	Good. Poor.
Poor	Poor	Very poor	Very poor	Poor	Very poor	Poor.
Poor	Poor	Very poor	Very poor	Very poor	Very poor	Poor.
Poor	Poor	Very poor	Very poor	Very poor	Very poor	Poor.
Poor	Poor	Good	Good	Poor	Good	Poor.
Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor.
Good Poor	Good Poor	Poor Poor	Very poor Very poor	Fair Poor	Very poor Very poor	Good. Poor.
Fair Very poor	Fair Very poor	Poor Very poor	Very poor Very poor	Fair Very poor	Very poor Very poor	Fair. Very poor.
Good Poor	Good Poor	Poor Poor	Very poor Very poor	Good Poor	Very poor Very poor	Good. Poor.
Poor	Poor	Very poor	Very poor	Very poor	Very poor	Poor.
Poor	Poor	Very poor	Very poor	Very poor	Very poor	Poor.
Poor	Poor	Very poor	Very poor	Very poor	Very poor	Poor.
Good Poor	Good Poor	Poor Poor	Poor Poor	Fair Poor	Poor Poor	Good. Poor.
Very poor	Very poor	Good	Good	Very poor	Good	Very poor.
Poor	Poor	Very poor	Very poor	Very poor	Very poor	Poor.
Poor	Poor	Very poor	Very poor	Very poor	Very poor	Poor.
Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor.
Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor.
Fair Poor	Fair Poor	Very poor Very poor	Very poor Very poor	Good Very poor	Very poor Very poor	Fair. Poor.
Poor	Poor	Very poor	Very poor	Poor	Very poor	Poor.
Good Very poor	Good Very poor	Poor Poor	Very poor Very poor	Fair Very poor	Very poor Very poor	Good. Very poor.

TABLE 5.—*Suitability of the*

Soil series and map symbol [1]	Wildlife suitability group		Elements of wildlife habitat	
	Irrigated symbol	Dryland symbol	Grain and seed crops	Grasses and legumes
Holtle: HIA, HmA, HNB.	2–41I	----------	Fair ----------	Fair ----------
	----------	3–43	Poor ----------	Poor ----------
Hopeka: HO, HS. For Labshaft part of HO and Sheege part of HS, see those series.	----------	4–44	Very poor ------	Very poor ------
Hussa: HUB.	2–31I	----------	Fair ----------	Fair ----------
	----------	3–33	Poor ----------	Poor ----------
Kobeh:				
KbA.	2–42I	----------	Fair ----------	Fair ----------
	----------	4–44	Very poor ------	Very poor ------
KgA, KHB.	3–42I	----------	Poor ----------	Poor ----------
	----------	4–44	Very poor ------	Very poor ------
Kobeh variant: Km.	2–41I	----------	Fair ----------	Fair ----------
	----------	3–43	Poor ----------	Poor ----------
Labshaft: LAE, LAF, LK. For Locane parts of LAE and LAF, see Locane series.	----------	4–44	Very poor ------	Very poor ------
Locane. Mapped only with Labshaft soils.	----------	4–44	Very poor ------	Very poor ------
Lone: LmA, LnB, LR.	3–42I	----------	Poor ----------	Poor ----------
For Rito and Credo parts of LR, see Rito and Credo series.	----------	4–44	Very poor ------	Very poor ------
Mau: MAE.	----------	4–43	Very poor ------	Very poor ------
Nayped: NaB, NdA, NdB, NK.	[2] 2–41I	----------	Fair ----------	Good ----------
For Kobeh part of NK, see Kobeh series, unit KgA.	----------	3–43	Poor ----------	Poor ----------
Nevka: Ns.	[2] 2–12I	----------	Fair ----------	Fair ----------
	----------	4–23	Very poor ------	Very poor ------
Overland. Mapped only with Bartine soils.	----------	4–44	Very poor ------	Very poor ------
Pedoli: PeB.	2–41I	----------	Poor ----------	Poor ----------
	----------	4–44	Very poor ------	Very poor ------
Playas: PL, PS. Not rated. For Dianev part of PS, see Dianev series, unit DN.				
Ratto: RAC, RCD.	----------	4–44	Very poor ------	Very poor ------
Ridit: RD.	----------	4–43	Very poor ------	Very poor ------
For Alpha part, see Alpha series.				
Rito.	2–41I	----------	Poor ----------	Poor ----------
Mapped only with Lone soils.	----------	4–44	Very poor ------	Very poor ------
Roca. Mapped only with Fera soils.	----------	4–43	Very poor ------	Very poor ------
Rubyhill:				
RfA.	2–41I	----------	Poor ----------	Poor ----------
	----------	4–43	Very poor ------	Very poor ------
RHC, RL.	----------	4–43	Very poor ------	Very poor ------
Sader: SA, SD.	2–12I	----------	Poor ----------	Fair ----------
	----------	3–13	Poor ----------	Poor ----------
Sheege: SE. For Croesus part, see Croesus series.	----------	4–44	Very poor ------	Very poor ------

soils for wildlife habitat—Continued

Elements of wildlife habitat—Continued				Kinds of wildlife		
Wild herbaceous plants	Shrubs	Wetland plants	Shallow water developments	Open-land	Wetland	Rangeland
Good Poor	Good Poor	Poor Poor	Very poor Very poor	Fair Poor	Very poor Very poor	Good. Poor.
Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor.
Good Poor	Good Poor	Poor Poor	Poor Poor	Fair Poor	Poor Poor	Good. Poor.
Fair Very poor	Fair Very poor	Poor Very poor	Very poor Very poor	Fair Very poor	Very poor Very poor	Fair. Very poor.
Fair Very poor	Fair Very poor	Very poor Very poor	Very poor Very poor	Poor Very poor	Very poor Very poor	Fair. Very poor.
Good Poor	Good Poor	Poor Poor	Very poor Very poor	Fair Poor	Very poor Very poor	Good. Poor.
Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor.
Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor.
Fair Very poor	Fair Very poor	Poor Very poor	Very poor Very poor	Poor Very poor	Very poor Very poor	Fair. Very poor.
Poor	Poor	Very poor	Very poor	Very poor	Very poor	Poor.
Good Poor	Good Poor	Poor Poor	Very poor Very poor	Good Poor	Very poor Very poor	Good. Poor.
Fair Poor	Fair Poor	Fair Fair	Fair Fair	Fair Very poor	Fair Fair	Poor. Poor.
Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor.
Good Very poor	Good Very poor	Poor Poor	Very poor Very poor	Fair Very poor	Very poor Very poor	Good. Very poor.
Very poor	Very poor	Poor	Very poor	Very poor	Very poor	Very poor.
Poor	Poor	Very poor	Very poor	Very poor	Very poor	Poor.
Good Very poor	Good Very poor	Poor Very poor	Very poor Very poor	Fair Very poor	Very poor Very poor	Good. Very poor.
Poor	Poor	Very poor	Very poor	Very poor	Very poor	oor.
Good Poor	Good Poor	Poor Poor	Very poor Very poor	Fair Very poor	Very poor Very poor	Good. Poor.
Poor	Poor	Poor	Very poor	Very poor	Very poor	Poor.
Fair Poor	Fair Poor	Good Good	Good Good	Fair Poor	Good Good	Fair. Poor.
Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor.

TABLE 5.—*Suitability of the*

Soil series and map symbol [1]	Wildlife suitability group		Elements of wildlife habitat	
	Irrigated symbol	Dryland symbol	Grain and seed crops	Grasses and legumes
Shipley:				
SfB, ShA, SMA.	2–41I	----------	Fair ----------	Fair ----------
	----------	3–43	Poor ----------	Poor ----------
SlA.	2–33I	----------	Fair ----------	Fair ----------
	----------	[2] 3–33	Poor ----------	Poor ----------
Shipley variant: Sn.	2–41I	----------	Fair ----------	Fair ----------
	----------	3–43	Poor ----------	Poor ----------
Silverado: SoA, SoB, SRD, StA.	2–41I	----------	Poor ----------	Poor ----------
	----------	4–44	Very poor ------	Very poor ------
Siri: SUF.	----------	4–43	Very poor ------	Very poor ------
Stampede: SVB.	----------	4–43	Very poor ------	Very poor ------
Tahquats: TAD.	----------	3–43	Poor ----------	Poor ----------
Tica: TCF, TK.	----------	4–44	Very poor ------	Very poor ------
Tonkin:				
Tn.	2–41I	----------	Fair ----------	Fair ----------
	----------	3–43	Poor ----------	Poor ----------
To.	[2] 2–12I	----------	Fair ----------	Fair ----------
	----------	4–23	Very poor ------	Very poor ------
Umil: UMB, US.	----------	4–44	Very poor ------	Very poor ------
Vinsad: VN.	----------	[2] 4–44	Very poor ------	Very poor ------

[1] Mapping units that are complexes of two or more taxonomic units are rated by the most limiting member of the complex. They are found under each component series. Mapping units that are associations of two or more taxonomic units are rated individually and are found under each component series.

soils are slightly saline-alkali affected and are occasionally flooded.

Elevation ranges from 5,800 to 6,100 feet. Average annual precipitation is 8 to 10 inches, average annual air temperature is 41° to 45° F, and the frost-free season is 70 to 100 days.

The native vegetation is mainly big sagebrush, rubber rabbitbrush, shadscale, greasewood, and winterfat.

WILDLIFE SUITABILITY GROUP 3–42I

The soils in this group are moderately deep to very deep and well drained or somewhat excessively drained. The surface layer is loam, fine sandy loam, and sandy loam that in places contains gravel. Slope ranges from 0 to 8 percent. Permeability is moderate to rapid, and available water capacity is low to high.

Elevation ranges from 5,800 to 6,200 feet. Average annual precipitation is 8 to 10 inches, average annual air temperature is 41° to 46° F, and the frost-free season is 70 to 100 days.

The native vegetation is mainly big sagebrush and Sandberg bluegrass.

WILDLIFE SUITABILITY GROUP 3–13

The soils in this group are very deep and somewhat poorly drained or poorly drained. The surface layer is loam or silty clay loam. Slope is 0 to 2 percent. Permeability is very slow or slow, and available water capacity is high. The water table is between depths of 24 and 60 inches. Some of these soils are saline-alkali affected and are occasionally flooded.

Elevation ranges from 5,800 to 6,200 feet. Average annual precipitation is 8 to 10 inches, average annual air temperature is 43° to 46° F, and the frost-free season is 70 to 100 days.

The native vegetation is mainly wiregrass, saltgrass, bluejoint ryegrass, Great Basin wildrye, greasewood, and rubber rabbitbrush.

WILDLIFE SUITABILITY GROUP 3–33

The soils in this group are very deep and well drained, moderately well drained, or poorly drained. The surface layer is loam, silty clay loam, or silt loam. Slope ranges from 0 to 4 percent. Permeability is moderate to very slow, and available water capacity is high. The water table is between depths of 36 and 72 inches. These soils are slightly to moderately saline-alkali affected. Some areas are occasionally flooded.

Elevation ranges from 5,700 to 7,000 feet. Average annual precipitation is 8 to 12 inches, average annual air temperature is 42° to 46° F, and the frost-free season is 70 to 100 days.

soils for wildlife habitat—Continued

Elements of wildlife habitat—Continued				Kinds of wildlife		
Wild herbaceous plants	Shrubs	Wetland plants	Shallow water developments	Open-land	Wetland	Rangeland
Good Poor	Good Poor	Poor Poor	Very poor Very poor	Fair Poor	Very poor Very poor	Good. Poor.
Poor Very poor	Poor Very poor	Poor Poor	Poor Poor	Fair Poor	Poor Poor	Poor. Very poor.
Good Poor	Good Poor	Poor Poor	Very poor Very poor	Fair Poor	Very poor Very poor	Good. Poor.
Good Very poor	Good Very poor	Poor Poor	Very poor Very poor	Fair Very poor	Very poor Very poor	Good. Very poor.
Poor	Poor	Very poor	Very poor	Very poor	Very poor	Poor.
Poor	Poor	Poor	Very poor	Very poor	Very poor	Poor.
Poor	Poor	Poor	Very poor	Poor	Very poor	Poor.
Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor.
Good Poor	Good Poor	Poor Poor	Very poor Very poor	Fair Poor	Very poor Very poor	Good. Poor.
Poor Poor	Poor Poor	Good Good	Good Good	Fair Very poor	Good Good	Poor. Poor.
Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor.
Very poor	Very poor	Very poor	Fair	Very poor	Very poor	Very poor.

[2] These soils are inclusions in wildlife suitability groups. Theyare of small extent and may be treated the same as the other soils in this group.

The native vegetation is mainly saltgrass, bluejoint ryegrass, Great Basin wildrye, squirreltail, rubber rabbitbrush, and greasewood.

WILDLIFE SUITABILITY GROUP 3–43

The soils in this group are deep or very deep and somewhat excessively drained or well drained. The surface layer is loam, silt loam, fine sandy loam, sandy loam, or loamy very fine sand that in places contains gravel or stones. Slope ranges from 0 to 30 percent. Permeability is slow to rapid, and available water capacity is low to high. In some places the soils are occasionally flooded.

Elevation ranges from 5,800 to 7,800 feet. Average annual precipitation is 8 to 14 inches, average annual air temperature is 41° to 46° F, and the frost-free season is 50 to 100 days.

The native vegetation is mainly big sagebrush, rabbitbrush, squirreltail, Sandberg bluegrass, Great Basin wildrye, Indian ricegrass, and scattered pinyon and juniper.

WILDLIFE SUITABILITY GROUP 4–23

The soils in this group are deep or very deep and moderately well drained or somewhat poorly drained. The surface layer is silty clay loam, silt loam, or fine sandy loam. Slope is 0 to 2 percent. Permeability is slow to moderate, and available water capacity is high. The water table is between depths of 30 and 72 inches. Some of the soils are slightly to strongly saline-alkali affected.

Elevation ranges from 5,770 to 6,020 feet. Average annual precipitation is 8 to 10 inches, average annual air temperature is 41° to 46° F, and the frost-free season is 70 to 100 days.

The native vegetation is mainly saltgrass, alkali sacaton, Great Basin wildrye, greasewood, and rubber rabbitbrush.

WILDLIFE SUITABILITY GROUP 4–43

The soils in this group are shallow, moderately deep, deep, or very deep and well drained or somewhat excessively drained. The surface layer is clay loam, loam, fine sandy loam, and sandy loam and is commonly stony, gravelly, or cobbly. Slope is generally 15 to 50 percent, but in some places it is 0 to 15 percent and in other places it is as much as 75 percent. Permeability is very slow to rapid, and available water capacity is very low to moderate.

Elevation ranges from 5,800 to over 10,600 feet. Average annual precipitation is 8 to 18 inches, average

TABLE 6.—*Wildlife in Diamond Valley Area*

[XX means habitat type of major importance to this species, X means habitat type of minor importance to this species, and no entry means species does not inhabit; asterisk means rare or endangered species]

Wildlife species	Open-land habitat	Wetland habitat	Rangeland habitat
Pronghorn antelope	X		XX
Badger	X		XX
Shore birds	X	XX	
Songbirds	XX	X	XX
Bobcat	X		XX
Cottontail and other rabbits	XX	X	XX
Coyote	X		XX
Mule deer	X		XX
Mourning dove	XX		X
Bald eagle		X	XX
Golden eagle	X		XX
*Peregrine falcon	X	X	XX
Kit fox	X		XX
Sage grouse	X		XX
Mountain lion			X
Chukar			XX
Hungarian partridge	XX		X
Reptiles	X		XX
Rodents	XX	XX	XX
Skunks	XX	X	X
Waterfowl	X	XX	
Weasel	X	X	XX

annual air temperature is 40° to 46° F, and the frost-free season ranges from less than 50 to 100 days.

The native vegetation is mainly big sagebrush, Sandberg bluegrass, bluebunch wheatgrass, Great Basin wildrye, bitterbrush, ephedra, Douglas rabbitbrush, and open stands of pinyon and juniper.

WILDLIFE SUITABILITY GROUP 4–44

The soils in this group are shallow to very deep and somewhat excessively drained to somewhat poorly drained. The surface layer is silt loam, loam, very fine sandy loam, fine sandy loam, and sandy loam that in places contains shale fragments, gravel, cobbles, or stones. Slope ranges from 0 to 75 percent. Permeability is slow to rapid. Available water capacity is mostly very low or low, but in places it is moderate to high. Most of the shallow soils are limited in depth by a duripan or bedrock.

Elevation ranges from 5,600 feet to more than 10,600 feet. Average annual precipitation is 8 to 18 inches, average annual air temperature is 35° to 47° F, and the frost-free season is less than 50 days to 100 days.

The native vegetation is highly variable, ranging from phreatophytes to xerophytes.

Windbreaks

Windbreaks are planted to protect soils, crops, livestock, homes, and farm buildings. During the growing season they protect crops from drying winds. In winter they protect livestock, control drifting snow, and reduce fuel needed to heat homes. While crops are off the land, windbreaks protect the soil against blowing. Windbreaks also provide food and shelter for wildlife and enhance the beauty of the landscape.

Windbreaks should be carefully planned for the purpose intended. Selection of specific trees and shrubs and proper spacing and placement of the windbreak are important factors in planning a windbreak system. A single windbreak of a system of windbreaks is an important part of a complete soil and water conservation plan.

Tree plantings in Diamond Valley Area are not well enough established at present to make possible direct predictions of growth rates or suitability of various species.

Ideally, windbreaks should be planted on the windward side of and at least 100 feet from the area to be protected, and they should be no less than two rows wide. In some areas, five to seven rows are required to give effective protection. The trees must be dense enough and high enough to reduce wind velocity. One or more rows of evergreens for winter protection and at least one row of deciduous trees for maximum summer protection are needed. Evergreens should be temporarily protected from sun and wind. Such protection can be provided by a parallel planting of grain or corn on each side.

Low-growing shrubs should be planted on the windward side of the windbreak to prevent wind from sweeping under the windbreak. Spacing of plants within rows should be as follows: small shrubs, 1 to 4 feet; large shrubs and small trees, 5 to 8 feet; large trees, 10 to 12 feet. Space between rows should be at least 12 feet. More space is desirable between evergreens and deciduous trees to prevent overtopping. Clean cultivation is important for establishment, survival, and maximum growth.

An irrigation system must be installed by planting time so the soil can be watered before planting, immediately after planting, and at least once each week through the first summer. Deep watering is essential for root development. In northern Nevada irrigation should be reduced early in fall so that deciduous trees have a chance to "harden off." Winter irrigation of evergreens may be necessary to prevent drought losses and "winter burn."

Windbreaks must be protected from livestock and from fire. They should also be protected from rodents, rabbits, porcupines, and deer by wire cylinders, aluminum foil, or paper around the trunk, or by using rabbit and deer repellent. Insect control may be necessary. If a plant is lost, it should be replaced as soon as possible. This is particularly important during the first few years. A good windbreak has uniform density and height.

Windbreak suitability groups

The kind of soil largely determines the most suitable trees and shrubs for windbreaks, their growth, and the management needed for their upkeep. Most trees and shrubs are not tolerant of saline and alkali soils. They are better suited to medium-textured soils than to fine-textured soils. Most trees grow best in deep, well-drained, well-aerated soils that have good water holding capacity, but willows and cottonwoods grow best over a beneficial water table.

The soils in this survey area have been placed in five

windbreak suitability groups. The group for each soil can be identified by referring to the "Guide to Mapping Units" at the back of this survey. A windbreak suitability group is a grouping of soils that have similar potentials and that require similar management to produce trees and shrubs.

The five windbreak suitability groups in Diamond Valley Area are described in the following pages and in table 7. In this area irrigation is necessary for establishment of windbreaks. Only soils that have a potential for irrigation are placed in windbreak suitability groups.

Many soils in this area are shallow, steep, or strongly saline, or they are otherwise unsuited to windbreaks. In most cases there is no need for windbreaks on these soils at present. Complexes are grouped according to the most limiting component soil.

The soils in windbreak suitability groups are on the valley bottom and surrounding fans. Slope is mostly less than 8 percent, average annual precipitation is 8 to 10 inches, and the frost-free season is 70 to 100 days. If windbreaks are needed in the foothills and mountains, a special investigation of the site should be made, and provisions for water to establish the windbreak should be taken into consideration.

WINDBREAK SUITABILITY GROUP NV 28–1

The soils in this group are well suited to trees and shrubs for windbreaks. These soils are deep and well drained or moderately well drained. They are mostly medium textured and are on fans and flood plains. Permeability is moderate or moderately slow, and available water capacity is mostly high.

Establishing and maintaining windbreaks on these soils requires no special practices other than maintaining favorable moisture relations in the rooting zone.

WINDBREAK SUITABILITY GROUP NV 28–2

The soils in this group are suited to trees and shrubs for windbreaks. These soils are deep and well drained to somewhat excessively drained. The upper part of the soil is moderately coarse textured to moderately fine textured, and the substratum is mostly loamy sand or sand that contains 20 to 70 percent gravel. The soils are on fans and flood plains. Permeability is rapid to moderately slow, and available water capacity is low to high. Some of the soils are slightly saline-alkali affected and are subject to overflow.

Establishing and maintaining windbreaks on these soils requires no special practices other than maintaining favorable moisture relations in the rooting zone.

WINDBREAK SUITABILITY GROUP NV 28–3

The soils in this group are limited in their capacity for growing trees and shrubs for windbreaks. These soils are deep and well drained to somewhat excessively drained. They are gravelly and moderately coarse textured or coarse textured and are on terraces and fans. Permeability is moderately rapid, and available water capacity is low.

Establishing and maintaining windbreaks on these soils requires good water management practices to ensure an adequate moisture supply in the rooting zone.

WINDBREAK SUITABILITY GROUP NV 28–4

The soils in this group are limited in their capacity for growing trees and shrubs for windbreaks. These soils are deep and somewhat poorly drained, moderately well drained, or well drained. They are medium textured or moderately coarse textured. Permeability is rapid to slow, and available water capacity is high to low. These soils are slightly to moderately saline-alkali affected, and a water table is present in places between depths of 36 and 60 inches. Some areas are occasionally flooded.

Most trees and shrubs have a relatively low tolerance to salt and alkali. Plants that tolerate this condition must be selected.

WINDBREAK SUITABILITY GROUP NV 28–5

The soils in this group are limited in their capacity for growing trees and shrubs for windbreaks. These soils are mostly moderately deep and well drained. They are medium textured to coarse textured over a strongly cemented hardpan. Permeability is moderate above the pan, and available water capacity is low.

In some cases the pan can be broken by ripping, which improves rooting depth and available water capacity.

Woodland

The soils of the Diamond Valley Area have been placed in woodland suitability groups to assist owners in planning the use of their soils for wood crops. Each group is made up of soils that are suited to the same kind of trees, that need about the same management where the vegetation on them is similar, and that have the same potential production.

Each woodland group is identified by a three-part symbol, such as 3x1 or 3d1. The potential productivity of the soils in the group is indicated by the first number in the symbol. In this area only the rating of 3, or low, was used. This rating is based on field determination of average site index. Site index of a given soil for the pinyon-juniper type is the basal area, in square feet, of trees greater than 4.5 feet in height when the stand averages 5 inches in diameter at a height of 1 foot. Site index can be converted into approximate expected growth and yield per acre in cubic feet or cords. The site index was determined for each major kind of wooded soil. It was based on field measurements of existing stands growing on identified soils. Because field measurements of site index were not feasible for every kind of soil, information about key soils and tree species was projected to similar soils as needed. Such projections are estimates and range from a low of 50 square feet of basal area per acre on the poorest site to a maximum of 250 square feet on the best site.

The second part of the symbol identifying a woodland group is a small letter. The small letter indicates an important soil property that imposes a hazard or limitation in managing the soils in the group for trees. In this survey d and x are used. The letter *d* indicates that the rooting depth is restricted by hardpan or bedrock at a depth of less than 20 inches. The letter *x* indicates presence of stones, cobbles, or rocks that restrict use of the soil for woodland.

The last part of the symbol is another number and

TABLE 7.—*Ratings of windbreak suitability groups*

Windbreak suitability group	Green ash	Siberian elm	Honey locust	Russian-olive	Lombardy poplar [1]
NV 28–1. Deep, well drained and moderately well drained, medium textured soils.	Good	Good	Good	Good	Good to fair.
NV 28–2. Deep, well drained and somewhat excessively drained, medium textured soils with sandy substrata.	Fair	Good	Fair	Good	Fair to poor.
NV 28–3. Deep, well drained to somewhat excessively drained, gravelly, droughty soils.	Fair to poor.	Good to fair.	Fair to poor.	Good to fair.	Poor
NV 28–4. Deep, moderately well drained to somewhat poorly drained, salt- and alkali-affected soils.	Fair	Good to fair.[2]	Fair	Good	Fair
NV 28–5. Soils that are moderately deep over a strongly cemented pan.[4]	Fair to poor.	Good to fair.	Fair to poor.	Good to fair.	Poor

[1] These trees are subject to fungal disease in Nevada; high mortality of young trees.
[2] Fair where water table is above a depth of 24 inches.

is used to differentiate woodland suitability groups that have identical first and second parts in their identifying symbol. Each woodland suitability group in the area is rated for various management hazards or limitations. These ratings are *good, fair,* and *poor* for accessibility. For equipment limitations, seedling mortality, plant competition, and windthrow hazard ratings are given as *slight, moderate,* and *severe.* These are described in the following paragraphs.

Accessibility of the area to off-road movement of vehicles other than harvesting equipment depends on surface gradient and soil characteristics such as texture, stoniness, rock outcrop, and the like. *Good* accessibility means few or no limitations. *Fair* means moderate limitations such that most off-road vehicles can traverse the area but with some difficulty. *Poor* means severe limitations such that most off-road vehicles can traverse the area only with great difficulty or not at all.

Equipment limitations depend on soil characteristics that restrict or prohibit the use of harvesting equipment either seasonally or continually. *Slight* means no restriction on the kind of equipment or the time of year it is used. *Moderate* means that use of equipment is restricted for 3 months of the year or less. *Severe* means that special equipment is needed and that its use is severely restricted for more than 3 months of the year.

Seedling mortality refers to mortality naturally occurring on planted tree seedlings as influenced by kind of soil or topographic conditions when plant competition is assumed not to be a factor. *Slight* means a loss of 0 to 25 percent of the seedlings; *moderate* means a loss of 25 to 50 percent; and *severe* means a loss of more than 50 percent. It is assumed that seed supplies are adequate.

Plant competition is the degree to which undesirable plants invade openings in the tree canopy. Considered in the ratings are available water capacity, fertility, drainage, and degree of erosion. *Slight* means that plant competition does not prevent adequate natural regeneration and early growth or interfere with seedling development. *Moderate* means that competition delays natural or artificial establishment and growth rate but does not prevent the development of fully stocked normal stands. *Severe* means that competition prevents adequate natural or artificial regeneration unless the site is properly prepared and maintenance practices such as burning, spraying, disking, or girdling are applied.

Windthrow hazard depends on the soil characteristics that enable trees to resist being blown down by wind. *Slight* means that most trees withstand the wind; *moderate* means that some trees are expected to blow down during periods of excessive wetness and high wind; and *severe* means that many trees are expected to blow down during periods when the soil is wet and winds are moderate to high.

Understory vegetation consists of grasses, forbs, shrubs, and other plants within reach of livestock or of grazing or browsing wildlife. A well-managed wooded area can produce enough understory vegetation to support the optimum number of livestock or wildlife, or both.

The quantity and quality of the understory vegetation vary with the kind of soil, the age and kinds of trees, the density of the canopy, and the depth and condition of the forest litter. The density of the forest canopy is a major influence because it affects the amount of light that understory plants receive during the growing season.

Stands of pinyon pine and juniper in this survey area are very open. They have been cut over or burned at one time or another, so there is a considerable amount of grazable understory that is used by livestock and wildlife.

The common names of the major native understory plants are given for each woodland suitability group. No attempt was made to provide percentage composition of the understory vegetation in this survey area.

WOODLAND SUITABILITY GROUP 3d1

The soils in this group are mostly shallow and well drained. The soil is very gravelly or cobbly and medium

for producing some adapted trees and shrubs

Golden willow	Rocky Mountain juniper	Ponderosa pine	Scotch pine	Buffalo-berry	Tatarian honey-suckle	Siberian peashrub	American plum	European sagebrush	Fourwing saltbush
Good	Good	Good	Good	Good	Good	Good	Good	Good	Good.
Fair	Good	Good	Good	Fair	Fair	Good	Fair	Fair	Good.
Fair to poor.	Good	Fair	Fair	Poor	Poor	Fair	Fair to poor.	Fair to poor.	Fair.
Fair	Fair	Poor	Fair to poor.	Good	Fair to poor.[3]	Fair	Fair to poor.[3]	Fair	Good to fair.[2]
Fair to poor.	Good to fair.	Fair	Fair to poor.	Poor	Poor	Fair	Fair to poor.	Fair to poor.	Fair.

[3] Poor where water table is above a depth of 24 inches.
[4] Rated for soils with pan that has not been disturbed.

textured over sedimentary bedrock at a depth of 4 to 20 inches. Permeability is moderate, and available water capacity is low. Runoff is medium, and the hazard of erosion is moderate. These soils are droughty.

These soils are on pediments, hills, ridges, and knolls. Slope ranges from 4 to 75 percent. Elevation ranges from 5,800 to 8,000 feet. Average annual precipitation is 12 to 14 inches, average annual air temperature is 41° to 46° F, and the frost-free season is 50 to 100 days.

Precipitation falls throughout the year, but it is generally highest between March and May and lowest in September.

The indicator forest type is pinyon-juniper. Existing stands are mostly of mixed age. Canopy cover ranges from about 15 to 30 percent mature potential pinyon-juniper. The soils in this group are in woodland suitability class (site index 10–50).

Soils in this group generally have fair to poor accessibility, and restrictions on use of equipment are moderate to severe because of stones, slope, and winter snow. Mortality of tree seedlings is slight to moderate, and plant competition is moderate to severe. The susceptibility of trees to windthrow is slight to moderate, and some loss is incurred through pests and disease. The forest tree species have little value for commercial timber products. Under proper management the production of Christmas trees is poor to fair and the production of fenceposts is fair. In about 1 or 2 years in 10 the production of pine nuts is good. The stands of pinyon pine have fair value for firewood.

Where grazing has not been excessive, relative forage value of the understory vegetation is high to low. It consists of bitterbrush, ephedra, bluebunch wheatgrass, Thurber needlegrass, bluegrass, Great Basin wildrye, squirreltail, Western wheatgrass, mountain-mahogany, serviceberry, Sandberg bluegrass, low sagebrush, rabbitbrush, big sagebrush, and annuals. It is presently grazed by cattle and wildlife.

WOODLAND SUITABILITY GROUP 3x1

The soils in this group are mostly shallow to moderately deep and well drained. These soils are gravelly, cobbly, or stony and medium textured. A hardpan or bedrock is at a depth of 10 to 40 inches. Permeability is moderate, and available water capacity is low. Runoff is medium or rapid, and the hazard of erosion is moderate or severe.

These soils are on mountain faces, slopes, knolls, and ridges. Slope ranges from 4 to 75 percent. Elevation ranges from 6,000 to 8,500 feet. Average annual precipitation is 12 to 16 inches, average annual air temperature is 39° to 47° F, and the frost-free season is 50 to 100 days.

Precipitation falls throughout the year but is generally highest between March and May and lowest in September.

The indicator forest type is pinyon-juniper. Existing stands are mostly of mixed age. Canopy cover ranges from about 20 to 30 percent mature potential pinyon-juniper.

The soils in this group are in woodland suitability class 3 (site index 10-50).

Soils in this group generally have fair to poor accessibility, and restrictions on use of equipment are moderate to severe because of slope, rockiness, and winter snow. Mortality of tree seedlings is moderate to severe because of the cold temperatures in spring. Plant competition is moderate to severe. The susceptibility of trees to windthrow is slight to moderate, and some loss is incurred through pests and disease. The forest tree species have little value for commercial timber products. Under proper management the production of Christmas trees is fair to good, and the production of fenceposts is fair. In about 1 or 2 years in 10 the production of pine nuts is good. The stands of pinyon have fair value for firewood.

Where grazing has not been excessive, relative forage value of the understory vegetation is high to low. It consists of bluebunch wheatgrass, Thurber needlegrass, long-tongue muttongrass, ephedra, bitterbrush, serviceberry, Great Basin wildrye, squirreltail, Sandberg bluegrass, mountain-mahogany, snowberry, Western wheatgrass, Indian ricegrass, big sagebrush, low

sagebrush, rabbitbrush, and annuals. It is presently grazed by cattle and wildlife.

WOODLAND SUITABILITY GROUP 3x2 [5]

The soils in this group are mostly shallow to moderately deep and well drained. These soils are gravelly and cobbly and are medium textured. Limestone bedrock is at a depth of 15 to 40 inches. Permeability is moderate, and available water capacity is very low. Runoff is rapid, and the hazard of erosion is moderate to severe. These soils are somewhat droughty.

These soils are on fans, hills, and mountainsides. Slope ranges from 15 to 75 percent, but it is mostly 30 to 50 percent. Elevation ranges from 7,500 feet to over 10,600 feet. Average annual precipitation is 14 to 18 inches, average annual air temperature is 35° to 45° F, and the frost-free season is less than 50 days to 70 days.

Precipitation falls throughout the year but is generally highest between March and May and lowest in September.

The indicator forest type is mountain-mahogany. Scattered pinyon and juniper are also in the overstory. Existing stands are mostly old mature trees. Canopy cover ranges from 10 to 30 percent. The soils in this group are in woodland suitability class 3 (site index basal area data have not been developed).

Soils in this group generally have fair to poor accessibility, and restrictions on use of equipment are moderate to severe because of slope, rockiness, and winter snow. Mortality of tree seedlings is severe because of the cold temperatures in spring. Plant competition is moderate. The susceptibility of trees to windthrow is slight, and some loss is incurred through pests and disease. The forest tree species have little value for commercial timber products. The stands have fair value as a source of firewood and fenceposts.

Where grazing has not been excessive, relative forage value of the understory vegetation is high to low. It consists of bitterbrush, Thurber needlegrass, beardless bluebunch wheatgrass, long-tongue muttongrass, Nevada bluegrass, serviceberry, squirreltail, Indian ricegrass, Sandberg bluegrass, big sagebrush, rabbitbrush, and annuals. It is presently grazed by cattle and wildlife.

Engineering Uses of the Soils

This section is useful to those who need information about soils used as structural material or as foundation upon which structures are built. Among those who can benefit from this section are planning commissions, land developers, engineers, contractors, and farmers.

Among properties of soils highly important in engineering are permeability, strength, compaction characteristics, soil drainage condition, shrink-swell potential, grain size, plasticity, and soil reaction. Also important are depth to water table, depth to bedrock, and soil slope. These properties, in various degrees and combinations, affect construction and maintenance of roads, airports, pipelines, foundations for small buildings, irrigation systems, ponds and small dams, and systems for disposal of sewage and refuse.

Information in this section of the soil survey can be helpful to those who—

1. Select potential residential, industrial, commercial, and recreational areas.
2. Evaluate alternate routes for roads, highways, pipelines, and underground cables.
3. Seek sources of road fill, gravel, sand, or topsoil.
4. Plan farm irrigation systems, ponds, land leveling, and other structures for controlling water and conserving soil.
5. Correlate performance of structures already built with properties of the kinds of soil on which they are built, for the purpose of predicting performance of structures on the same or similar kinds of soil in other locations.
6. Develop preliminary estimates pertinent to construction in a particular area.

Most of the information in this section is presented in tables 8 and 9, which show, respectively, several estimated soil properties significant to engineering and interpretations for various engineering uses. This information, along with the soil map and other parts of this publication, can be used to make interpretations in addition to those given in tables 8 and 9, and it also can be used to make other useful maps.

This information, however, does not eliminate need for further investigations at sites selected for engineering works, especially works that involve heavy loads or that require excavations to depths greater than those shown in the tables, generally depths greater than 6 feet. Also, inspection of sites, especially the small ones, is needed because many delineated areas of a given soil mapping unit may contain small areas of other kinds of soil that have strongly contrasting properties, and different suitabilities or limitations for soil engineering.

Some of the terms used in this soil survey have special meaning to soil scientists that is not known to all engineers. The Glossary defines many of these terms as commonly used in soil science.

Engineering soil classification systems

The two systems most commonly used in classifying samples of soils for engineering are the Unified system (*2*), used by Soil Conservation Service engineers, the Department of Defense, and others; and the AASHTO system (*1*), adopted by the American Association of State Highway and Transportation Officials.

In the Unified system soils are classified according to particle-size distribution, plasticity, liquid limit, and organic-matter content. Soils are grouped in 15 classes. There are eight classes of coarse-grained soils, identified as GW, GP, GM, GC, SW, SP, SM, and SC; six classes of fine-grained soils, identified as ML, CL, OL, MH, CH, and OH; and one class of highly organic soils, identified as Pt. Soils on the borderline between two classes are designated by symbols for both classes; for example, CL–ML.

The AASHTO system is used to classify soils according to those properties that affect use in highway construction and maintenance. In this system, a soil is

[5] Woodland suitability class is an estimate only; site index criteria for mountain-mahogany have not been developed.

placed in one of seven basic groups ranging from A–1 through A–7 on the basis of grain-size distribution, liquid limit, and plasticity index. In group A–1 are gravelly soils of high bearing strength, the best soils for subgrade (foundation). At the other extreme, in group A–7, are clay soils that have low strength when wet and that are the poorest soils for subgrade. The estimated classification is given in table 9 for all soils mapped in the survey area.

Soil properties significant to engineering

Several estimated soil properties significant in engineering are given in table 8. These estimates are made for typical soil profiles, by layers sufficiently different to have different significance for soil engineering. The estimates are based on field observations made in the course of mapping and on experience with the same kinds of soil elsewhere. Following are explanations of some of the columns in table 8.

Depth to hardpan on bedrock is distance from the surface of the soil to the upper surface of an indurated layer or the rock layer.

Depth to seasonal high water table is distance from the surface of the soil to the highest level that ground water reaches in the soil in most years.

Soil texture is described in the standard terms used by the Department of Agriculture. These terms take into account relative percentages of sand, silt, and clay in soil material that is less than 2 millimeters in diameter. "Loam," for example, is soil material that contains 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the soil contains gravel or other particles coarser than sand, an approximate modifier is added, as for example, "gravelly loamy sand." "Sand," "silt," "clay," and some of the other terms used in USDA textural classification are defined in the Glossary of this soil survey.

Liquid limit and plasticity index indicate the effect of water on the strength and consistence of soil material. As the moisture content of a clayey soil is increased from a dry state, the material changes from a semisolid to a plastic state. If the moisture content is further increased, the material changes from a plastic to a liquid state. The plastic limit is the moisture content at which the soil material changes from the semisolid to plastic state; and the liquid limit, from a plastic to a liquid state. The plasticity index is the numerical difference between the liquid limit and the plastic limit. It indicates the range of moisture content within which a soil material is plastic. Liquid limit and plasticity index are estimated in table 8.

Permeability is that quality of a soil that enables it to transmit water or air. It is estimated on basis of those soil characteristics observed in the field, particularly structure and texture. The estimates do not take into account lateral seepage or such transient soil features as plowpans and surface crusts.

Available water capacity is the ability of soil to hold water for use by most plants. It is commonly defined as the difference between the amount of water in the soil at field capacity and the amount at the wilting point of most crop plants.

Reaction is the degree of acidity or alkalinity of a soil, expressed in pH values. The pH value and terms used to describe soil reaction are explained in the Glossary.

Corrosivity pertains to potential soil-induced chemical action that dissolves or weakens uncoated steel or concrete. Rate of corrosion of uncoated steel is related to soil properties such as drainage, texture, total acidity, and electrical conductivity of the soil material. Corrosivity for concrete is influenced mainly by the content of sodium or magnesium sulfate, but also by soil texture and acidity. Installations of uncoated steel that intersect soil boundaries or soil horizons are more susceptible to corrosion than installations entirely in one kind of soil or in one soil horizon. A corrosivity rating of *low* means that there is a low probability of soil-induced corrosion damage. A rating of *high* means that there is a high probability of damage, so that protective measures for steel and more resistant concrete should be used to avoid or minimize damage.

Salinity refers to the amount of soluble salts in the soil. It is expressed as the electrical conductivity of the saturation extract in millimhos per centimeter at 25° C. Salinity affects the suitability of a soil for crop production, its stability when used as construction material, and its corrosivity to metals and concrete.

Shrink-swell potential is the relative change in volume to be expected of soil material with changes in moisture content; that is, the extent to which the soil shrinks as it dries out or swells when it gets wet. Extent of shrinking and swelling is influenced by the amount and kind of clay in the soil. Shrinking and swelling of soils causes much damage to building foundations, roads, and other structures. A *high* shrink-swell potential indicates a hazard to maintenance of structures built in, on, or of material having this rating.

Potential frost action refers to the likelihood of damage to pavements and other structures by frost heaving and low soil strength after thawing. Frost action is defined as freezing temperatures in the soil and movement of soil moisture into the freezing zone, which causes the formation of ice lenses. Soil texture, temperature, moisture content, porosity, permeability, and content of organic matter are the most important soil properties that affect frost action. It is assumed that the soil is not covered by insulating vegetation or snow and is not artificially drained. Silty and clayey soils that have a high water table in winter are most susceptible to frost action. Well drained, very gravelly or sandy soils are the least susceptible.

Engineering interpretations of the soils

The interpretations in table 9 are based on the estimated engineering properties of soils shown in table 8 and on the experience of engineers and soil scientists with the soils of the Diamond Valley Area. In table 9, ratings are used to summarize limitation or suitability of the soils for all listed purposes other than drainage of cropland and pasture, irrigation, ponds and reservoirs, embankments, dikes and levees. For these particular uses, table 9 lists those soil features not to be overlooked in planning, installation, and maintenance.

Soil limitations are indicated by the ratings slight, moderate, and severe. *Slight* means soil properties

TABLE 8.—*Estimated soil properties*

[An asterisk in the first column indicates that at least one mapping unit in this series is made up of two or more kinds of soil. The instructions for referring to other series that appear in the first column of this

Soil series and map symbols	Depth to—		Depth from surface	Dominant USDA texture	Classification		Coarse fraction greater than 3 inches	Percentage less than 3 inches passing sieve—	
	Hardpan or bedrock	Seasonal high water table			Unified	AASHTO		No. 4 (4.7 mm)	No. 10 (2.0 mm)
	Ft	*Ft*	*In*				*Pct*		
*Alhambra									
Ab, AbC, Ak, As	>5	>5	0–15	Fine sandy loam	SM, ML	A–4	0	100	100
			15–36	Sandy loam	SM	A–2	0	100	100
			36–60	Gravelly sand	SP–SM	A–1	0	70–80	60–70
For Kobeh part of Ak, see Kobeh series. For Shipley and Shipley variant parts of As, see Shipley series, unit ShA, and Shipley variant.									
Ac	>5	>5	0–10	Silt loam	ML	A–6, A–7	0	100	100
			10–30	Fine sandy loam	SM, ML	A–4	0	100	100
			30–60	Loamy fine sand	SM	A–2	0	100	100
Ad	>5	>5	0–10	Silt loam	ML	A–6, A–7	0	100	100
			10–30	Fine sandy loam	SM–SC, CL–ML	A–4	0	100	100
			30–60	Stratified fine sandy loam, silt loam and very fine sandy loam.	[2] ML	[2] A–4, A–5	0	100	100
Ah [3]	>5	>5	0–10	Gravelly sandy loam.	SM	A–2	0	70–80	60–70
			10–40	Fine sandy loam	SM, ML	A–4	0	100	100
			40–60	Loamy fine sand	SM	A–2	0	100	100
Am	>5	>5	0–15	Fine sandy loam	SM, ML	A–4	0	100	100
			15–36	Sandy loam	SM	A–2	0	100	100
			36–60	Gravelly sand	SP–SM	A–1	0	70–80	60–70
For Kobeh part of Am, see Kobeh series.									
Alpha	3.3–>5	>5	0–17	Loam	ML	A–4	0	95–100	90–100
			17–60	Clay loam	CL	A–6, A–4	0	90–100	90–100
*Atrypa:									
AT	[4] 1.0–1.6	>5	0–13	Loam	ML, CL–ML	A–4	0	90–100	85–100
			13	Soft fractured shale bedrock.					
AY	[4] 1.0–1.6	>5	0–20	Gravelly loam	SM, SM–SC	A–4	0–5	65–75	60–70
			20	Soft fractured shale bedrock.					
For Hopeka part, see Hopeka series.									
Badland: Too variable to rate.									
*Bartine: BA, BC	[5] 1.6–3.3	>5	0–14	Gravelly loam	SM	A–4	0–10	75–80	60–70
			14–31	Very gravelly loam.	GM	A–2	5–20	40–50	35–45
			31	Hard limestone bedrock.					
For Overland part of BA and Siri part of BC, see their respective series.									

significant to engineering

soils in such mapping units may have different properties and limitations, and for this reason it is necessary to follow carefully the table. The symbol > means greater than; the symbol < means less than]

Percentage less than 3 inches passing sieve—Cont.		Liquid limit	Plasticity index	Permeability	Available water capacity	Reaction	Salinity	Shrink-swell potential	Frost action potential	Corrosivity (untreated steel)
No. 40 (0.42 mm)	No. 200 (0.074 mm)									
		Pct		*In per hr*	*In per in of soil*	*pH*	*Mmhos per cm at 25° C*			
75–85	45–55	20–30	0–5	2.0–6.0	0.10–0.13	8.5–9.0	<2	Low	High	High.
60–70	25–35	15–25	[1] NP	2.0–6.0	0.08–0.12	8.5–9.0	2–4	Low	Moderate	High.
35–45	5–10	10–20	NP	>20	0.03–0.06	8.5–9.0	<2	Low	Low	High.
90–100	75–85	40–60	10–15	0.2–0.6	0.14–0.17	>9.0	2–4	Moderate	High	High.
75–85	45–55	20–30	NP	2.0–6.0	0.10–0.13	>9.0	2–4	Low	High	High.
60–70	15–25	10–20	NP	6.0–20	0.08–0.10	8.5–9.0	2–4	Low	Moderate	High.
90–100	75–85	40–50	10–20	0.6–2.0	0.14–0.17	8.5–9.0	2–4	Moderate	High	High.
70–80	45–55	20–30	5–10	2.0–6.0	0.10–0.13	8.5–9.0	2–4	Low	High	High.
75–95	60–80	35–45	5–10	0.2–0.6	0.14–0.17	8.5–9.0	2–4	Low	High	High.
35–45	20–30	15–25	NP	2.0–6.0	0.08–0.10	>9.0	8–15	Low	Low	High.
75–85	45–55	20–30	NP	2.0–6.0	0.10–0.13	>9.0	4–8	Low	High	High.
60–70	15–25	10–20	NP	6.0–20	0.08–0.10	>9.0	4–8	Low	Moderate	High.
75–85	45–55	20–30	0–5	2.0–6.0	0.10–0.13	>9.0	>16	Low	High	High.
60–70	25–35	15–25	NP	2.0–6.0	0.08–0.12	>9.0	8–15	Low	Moderate	High.
35–45	5–10	10–20	NP	>20	0.03–0.06	>9.0	8–15	Low	Low	High.
80–95	60–75	25–35	0–5	0.6–2.0	0.13–0.17	6.6–7.3	<2	Low	High	High.
80–90	65–75	30–45	10–20	0.2–0.6	0.15–0.18	6.6–9.0	<2	Moderate	High	High.
80–90	60–70	25–35	5–10	0.6–2.0	0.14–0.17	6.6–8.4	<2	Moderate	High	High.
55–65	35–45	25–35	5–10	0.6–2.0	0.10–0.13	6.6–8.4	<2	Moderate	Moderate	High.
50–65	35–45	25–35	0–5	0.6–2.0	0.08–0.12	7.9–8.4	<2	Low	Moderate	High.
30–40	20–30	25–35	0–5	0.6–2.0	0.05–0.07	8.5–9.0	<2	Low	Low	High.

TABLE 8.—*Estimated soil properties*

Soil series and map symbols	Depth to—		Depth from surface	Dominant USDA texture	Classification		Coarse fraction greater than 3 inches	Percentage less than 3 inches passing sieve—	
	Hardpan or bedrock	Seasonal high water table			Unified	AASHTO		No. 4 (4.7 mm)	No. 10 (2.0 mm)
	Ft	*Ft*	*In*				*Pct*		
*Bicondoa: BD	>5	0–2	0–5	Loam or silt loam	[2] CL	A–6, A–7	0	100	100
			5–24	Silty clay	CH	A–7	0	100	100
For Dianev part, see Dianev series, unit DO.			24–60	Stratified silty clay, silty clay loam and silt loam.	[2] CL	A–6, A–7	0	100	100
Bobs: BGD	[6] 1–1.6	>5	0–19	Gravelly loam	SM	A–4	0–5	70–80	60–70
			19	Indurated hardpan.					
*Bruffy: Br, Bs, Bu	>5	[7] >5	0–23	Silt loam	ML	A–6, A–7	0	100	100
			23–35	Gravelly sandy clay loam and gravelly fine sandy loam [2]	[2] SC, GC	A–2	65–85	60–75	50–70
For Kobeh part of Bu, see Kobeh series.			35–60	Gravelly sand	SP–SM	A–1	65–75	60–70	40–50
Credo: CfB, CgC	>5	>5	0–18	Loam	ML	A–4	0–5	85–95	80–90
			18–34	Clay loam and gravelly sandy clay loam.	SC	A–6	0–10	85–95	80–90
			34–60	Very cobbly coarse sandy loam.	SM–SC	A–1	30–50	60–70	50–60
*Croesus: CS									
For Sheege part, see Sheege series.	[5] 1.6–3.3	>5	0–9	Gravelly loam	SM, GM	A–4	0	60–70	55–65
			9–34	Very gravelly loam.	GM	A–1, A–2	0–10	35–55	30–50
			34	Siltstone bedrock.					
Cyan: CY	[8] 2.5–3.3	>5	0–8	Very cobbly loam	GM	A–4	30–60	60–70	55–65
			8–17	Very gravelly clay.	GC	A–2	10–20	35–45	30–40
			17–50	Very gravelly sandy loam.	GM	A–1	10–20	35–45	30–40
Devoy: DC, DE	[5] 1.6–3.8	>5	0–12	Gravelly loam	GM, SM	A–4	0–20	55–75	50–70
			12–30	Very gravelly clay loam and very gravelly clay.	[1] GC	A–6, A–7	0–20	45–60	40–55
Rock outcrop part of DC not rated.			30	Alaskite bedrock.					
Dianev:									
DN	>5	3–6	0–23	Silt loam	ML	A–4	0	100	100
			23–60	Silty clay loam	CL	A–7	0	100	100
DO	>5	2.5–4	0–60	Silty clay loam	CL	A–7	0	100	100
Fairydell: FAE	>5	>5	0–23	Gravelly loam	SC, SM–SC	A–4	0–10	75–85	70–80
			23–60	Very gravelly loam.	GM	A–1, A–2	0–15	40–50	35–45
*Fera: FR	[5] 3.3–5	>5	0–11	Very stony or very gravelly loam.	GM–GC, GC	A–2	0–20	40–60	35–45
For Roca part, see Roca series.			11–42	Very gravelly clay loam and very gravelly clay.	GC	A–2	0–5	40–60	35–45
			42	Conglomerate bedrock.					

significant to engineering—Continued

Percentage less than 3 inches passing sieve—Cont.		Liquid limit	Plasticity index	Permeability	Available water capacity	Reaction	Salinity	Shrink-swell potential	Frost action potential	Corrosivity (untreated steel)
No. 40 (0.42 mm)	No. 200 (0.074 mm)									
		Pct		*In per hr*	*In per in of soil*	*pH*	*Mmhos per cm at 25° C*			
95–100	85–95	35–45	20–30	0.2–0.6	0.14–0.17	8.5–9.0	4–8	Moderate	High	High.
95–100	90–95	50–60	30–40	0.06–0.2	0.14–0.17	8.5–9.0	4–8	High	Moderate	High.
95–100	85–95	35–45	20–30	0.06–0.2	0.14–0.17	>9.0	2–4	Moderate	High	High.
50–65	35–50	25–35	0–5	0.6–2.0	0.07–0.10	7.9–8.4	<2	Low	Moderate	High.
85–100	65–85	35–45	10–15	0.6–2.0	0.14–0.17	7.9–8.4	2–8	Moderate	High	High.
45–55	25–35	25–35	10–20	0.6–2.0	0.12–0.14	8.5–9.0	2–4	Moderate	Moderate	High.
25–35	5–10	10–20	NP	>20	0.03–0.05	8.5–9.0	2–4	Low	Low	High.
70–80	55–65	20–30	0–5	0.6–2.0	0.10–0.12	6.6–7.3	<2	Low	High	High.
70–80	40–50	25–35	10–15	0.2–0.6	0.13–0.15	6.6–8.4	<2	Moderate	Moderate	High.
30–40	15–25	15–25	0–5	6.0–20	0.04–0.05	8.5–9.0	<2	Low	Low	High.
45–55	35–45	20–30	NP	0.6–2.0	0.07–0.10	6.1–6.5	<2	Low	Moderate	High.
35–45	20–30	20–30	NP	0.6–2.0	0.04–0.05	6.6–7.8	<2	Low	Moderate	High.
45–55	35–45	20–30	0–5	0.6–2.0	0.06–0.10	6.6–7.3	<2	Low	Moderate	High.
25–35	20–30	35–45	20–30	0.2–0.6	0.05–0.07	6.6–7.3	<2	Moderate	Moderate	High.
20–30	10–15	10–20	NP	2.0–6.0	0.04–0.05	6.6–7.3	<2	Low	Low	High.
45–65	40–50	20–30	0–5	0.6–2.0	0.10–0.12	6.6–7.3	<2	Low	Moderate	High.
40–50	35–45	40–50	25–35	0.06–0.2	0.08–0.10	6.1–6.5	<2	Moderate	Moderate	High.
90–100	65–75	30–40	5–10	0.6–2.0	0.13–0.17	8.5–9.0	4–8	Moderate	High	High.
90–100	70–80	40–50	20–30	0.06–0.2	0.15–0.18	8.5–9.0	4–8	Moderate	High	High.
90–100	70–80	40–50	20–30	0.06–0.2	0.15–0.18	8.5–9.0	>16	Moderate	High	High.
60–70	40–50	20–30	5–10	0.6–0.2	0.11–0.14	7.4–8.4	<2	Low	Moderate	High.
30–40	20–30	20–30	0–5	0.6–2.0	0.06–0.07	8.5–9.0	<2	Low	Moderate	High.
30–40	25–35	20–30	5–10	0.6–2.0	0.05–0.08	6.6–7.3	<2	Low	Moderate	High.
35–40	25–35	30–40	15–25	0.06–0.2	0.05–0.08	6.6–7.3	<2	Moderate	Moderate	High.

TABLE 8.—*Estimated soil properties*

Soil series and map symbols	Depth to—		Depth from surface	Dominant USDA texture	Classification		Coarse fraction greater than 3 inches	Percentage less than 3 inches passing sieve—	
	Hardpan or bedrock	Seasonal high water table			Unified	AASHTO		No. 4 (4.7 mm)	No. 10 (2.0 mm)
	Ft	*Ft*	*In*				*Pct*		
*Fusulina: FU For Sheege part, see Sheege series.	[4] 0.5–1.5	>5	0–12 12	Shaly loam Soft fractured shale bedrock.	SM, ML	A–4	0	65–75	60–70
Gabel: GAE, GB Badland part of GB too variable to rate.	[4] 1.6–3.3	>5	0–7 7–15 15–24 24–40	Gravelly loam Very gravelly sandy clay loam. Very gravelly coarse sandy loam. Soft tuff bedrock.	SC–SM, SC, CL–ML, CL CL GM	A–4 A–2 A–1	0 0 0	80–90 40–55 40–50	65–75 30–45 30–45
Hamacert: HaA	>5	>5	0–21 21–60	Loamy fine sand Fine sand	SM SM	A–4 A–2	0 0	100 100	100 100
Handy: HDD	>5	>5	0–4 4–30 30–60	Gravelly loam Gravelly clay Gravelly fine sandy loam.	SM, SM–SC, ML, CL–ML CL, CH SM	A–4 A–7 A–2, A–4	0–5 0–5 0–5	70–80 70–80 65–75	65–75 65–75 60–70
*Hayeston: HE For Silverado part, see Silverado series.	>5	>5	0–31 31–60	Gravelly fine sandy loam. Very gravelly loamy fine sand and sand.	SM GM, GP–GM	A–2, A–4 A–1	0 0	80–90 40–50	70–80 35–45
Holtle: HIA, HmA, HNB	>5	[9] >5	0–60	Loam	CL–ML, ML	A–4	0	90–100	85–100
*Hopeka: HO, HS For Labshaft part of HO and Sheege part of HS, see their respective series.	[5] 0.3–0.8	>5	0–7 7	Gravelly and very gravelly loam. Hard dolomite bedrock.	GC	A–2	0–10	40–50	35–45
Hussa: HUB	>5	4–6	0–17 17–36 36–60	Loam and silt loam. Silty clay loam and heavy silt loam. Gravelly loam	ML CL ML, CL–ML	A–4 A–6, A–7 A–4	0 0 0	90–100 90–100 70–80	90–100 90–100 65–75
Kobeh: KbA, KgA, KHB	>5	>5	0–7 7–24 24–60	Fine sandy loam Gravelly fine sandy loam and gravelly sandy loam. Gravelly and very gravelly sand.	SM SM GP–GM	A–4 A–2 A–1	0 0 0	80–90 60–70 40–50	75–85 55–65 35–45
Kobeh variant: Km	>5	>5	0–21 21–60	Sandy loam Loamy fine sand and sand.	SM SP–SM, SM	A–2, A–4 A–1, A–3	0 0	90–100 90–100	85–95 85–95

significant to engineering—Continued

Percentage less than 3 inches passing sieve—Cont.		Liquid limit	Plasticity index	Permeability	Available water capacity	Reaction	Salinity	Shrink-swell potential	Frost action potential	Corrosivity (untreated steel)
No. 40 (0.42 mm)	No. 200 (0.074 mm)									
		Pct		*In per hr*	*In per in of soil*	*pH*	*Mmhos per cm at 25° C*			
55–65	45–55	25–35	0–5	0.6–2.0	0.10–0.14	6.6–7.3	<2	Low	Moderate	High.
55–65	45–55	20–30	5–10	0.6–2.0	0.10–0.13	6.6–7.3	<2	Low	Moderate	High.
25–30	12–20	30–40	10–20	0.2–0.6	0.05–0.10	6.6–7.3	<2	Moderate	Low	High.
20–30	12–15	10–20	0–5	6.0–20	0.04–0.05	6.6–7.3	<2	Low	Low	High.
70–80	35–45	15–25	NP	6.0–20	0.08–0.10	6.6–7.3	<2	Low	Moderate	Moderate.
65–75	25–35	10–20	NP	6.0–20	0.06–0.08	6.6–7.3	<2	Low	Low	Moderate.
55–65	45–55	25–35	5–10	0.6–2.0	0.13–0.15	6.6–7.3	<2	High	Moderate	High.
60–70	50–60	45–55	30–40	0.06–0.2	0.15–0.17	6.6–7.8	<2	Low	Moderate	High.
45–55	30–40	20–30	NP	2.0–6.0	0.07–0.10	7.9–8.4	<2	Low	Moderate	High.
50–60	30–40	20–30	NP	2.0–6.0	0.07–0.10	8.5–9.0	<2	Low	Moderate	High.
20–30	5–15	10–20	NP	6.0–20	0.04–0.05	8.5–9.0	<2	Low	Low	High.
80–90	60–70	25–35	5–10	0.6–2.0	0.12–0.15	6.6–9.0	<2	Low	High	High.
30–40	20–30	25–35	10–15	0.6–2.0	0.04–0.07	8.5–9.0	<2	Low	Moderate	High.
85–95	65–75	30–40	NP–5	0.6–2.0	0.14–0.17	8.5–9.0	2–4	Low	High	High.
90–100	70–80	35–45	15–25	0.2–0.6	0.15–0.17	7.9–8.4	2–4	Moderate	High	High.
60–70	45–55	25–35	5–10	0.6–2.0	0.10–0.14	7.9–8.4	<2	Low	High	High.
55–65	35–45	15–25	NP	2.0–6.0	0.10–0.12	6.1–7.3	<2	Low	Moderate	Moderate.
35–45	25–35	15–25	NP	6.0–20	0.08–0.10	6.6–9.0	<2	Low	Moderate	Moderate.
20–30	5–10	10–20	NP	>20	0.04–0.05	8.5–9.0	<2	Low	Low	Moderate.
55–65	30–40	15–25	NP	2.0–6.0	0.10–0.13	6.6–7.8	<2	Low	Moderate	Moderate.
45–55	5–15	10–20	NP	>20	0.06–0.08	8.5–9.0	<2	Low	Low	Moderate.

TABLE 8.—*Estimated soil properties*

Soil series and map symbols	Depth to—		Depth from surface	Dominant USDA texture	Classification		Coarse fraction greater than 3 inches	Percentage less than 3 inches passing sieve—	
	Hardpan or bedrock	Seasonal high water table			Unified	AASHTO		No. 4 (4.7 mm)	No. 10 (2.0 mm)
	Ft	*Ft*	*In*				*Pct*		
*Labshaft: LAE, LAF, LK For Locane parts of LAE and LAF, see Locane series. Rock outcrop part of Lk not rated.	[5] 0.8–1.6	>5	0–12 12–19 19	Very stony loam Gravelly sandy clay loam. Conglomerate bedrock.	GM–GC, GC GC	A–2 A–2	10–25 5–15	50–60 65–60	45–55 60–50
Locane [11]	[5] 0.8–1.6	>5	0–5 5–19 19	Extremely stony loam. Gravelly clay loam. Conglomerate bedrock.	GM–GC, GC GC	A–2 A–2	10–25 5–15	35–45 35–45	30–40 30–40
*Lone: LmA, LnB, LR For Credo and Rito parts of LR, see their respective series.	[6] 2.0–3.0	>5	0–14 14–21 21–30 30–33 33–60	Gravelly loam and loam. Gravelly sandy loam. Very gravelly sand. Indurated hardpan. Gravelly sand	CL–ML, CL SM GP GP	A–4 A–1 A–1 A–1	0 0 0 0	80–90 60–70 40–50 50–60	75–85 50–60 30–40 45–55
Mau: MAE	[5] 1.6–3.3	>5	0–6 6–34 34	Stony loam Very gravelly clay and very gravelly clay loam. Andesite bedrock.	GM–GC, GC GC	A–4 A–2	5–10 5–10	60–70 40–50	55–65 35–45
*Nayped: NaB, NdA, NdB, NK For Kobeh part of NK, see Kobeh series.	>5	>5	0–60	Loam	ML	A–4	0	100	90–100
Nevka: Ns	>5	2.5–3.5	0–24 24–37 37–50	Silt loam Loam Sandy loam	ML CL–ML, ML SM	A–4 A–4 A–2, A–4	0 0 0	100 100 100	100 100 100
Overland	[4] 1.6–3.3	>5	0–22 22	Very gravelly loam. Limestone bedrock.	GM	A–1	5–10	30–40	25–35
Pedoli: PeB	>5	>5	0–6 6–25 25–35 35–60	Gravelly fine sandy loam. Gravelly clay loam. Gravelly sandy loam. Very gravelly loamy sand.	SM CL SM GP–GM, GM	A–4 A–6 A–1, A–2 A–1	0–5 0 0 0	80–95 85–95 75–85 40–50	75–85 80–85 70–80 35–45
*Playas: PL, PS For Dianev part of PS, see Dianev series, unit DN.	>5	(11)	0–60	Silty clay loam and silty clay.	[2] CH	[2] A–7	0	100	100

significant to engineering—Continued

Percentage less than 3 inches passing sieve—Cont.		Liquid limit	Plasticity index	Permeability	Available water capacity	Reaction	Salinity	Shrink-swell potential	Frost action potential	Corrosivity (untreated steel)
No. 40 (0.42 mm)	No. 200 (0.074 mm)									
		Pct		*In per hr*	*In per in of soil*	*pH*	*Mmhos per cm at 25° C*			
35–45	25–35	20–30	5–10	0.6–2.0	0.05–0.07	6.6–7.3	<2	Low	Moderate	High.
35–40	25–35	25–35	10–20	0.2–0.6	0.07–0.09	6.6–7.3	<2	Moderate	Moderate	High.
25–35	20–30	20–30	5–10	0.6–2.0	0.05–0.07	6.6–7.3	<2	Low	Moderate	High.
25–35	20–30	30–40	15–25	0.2–0.6	0.09–0.10	6.1–6.5	<2	Moderate	Moderate	High.
65–75	50–60	20–30	5–10	0.6–2.0	0.10–0.13	6.6–7.3	<2	Low	Moderate	High.
30–40	15–25	15–25	NP	2.0–6.0	0.07–0.10	8.5–9.0	2–4	Low	Moderate	High.
15–25	2–5	10–20	NP	>20	0.04–0.05	8.5–9.0	2–4	Low	Low	High.
20–30	2–5	10–20	NP	>20	0.04–0.05	8.5–9.0	2–4	Low	Low	High.
50–60	35–45	20–30	5–10	0.6–2.0	0.12–0.15	6.6–7.3	<2	Low	Moderate	High.
30–40	25–35	30–40	20–30	0.06–0.2	0.07–0.09	6.6–9.0	2–4	Moderate	Moderate	High.
80–95	60–75	25–35	NP–5	0.2–0.6	0.14–0.17	7.9–9.0	[10] 2–4	Low	High	High.
90–100	70–90	30–40	NP–5	0.6–2.0	0.14–0.18	8.5–>9.0	>15	Low	High	High.
85–95	60–75	25–35	5–10	0.6–2.0	0.13–0.17	>9.0	4–8	Moderate	High	High.
60–70	30–40	15–25	NP–5	2.0–6.0	0.10–0.13	>9.0	4–8	Low	High	High.
20–30	15–25	20–30	NP–5	0.6–2.0	0.05–0.07	8.5–9.0	<2	Low	Moderate	High.
55–65	35–45	15–25	NP	2.0–6.0	0.08–0.10	6.6–7.3	<2	Low	Moderate	High.
75–80	55–65	30–40	15–25	0.2–0.6	0.14–0.16	7.9–9.0	<2	Moderate	Moderate	High.
45–55	20–30	15–25	NP	2.0–6.0	0.07–0.08	8.5–9.0	<2	Low	Low	High.
20–30	5–15	15–20	NP	6.0–20	0.04–0.05	8.5–9.0	<2	Low	Low	High.
95–100	85–95	50–60	30–40	<0.06	0.15–0.17	>9.0	<8	High	High	High.

TABLE 8.—*Estimated soil properties*

Soil series and map symbols	Depth to—		Depth from surface	Dominant USDA texture	Classification		Coarse fraction greater than 3 inches	Percentage less than 3 inches passing sieve—	
	Hardpan or bedrock	Seasonal high water table			Unified	AASHTO		No. 4 (4.7 mm)	No. 10 (2.0 mm)
	Ft	*Ft*	*In*				*Pct*		
Ratto: RAC, RCD	[6] 1.0–1.6	>5	0–3	Gravelly fine sandy loam.	SM	A–2, A–4	0–10	75–85	70–80
			3–20	Gravelly clay	CL, CH	A–7	0–5	80–90	75–85
			20–34	Indurated hardpan.					
			34–60	Very gravelly sand.	GP–GM	A–1	0–5	25–35	15–25
*Ridit: RD For Alpha part, see Alpha series.	[6] 1.6–3.3	>5	0–15	Loam	CL–ML, CL	A–4	0–5	85–90	80–85
			15–31	Very gravelly loam.	GM	A–1	0–5	25–35	20–30
			31–34	Duripan.					
			34	Andestine bedrock.					
Rito	>5	>5	0–10	Gravelly loam	SM	A–4	0–5	70–80	65–75
			10–30	Very gravelly loam.	GM	A–2	0–5	45–55	40–50
			30–60	Very gravelly sandy loam.	GM	A–1	0–5	40–50	35–45
Roca	[4] 1.6–3.3	>5	0–4	Very stony loam	SM–SC, SM	A–4	5–20	65–75	60–70
			4–24	Gravelly clay	GC, CL, CH	A–7	0–5	60–70	55–65
			24–36	Weathered shale.					
Rock outcrop. Not rated.									
Rubyhill: RfA, RHC, RL	[6] 1.6–2.5	>5	0–4	Fine sandy loam	SM	A–4	0	100	85–100
			4–21	Loam or light clay loam.	CL	A–6	0	100	85–100
			21–50	Duripan.					
Sader: SA, SD	>5	[12] 3–5	0–5	Loam	CL, CL–ML	A–4	0	100	100
			5–34	Silty clay loam	CL	A–7	0	100	100
			34–60	Clay	CH	A–7	0	100	100
*Sheege: SE For Croesus part, see Croesus series.	[5] 0.8–1.6	>5	0–6	Very cobbly loam	GM	A–2, A–4	50–60	55–65	50–60
			6–17	Very gravelly fine sandy loam.	GM	A–1	10–20	35–45	30–40
			17	Limestone bedrock.					
Shipley: SfB, ShA, SMA	>5	[13] >5	0–18	Silt loam	ML	A–4	0	100	100
			18–60	Very fine sandy loam.	ML	A–4	0	100	100
SlA	>5	3.5–5.0	0–60	Silt loam	ML	A–4	0	100	100
*Shipley variant: Sn For Shipley part, see Shipley series, unit ShA.	>5	>5	0–32	Silt loam	ML	A–4	0	95–100	95–100
			32–60	Very gravelly loamy fine sand.	GP–GM	A–1	0–5	35–45	30–40
Silverado: SoA, SoB, SRD	>5	>5	0–13	Sandy loam	SM	A–2	0	70–80	65–75
			13–32	Gravelly sandy loam.	SM	A–1, A–2	0	65–75	60–70
			32–60	Gravelly coarse sand.	SP, SW	A–1	0–5	60–70	55–65

significant to engineering—Continued

Percentage less than 3 inches passing sieve—Cont.		Liquid limit	Plasticity index	Permeability	Available water capacity	Reaction	Salinity	Shrink-swell potential	Frost action potential	Corrosivity (untreated steel)
No. 40 (0.42 mm)	No. 200 (0.074 mm)									
		Pct		*In per hr*	*In per in of soil*	*pH*	*Mmhos per cm at 25° C*			
55–65	30–40	15–25	NP	2.0–6.0	0.08–0.10	6.6–7.3	<2	Low	Moderate	High.
70–80	60–70	45–55	25–35	0.06–0.2	0.15–0.17	6.6–7.3	<2	High	Moderate	High.
10–20	5–10	10–15	NP	>20	0.05–0.06	8.5–9.0	2–4	Low	Low	High.
65–75	50–60	20–30	5–10	0.6–2.0	0.15–0.17	6.6–7.3	<2	Low	High	High.
15–25	12–20	20–30	NP	0.6–2.0	0.05–0.06	7.9–9.0	<2	Low	Low	High.
55–65	40–50	20–30	NP–5	0.6–2.0	0.10–0.12	6.6–7.3	<2	Low	Moderate	High.
35–45	25–35	20–30	NP–5	0.6–2.0	0.06–0.08	6.6–7.3	<2	Low	Moderate	High.
20–30	12–15	15–25	NP	2.0–6.0	0.05–0.06	7.9–8.4	<2	Low	Low	High.
50–60	35–45	25–35	5–10	0.6–2.0	0.07–0.10	6.6–7.3	<2	Low	Moderate	High.
50–60	45–55	45–55	35–45	<0.06	0.13–0.15	6.6–7.3	<2	High	Moderate	High.
65–75	40–50	20–30	NP	2.0–6.0	0.11–0.13	6.6–7.3	<2	Low	High	High.
75–85	55–65	25–35	10–20	0.6–2.0	0.16–0.18	7.4–9.0	<2	Moderate	High	High.
85–95	60–75	25–35	5–10	0.6–2.0	0.15–0.17	8.5–9.0	4–8	Moderate	High	High.
95–100	85–95	40–50	15–25	0.2–0.6	0.17–0.18	8.5–>9.0	4–8	Moderate	High	High.
90–100	80–95	50–65	30–40	0.06–0.2	0.15–0.17	>9.0	2–4	High	Moderate	High.
45–55	30–40	20–30	NP	0.6–2.0	0.06–0.07	7.9–8.4	<2	Low	Moderate	High.
20–30	12–20	15–25	NP	2.0–6.0	0.05–0.06	7.9–8.4	<2	Low	Low	High.
90–100	75–85	30–40	0–5	0.6–2.0	0.13–0.18	7.9–9.0	<2	Low	High	High.
85–95	55–65	25–35	NP	0.6–2.0	0.15–0.17	8.5–9.0	2–4	Low	High	High.
90–100	75–85	30–40	0–5	0.6–2.0	0.17–0.18	>8.5	8–15	Low	High	High.
85–90	70–80	30–40	NP	0.6–2.0	0.17–0.18	8.5–9.0	<2	Low	High	High.
20–30	5–10	10–20	NP	6.0–20	0.05–0.06	8.5–9.0	<2	Low	Low	High.
40–50	25–35	15–25	NP	2.0–6.0	0.13–0.15	6.1–7.3	<2	Low	High	High.
35–45	20–30	15–25	NP	2.0–6.0	0.10–0.13	6.6–7.3	<2	Low	Moderate	High.
25–35	0–5	10–15	NP	>20	0.05–0.06	8.5–9.0	<2	Low	Low	High.

TABLE 8.—*Estimated soil properties*

Soil series and map symbols	Depth to—		Depth from surface	Dominant USDA texture	Classification		Coarse fraction greater than 3 inches	Percentage less than 3 inches passing sieve—	
	Hardpan or bedrock	Seasonal high water table			Unified	AASHTO		No. 4 (4.7 mm)	No. 10 (2.0 mm)
	Ft	*Ft*	*In*				*Pct*		
StA	>5	[7] >5	0–8	Silt loam	ML	A–4	0	100	100
			8–30	Gravelly sandy loam.	SM	A–1, A–2	0	65–75	60–70
			30–60	Gravelly coarse sand.	SP, SW	A–1	0–5	60–70	55–65
Siri: SUF	>5	>5	0–60	Very gravelly loam.	GM	A–1	0	30–40	25–35
Stampede: SVB	[6] 1.6–2.5	>5	0–10	Clay loam	CL	A–7	0	85–100	80–95
			10–23	Clay	CH	A–7	0	95–100	95–100
			23–50	Duripan.					
Tahquats: TAD	>5	>5	0–7	Stony loam	SM	A–4	5–15	75–85	70–80
			7–24	Gravelly clay loam.	CL	A–6	10–25	70–75	65–75
			24–60	Very gravelly clay loam.	GC	A–2	25–50	35–45	25–35
Tica: TCF, TK	[5] 0.8–1.6	>5	0–7	Very stony loam	GC, GM–GC	A–2	20–40	50–60	45–55
Rock outcrop part of TK not rated.			7–18	Very gravelly sandy clay loam and very gravelly clay.	[2] GC	A–2	5–10	35–45	25–35
			18	Andesite bedrock.					
Tonkin: Tn, To	>5	[14] >5	0–15	Loam	ML	A–4	0	100	100
			15–32	Sandy clay loam	SC	A–6	0	100	100
			32-60	Loamy fine sand	SM	A–2	0	100	100
Umil: UMB, US	[6] 0.5–1.5	>5	0–11	Loam	SM, ML	A–4	0–5	85–95	80–90
			11–60	Indurated hardpan and weakly cemented very gravelly fine sand.					
Vinsad: VN	>5	2.5–3.0	0–42	Very fine sandy loam.	ML	A–4	0	100	100
			42–60	Silty clay loam	CL	A–6, A–7	0	100	100

[1] NP means nonplastic.
[2] Classification and grading are for mixed material.
[3] The properties of the gravelly sandy loam component are described here. The silt loam component is the same as Ac, except for salinity, which is 8–15 mmhos per cm in the surface layer.
[4] Bedrock rippable with light equipment.
[5] Bedrock not rippable with light equipment.
[6] Hardpan not rippable with light equipment.
[7] Occasionally flooded.
[8] Rippable hardpan; depth to bedrock may be 40 to 60 inches.

significant to engineering—Continued

Percentage less than 3 inches passing sieve—Cont.		Liquid limit	Plasticity index	Permeability	Available water capacity	Reaction	Salinity	Shrink-swell potential	Frost action potential	Corrosivity (untreated steel)
No. 40 (0.42 mm)	No. 200 (0.074 mm)									
		Pct		*In per hr*	*In per in of soil*	*pH*	*Mmhos per cm at 25° C*			
85–90	70–80	25–35	0–5	0.6–2.0	0.17–0.18	6.1–7.3	<2	Low	High	High.
35–45	20–30	15–25	NP	2.0–6.0	0.10–0.13	6.6–7.3	<2	Low	Moderate	High.
25–35	0–5	10–15	NP	>20	0.05–0.07	8.5–9.0	<2	Low	Low	High.
20–30	15–25	20–30	0–5	0.6–2.0	0.06–0.07	7.9–9.0	<2	Low	Moderate	High.
75–85	65–75	40–50	25–30	0.2–0.6	0.17–0.18	6.1–7.3	<2	Moderate	High	High.
85–95	80–90	55–65	30–40	<0.06	0.15–0.17	6.1–7.3	<2	High	Moderate	High.
60–70	40–50	20–30	0–5	0.6–2.0	0.08–0.12	5.6–6.0	<2	Low	Moderate	High.
60–70	50–60	25–35	10–20	0.2–0.6	0.13–0.15	5.6–6.5	<2	Moderate	Moderate	High.
20–30	12–20	25–35	10–20	0.2–0.6	0.08–0.12	6.1–6.5	<2	Low	Low	High.
40–50	25–35	20–30	5–10	0.6–2.0	0.06–0.08	6.6–7.3	<2	Low	Moderate	High.
20–30	15–25	45–55	25–35	0.06–0.2	0.06–0.08	6.6–7.3	<2	Moderate	Moderate	High.
85–95	60–70	20–30	0–5	0.6–2.0	0.15–0.17	8.5–9.0	[15] 2–4	Low	High	High.
80–90	40–50	30–40	10–20	0.2–0.6	0.17–0.18	>9.0	2–4	Moderate	Moderate	High.
65–75	15–25	10–20	NP	6.0–20	0.08–0.10	>9.0	2–4	Low	Low	High.
65–75	45–55	25–35	0–5	2.0–6.0	0.13–0.15	6.6–8.4	<2	Low	High	High.
85–95	50–65	20–30	NP	0.6–2.0	0.13–0.15	6.6–7.3	>16	[16]Low	High	High.
95–100	85–95	35–45	15–25	0.06–0.2	0.17–0.18	7.9–8.4	>16	[16]Moderate	High	High.

[9] Hla and HNA rarely flooded, HmA occasionally flooded.
[10] Salinity is < 2 mmho per cm in 0–16 inch layer and 2–4 mmho per cm in 16–60 inch layer.
[11] Inermittently flooded. Water ponds on surface. Depth to water table varies from 1 foot to > 5 feet.
[12] SA and SD have ponded runoff; SD is subject to occasional flooding.
[13] SMA is subject to occasional flooding.
[14] Water table in To is at a depth of 3 to 5 feet.
[15] Salinity for To is 4 to 8 mmho per cm.
[16] Volume variation caused by sodium sulfate may be a hazard.

TABLE 9.—*Interpretations of*

[An asterisk in the first column indicates that at least one mapping unit in this series is made up of two or more kinds of soil. The instructions for referring to other series

Soil series and map symbols	Degree and kind of limitation for—						
	Septic tank absorption fields	Sewage lagoons	Shallow excavations	Dwellings without basements	Dwellings with basements	Sanitary landfill (trench type)	Sanitary landfill (area type)
*Alhambra: Ab, AbC, Ac, Ak, As — For Kobeh part of Ak, see Kobeh series. For Shipley and Shipley variant parts of As, see Shipley series, unit ShA, and Shipley variant.	Slight	Severe: seepage.	Severe: cutbanks cave.	Slight	Slight	Severe: too sandy.	Severe: seepage.
Ad	Moderate: percs slowly.	Moderate: seepage.	Slight	Severe: low strength.	Slight	Slight: in places sand and gravel below a depth of 5 feet.	Slight
Ah, Am — For Kobeh part of Am, see Kobeh series.	Slight	Severe: seepage.	Severe: cutbanks cave.	Severe: low strength.	Slight	Severe: too sandy.	Slight
Alpha	Moderate where slopes are 8 to 15 percent: percs slowly. Severe where slopes are 15 to 30 percent.	Severe: slope.	Moderate where slopes are 8 to 15 percent: depth to rock; too clayey. Severe where slopes are 15 to 30 percent.	Moderate where slopes are 8 to 15 percent. Severe where slopes are 15 to 30 percent.	Moderate where slopes are 8 to 15 percent: depth to rock. Severe where slopes are 15 to 30 percent.	Severe: depth to rock.	Moderate where slopes are 8 to 15 percent. Severe where slopes are 15 to 30 percent.
*Atrypa: AT, AY — For Hopeka part of AY, see Hopeka series.	Severe: depth to rock.	Severe: slope; depth to rock.	Moderate where slopes are 4 to 15 percent: depth to rock. Severe where slopes are 15 to 75 percent.	Slight where slopes are less than 8 percent. Moderate where slopes are 8 to 15 percent. Severe where slopes are 15 to 75 percent.	Moderate where slopes are less than 15 percent: depth to rock. Severe where slopes are 15 to 75 percent.	Severe: depth to rock.	Slight where slopes are less than 8 percent. Moderate where slopes are 8 to 15 percent. Severe where slopes are 15 to 75 percent.
Badland. Too variable to rate.							

engineering properties

soils in such mapping units may have different properties and limitations, and for this reason it is necessary to follow carefully the that appear in the first column of this table]

Degree and kind of limitation for—Cont.	Suitability as source of—			Soil features affecting—				Hydrologic group
Local roads and streets	Cover material for area landfill	Road fill	Sand and gravel	Embankments, dikes, and levees	Pond reservoir areas	Irrigation	Drainage for crops and pasture	
Moderate for Ab, AbC, Ak, As: potential frost action. Severe for Ac: potential frost action.	Fair: too sandy.	Good	Fair for sand: excess fines. Unsuitable for gravel.	Piping; seepage.	Seepage	Fast intake; droughty.	Cutbanks cave.	B
Severe: potential frost action.	Good	Fair: low strength; frost action.	Unsuitable for sand or gravel.	Piping; low strength; hard to pack.	Seepage	Favorable	Favorable	B
Severe: potential frost action.	Fair: too sandy.	Good	Fair for sand: excess fines. Unsuitable for gravel.	Piping; seepage.	Seepage	Fast intake; droughty.	Excess salt; cutbanks cave.	B
Severe: potential frost action.	Fair where slopes are 8 to 15 percent: too clayey. Poor where slopes are 15 to 30 percent.	Severe: potential frost action.	Unsuitable for sand or gravel.	Low strength; piping.	Slope	Slope	Depth to rock; slope.	C
Moderate where slopes are 4 to 8 percent: depth to rock. Severe where slopes are 8 to 75 percent.	Poor: thin layer.	Poor: thin layer.	Unsuited	Thin layer; low strength; piping.	Slope; depth to rock.	Slope; rooting depth.	Depth to rock; slope.	B

TABLE 9.—*Interpretations of*

Soil series and map symbols	Degree and kind of limitation for—						
	Septic tank absorption fields	Sewage lagoons	Shallow excavations	Dwellings without basements	Dwellings with basements	Sanitary landfill (trench type)	Sanitary landfill (area type)
*Bartine: BA, BC — For Siri part of BC and Overland part of BA, see their respective series.	Severe: slope; depth to rock.	Severe: slope; depth to rock.	Severe: depth to rock; slope.	Severe: depth to rock; slope.	Severe: slope; depth to rock.	Severe: depth to rock.	Severe: slope.
*Bicondoa: BD — For Dianev part, see Dianev series.	Severe: wet; percs slowly.	Severe: wet.	Severe: wet.	Severe: wet; shrink-swell potential.	Severe: wet; shrink-swell potential.	Severe: wet.	Severe: wet.
Bobs: BGD	Severe: cemented pan.	Severe: cemented pan; slope.	Severe: cemented pan.	Moderate: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Slight where slopes are less than 8 percent. Moderate where slopes are 8 to 15 percent.
*Bruffy: Br, Bs, Bu — For Kobeh part of Bu, see Kobeh series.	Severe: floods.	Severe: floods; seepage.	Severe: floods; cut-banks cave.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.
Credo: CfB, CgC	Slight	Severe: seepage.	Slight	Moderate: shrink-swell potential.	Moderate: shrink-swell potential.	Slight	Slight
*Croesus: CS — For Sheege part, see Sheege series.	Severe: slope; depth to rock.	Severe: slope; depth to rock.	Severe: slope; depth to rock.	Severe: slope.	Severe: slope; depth to rock.	Severe: slope; depth to rock.	Severe: slope.
Cyan: CY	Slight where slopes are 4 to 8 percent. Moderate where slopes are 8 to 15 percent. Severe where slopes are greater than 15 cent.	Severe: slope; seepage.	Slight where slopes are 4 to 8 percent. Moderate where slopes are 8 to 15 percent. Severe where slopes are greater than 15 percent.	Moderate where slopes are 4 to 15 percent: shrink-swell potential. Severe where slopes are greater than 15 percent.	Slight where slopes are 4 to 8 percent. Moderate where slopes are 8 to 15 percent. Severe where slopes are greater than 15 percent.	Slight where slopes are 4 to 15 percent. Moderate where slopes are 15 to 25 percent. Severe where slopes are greater than 25 percent.	Slight where slopes are 4 to 8 percent. Moderate where slopes are 8 to 15 percent. Severe where slopes are greater than 15 percent.

engineering properties—Continued

Degree and kind of limitation for—Cont.	Suitability as source of—			Soil features affecting—				Hydrologic group
Local roads and streets	Cover material for area landfill	Road fill	Sand and gravel	Embankments, dikes, and levees	Pond reservoir areas	Irrigation	Drainage for crops and pasture	
Severe: slope; depth to rock.	Poor: thin layer.	Poor: thin layer.	Unsuitable for sand. Poor for gravel: excess fines.	Thin layer; seepage.	Slope; depth to rock.	Slope; rooting depth; droughty.	Depth to rock; slope.	B
Severe: wet; shrink-swell potential.	Poor: wet; too clayey.	Poor: wet; shrink-swell potential.	Unsuited ----	Low strength; hard to pack; shrink-swell potential.	Favorable ---	Excess salt; wet; percs slowly.	Excess salt; wet; percs slowly.	C
Severe: cemented pan.	Poor: thin layer.	Poor: thin layer.	Unsuited ----	Thin layer --	Cemented pan; slope.	Slope; droughty; rooting depth.	Cemented pan; slope; percs slowly.	D
Severe: floods; frost action.	Poor: too sandy.	Fair: potential frost action.	Fair for sand: excess fines. Unsuitable for gravel.	Low strength.	Seepage -----	Excess salt --	Favorable.[1]	
Severe: potential frost action.	Fair: too clayey.	Fair: potential frost action.	Poor for sand: excess fines. Unsuitable for gravel.	Medium to low strength.	Seepage; slope.	Slope -------	Slope; percs slowly.	C
Severe: slope -	Poor: slope.	Poor: slope.	Unsuited ----	Thin layer --	Depth to rock; slope.	Slope; droughty; rooting depth.	Slope; depth to rock.	C
Moderate where slopes are 4 to 15 percent; potential frost action. Severe where slopes are greater than 15 percent.	Poor: small stones.	Slight where slopes are 4 to 15 percent. Moderate where slopes are 15 to 25 percent. Severe where slopes are greater than 25 percent.	Unsuited ----	Seepage ----	Slope; seepage.	Slope; droughty.	Slope -------	C

TABLE 9.—*Interpretations of*

Soil series and map symbols	Degree and kind of limitation for—						
	Septic tank absorption fields	Sewage lagoons	Shallow excavations	Dwellings without basements	Dwellings with basements	Sanitary landfill (trench type)	Sanitary landfill (area type)
Devoy: DC, DE Rock outcrop part of DC not rated.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Moderate where slopes are 8 to 15 percent: depth to rock. Severe where slopes are greater than 15 percent.	Severe: depth to rock.	Severe: depth to rock.	Moderate where slopes are 8 to 15 percent. Severe where slopes are greater than 15 percent.
Dianev: DN, DO	Severe: wet; percs slowly.	Slight	Severe: wet.	Moderate: shrink-swell potential; low strength.	Moderate: wet; shrink-swell potential; low strength.	Severe: wet.	Severe: wet.
Fairydell: FAE	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope; small stones.	Severe: slope.
*Fera: FR For Roca part, see Roca series.	Severe: slope; percs slowly; depth to rock.	Severe: slope; large stones; depth to rock.	Severe: slope; small and large stones.	Severe: slope.	Severe: slope.	Severe: depth to rock.	Severe: slope.
*Fusulina: FU For Sheege part, see Sheege series.	Severe: slope; depth to rock.	Severe: slope; depth to rock.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope; depth to rock.	Severe: slope.
Gabel: GAE, GB Badland part of GB too variable to rate.	Severe: slope; depth to rock.	Severe: slope; depth to rock.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: small stones.	Severe: slope.
Hamacer: HaA	Slight	Severe: seepage.	Severe: cutbanks cave.	Slight	Slight	Severe: too sandy.	Slight

engineering properties—Continued

Degree and kind of limitation for—Cont.	Suitability as source of—			Soil features affecting—				Hydrologic group
Local roads and streets	Cover material for area landfill	Road fill	Sand and gravel	Embankments, dikes, and levees	Pond reservoir areas	Irrigation	Drainage for crops and pasture	
Moderate where slopes are 8 to 15 percent: large stones. Severe where slopes are greater than 15 percent.	Poor: large stones.	Poor: thin layer.	Unsuited ----	Thin layer --	Slope; depth to rock.	Slope; droughty; rooting depth.	Depth to rock; slope.	D
Severe: potential frost action; low strength.	Fair: too clayey.	Poor: potential frost action; low strength.	Unsuited ----	Low strength; shrink-swell potential; hard to pack.	Favorable ---	Excess salt; wet; percs slowly.	Wet; excess salt; percs slowly.	D
Severe: slope.	Poor: small stones; slope.	Fair where slopes are less than 25 percent: potential frost action. Severe where slopes are greater than 25 percent.	Unsuitable for sand. Poor for gravel: excess fines.	Favorable ---	Slope; seepage.	Slope; droughty.	Slope -------	B
Severe: slope.	Poor: slope; small and large stones.	Fair where slopes are 15 to 25 percent: potential frost action. Severe where slopes are greater than 25 percent.	Unsuited ----	Thin layer --	Slope; depth to rock.	Slope -------	Slope; depth to rock; percs slowly.	D
Severe: slope.	Poor: slope; area reclaim; thin layer.	Poor: slope; thin layer.	Unsuited ----	Thin layer; low strength; piping.	Slope; depth to rock.	Slope; rooting depth.	Slope; depth to rock.	C
Severe: slope.	Poor: small stones.	Poor: thin layer.	Unsuited ----	Thin layer; seepage.	Slope; depth to rock.	Slope; rooting depth; droughty.	Slope; depth to rock; percs slowly.	C
Slight -------	Poor: too sandy.	Good -------	Poor for sand: excess fines. Unsuitable for gravel.	Seepage; piping.	Seepage ----	Droughty; percs rapidly; erodes easily.	Cutbanks cave.	A

TABLE 9.—*Interpretations of*

Soil series and map symbols	Degree and kind of limitation for—						
	Septic tank absorption fields	Sewage lagoons	Shallow excavations	Dwellings without basements	Dwellings with basements	Sanitary landfill (trench type)	Sanitary landfill (area type)
Handy: HDD	Severe: percs slowly.	Moderate where slopes are 4 to 7 percent. Severe where slopes are 7 to 15 percent.	Severe: too clayey.	Severe: shrink-swell potential.	Severe: shrink-swell potential.	Severe: too clayey.	Slight where slopes are 4 to 8 percent. Moderate where slopes are 8 to 15 percent.
*Hayeston: HE For Silverado part, see Silverado series.	Slight	Severe: seepage.	Severe: small stones; cutbanks cave.	Slight	Slight	Severe: small stones.	Slight
Holtle: HIA, HNB	Moderate: floods.	Severe: floods.	Moderate: floods.	Severe: floods.	Severe: floods.	Moderate: floods.	Moderate: floods.
HmA	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.
*Hopeka: HO, HS For Labshaft part of HO and Sheege part of HS, see their respective series.	Severe: depth to rock; slope.	Severe: depth to rock; slope.	Severe: depth to rock; slope.	Severe: depth to rock; slope.	Severe: depth to rock; slope.	Severe: depth to rock.	Severe: slope.
Hussa: HUB	Severe: wet.	Severe: wet	Moderate: wet; small stones.	Moderate: low strength.	Moderate: wet; low strength.	Severe: wet.	Moderate: wet.
Kobeh: KbA, KgA, KHB	Slight	Severe: seepage.	Moderate: small stones.	Slight	Slight	Severe: too sandy; small stones.	Slight
Kobeh variant: Km	Slight	Severe: seepage.	Severe: too sandy; cutbanks cave.	Slight	Slight	Moderate: too sandy.	Slight

engineering properties—Continued

Degree and kind of limitation for—Cont.	Suitability as source of—			Soil features affecting—				Hydrologic group
Local roads and streets	Cover material for area landfill	Road fill	Sand and gravel	Embankments, dikes, and levees	Pond reservoir areas	Irrigation	Drainage for crops and pasture	
Severe: shrink-swell potential.	Poor: too clayey.	Poor: shrink-swell potential.	Poor for sand: excess fines. Unsuitable for gravel.	Low strength; compressible.	Slope; seepage.	Slope; percs slowly.	Slope; percs slowly.	C
Moderate: potential frost action.	Fair: small stones; too sandy.	Fair: potential frost action.	Poor for sand: excess fines. Fair for gravel: excess fines.	Seepage	Slope; seepage.	Slope; droughty; percs rapidly.	Slope; cutbanks cave.	B
Severe: potential frost action.	Good	Poor: potential frost action.	Unsuited	Low strength; piping; compressible.	Favorable	Favorable	Floods	B
Severe: potential frost action.	Good	Poor: potential frost action.	Unsuited	Low strength; piping; compressible.	Slope	Favorable	Floods	B
Severe: depth to rock; slope.	Poor: thin layer; slope.	Poor: thin layer.	Unsuited	Thin layer; seepage.	Slope; depth to rock.	Slope; rooting depth; droughty.	Slope; depth to rock.	D
Severe: potential frost action.	Fair: too clayey.	Poor: low strength; potential frost action.	Unsuited	Low strength; piping; compressible.	Wet; slope greater than 2 percent.	Wet	Wet	C
Moderate: potential frost action.	Poor: too sandy; small stones.	Good	Poor for sand: excess fines. Fair for gravel: excess fines.	Seepage	Seepage	Droughty; percs rapidly.	Favorable	A
Moderate: potential frost action.	Fair: too sandy.	Good	Fair for sand: excess fines. Unsuitable for gravel.	Medium strength; seepage; piping.	Seepage	Droughty; percs rapidly.	Favorable	(1)

TABLE 9.—*Interpretations of*

Soil series and map symbols	Degree and kind of limitation for—						
	Septic tank absorption fields	Sewage lagoons	Shallow excavations	Dwellings without basements	Dwellings with basements	Sanitary landfill (trench type)	Sanitary landfill (area type)
*Labshaft: LAE, LAF, LK For Locane parts of LAE and LAF, see Locane series. Rock outcrop part of LK not rated.	Severe: slope; depth to rock.	Severe: slope; depth to rock.	Severe: slope; depth to rock.	Severe: slope; depth to rock.	Severe: slope; depth to rock.	Severe: depth to rock; slope.	Severe: slope.
Locane	Severe: slope; depth to rock.	Severe: slope; depth to rock.	Severe: slope; depth to rock.	Severe: slope; depth to rock.	Severe: slope; depth to rock.	Severe: depth to rock; slope.	Severe: slope.
*Lone: LmA, LnB, LR For Credo and Rito parts of LR, see their respective series.	Severe: cemented pan.	Severe: cemented pan; seepage.	Severe: cemented pan.	Moderate: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Slight
Mau: MAE	Severe: slope; depth to rock.	Severe: slope; depth to rock.	Severe: slope; depth to rock; small stones.	Severe: slope.	Severe: slope; depth to rock.	Severe: depth to rock; small stones.	Severe: slope.
*Nayped: NaB, NdA, NdB, NK For Kobeh part of NK, see Kobeh series.	Moderate: percs slowly.	Slight where slopes are less than 2 percent. Moderate where slopes are 2 to 4 percent.	Slight	Moderate: low strength.	Moderate: low strength.	Slight	Slight
Nevka: Ns	Severe: wet.	Severe: wet	Severe: wet.	Moderate: shrink-swell potential; low strength.	Moderate: wet.	Severe: wet.	Severe: wet.
Overland	Severe: depth to rock; slope.	Severe: slope; depth to rock.	Severe: slope; depth to rock; small stones.	Severe: slope.	Severe: slope; depth to rock.	Severe: depth to rock.	Severe: slope.
Pedoli: PeB	Slight	Severe: seepage.	Severe: small stones; cutbanks cave.	Slight	Slight	Severe: small stones; too sandy.	Slight
*Playas: PL, PS For Dianev part of PS, see Dianev series.	Severe: percs slowly; floods.	Severe: floods.	Severe: floods.[2]	Severe: shrink-swell potential; floods.	Severe: shrink-swell potential; floods.	Severe: too clayey; floods.	Severe: floods.

engineering properties—Continued

Degree and kind of limitation for—Cont.	Suitability as source of—			Soil features affecting—				Hydrologic group
Local roads and streets	Cover material for area landfill	Road fill	Sand and gravel	Embankments, dikes, and levees	Pond reservoir areas	Irrigation	Drainage for crops and pasture	
Severe: slope; depth to rock.	Poor: slope; large stones; thin layer.	Poor: thin layer; large stones.	Unsuited	Large stones; thin layer.	Slope; depth to rock.	Slope; rooting depth.	Slope; depth to rock.	D
Severe: slope; depth to rock.	Poor: slope; thin layer.	Poor: slope; thin layer.	Unsuited	Thin layer	Slope; depth to rock.	Slope; rooting depth.	Slope; depth to rock.	D
Moderate: cemented pan; potential frost action.	Poor: small stones; thin layer; too sandy.	Poor: thin layer.	Fair for sand: excess fines. Fair for gravel.	Thin layer; seepage.	Cemented pan; slope; seepage.	Rooting depth; droughty.	Cemented pan; slope.	B
Severe: slope.	Poor: slope; thin layer; small stones.	Poor: thin layer; slope.	Unsuited	Thin layer; large stones.	Slope; depth to rock.	Slope; rooting depth; droughty.	Slope; depth to rock; percs slowly.	D
Severe: potential frost action; low strength.	Good	Poor: potential frost action; low strength.	Unsuited	Low strength; piping; compressible.	Slope	Favorable	Slope; percs slowly.	C
Severe: potential frost action.	Good	Poor: potential frost action.	Unsuited	Compressible; low strength; piping.	Favorable	Wet; excess salt.	Wet; excess salt; potential frost action.	B
Severe: slope.	Poor: slope; small stones.	Severe: slope.	Unsuited	Thin layer; seepage.	Slope; depth to rock.	Slope; droughty; rooting depth.	Slope; depth to rock.	B
Moderate: potential frost action.	Poor: small stones; too sandy.	Moderate: potential frost action.	Poor for sand: excess fines. Fair for gravel: excess fines.	Seepage	Slope; seepage.	Slope; droughty.	Slope; percs slowly.	C
Severe: shrink-swell potential; floods.	Poor: too clayey.	Poor: shrink-swell potential; medium to low strength.	Unsuited	Shrink-swell potential; excess salt; unstable fill.	Favorable	Percs slowly; slow intake; excess salt.	Floods; excess salt; percs slowly; poor outlets.	(3)

TABLE 9.—*Interpretations of*

Soil series and map symbols	Degree and kind of limitation for—						
	Septic tank absorption fields	Sewage lagoons	Shallow excavations	Dwellings without basements	Dwellings with basements	Sanitary landfill (trench type)	Sanitary landfill (area type)
Ratto: RAC, RCD	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan; seepage.	Slight where slopes are less than 8 percent. Moderate where slopes are 8 to 15 percent.
*Ridit: RD For Alpha part of RD, see Alpha series.	Severe: depth to rock; cemented pan.	Severe: cemented pan; slope; depth to rock.	Severe: cemented pan; small stones; depth to rock.	Moderate where slopes are 8 to 15 percent. Severe where slopes are greater than 15 percent.	Severe: cemented pan; depth to rock.	Severe: depth to rock; cemented pan.	Moderate where slopes are 8 to 15 percent. Severe where slopes are greater than 15 percent.
Rito	Slight	Severe: seepage.	Severe: too sandy; small stones; cutbanks cave.	Slight	Slight	Severe: too sandy; small stones.	Slight
Roca	Severe: slope; percs slowly; depth to rock.	Severe: slope; depth to rock.	Severe: slope; large stones; too clayey; depth to rock.	Severe: slope; shrink-swell potential.	Severe: slope; shrink-swell potential.	Severe: depth to rock.	Severe: slope.
Rock outcrop. Not rated.							
Rubyhill: Rfa, RHC, RL	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Moderate: shrink-swell potential; cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Slight
Sader: SA, SD	Severe: percs slowly; floods; wet.	Severe: floods; wet.	Severe: too clayey; floods; wet.	Severe: floods.	Severe: shrink-swell potential; floods.	Severe: wet; floods; too clayey.	Severe: floods.
*Sheege: SE For Croesus part, see Croesus series.	Severe: slope; depth to rock.	Severe: slope; depth to rock.	Severe: slope; depth to rock.	Severe: slope; depth to rock.	Severe: slope; depth to rock.	Severe: slope; depth to rock.	Severe: slope.
Shipley: SfB	Moderate: percs slowly.	Moderate: seepage.	Slight	Moderate: low strength.	Moderate: low strength.	Slight	Slight

engineering properties—Continued

Degree and kind of limitation for—Cont.	Suitability as source of—			Soil features affecting—				Hydrologic group
Local roads and streets	Cover material for area landfill	Road fill	Sand and gravel	Embankments, dikes, and levees	Pond reservoir areas	Irrigation	Drainage for crops and pasture	
Severe: shrink-swell potential; cemented pan.	Poor: thin layer; too clayey.	Poor: thin layer; shrink-swell potential.	Poor for sand: excess fines. Fair for gravel: excess fines.[3]	Shrink-swell potential; thin layer; low strength.	Slope; cemented pan; seepage.	Rooting depth; slope; percs slowly.	Slope; cemented pan; percs slowly.	D
Moderate where slopes are less than 15 percent: depth to rock; cemented pan. Severe where slopes are greater than 15 percent.	Poor: thin layer; small stones.	Poor: thin layer.	Unsuited ----	Thin layer; seepage.	Slope; cemented pan; depth to rock.	Slope; rooting depth; droughty.	Slope; cemented pan; depth to rock.	C
Moderate: potential frost action.	Poor: small stones.	Poor: thin layer; area reclaimed.	Unsuited ----	Thin layer; seepage.	Slope; cemented pan; seepage.	Slope; rooting depth; droughty.	Slope; cemented pan.	B
Severe: slope; shrink-swell potential.	Poor: thin layer; too clayey; slope; large stones.	Poor: thin layer; shrink-swell potential; slope.	Unsuited ----	Thin layer; shrink-swell potential; unstable fill.	Slope; depth to rock.	Slope; rooting depth; percs slowly.	Slope; percs slowly; depth to rock.	D
Severe: potential frost action.	Poor: thin layer.	Poor: thin layer; potential frost action.	Unsuited ----	Thin layer; low strength; compressible.	Slope; cemented pan.	Slope; cemented pan; rooting depth.	Slope; cemented pan.	B
Severe: floods; potential frost action.	Poor: too clayey.	Poor: shrink-swell potential; low strength; potential frost action.	Unsuited ----	Shrink-swell potential; unstable fill; excess salts.	Favorable ---	Slow intake; percs slowly; excess salts; wet; floods.	Wet; percs slowly; excess salts; floods.	D
Severe: slope; depth to rock.	Poor: thin layer; slope.	Poor: thin layer; slope.	Unsuited ----	Thin layer; seepage.	Slope; depth to rock.	Slope; rooting depth; droughty.	Slope; depth to rock.	D
Severe: potential frost action.	Good -------	Poor: potential frost action.	Unsuited ----	Low strength; piping; compressible.	Slope -------	Slope -------	Slope -------	C

TABLE 9.—*Interpretations of*

Soil series and map symbols	Degree and kind of limitation for—						
	Septic tank absorption fields	Sewage lagoons	Shallow excavations	Dwellings without basements	Dwellings with basements	Sanitary landfill (trench type)	Sanitary landfill (area type)
ShA	Moderate: percs slowly.	Moderate: seepage.	Slight	Moderate: low strength.	Moderate: low strength.	Slight	Slight
SlA	Moderate: percs slowly.	Moderate: seepage.	Moderate: wet.	Moderate: low strength.	Moderate: low strength.	Severe: wet.	Slight
SMA	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.
*Shipley variant: Sn. For Shipley part, see Shipley series, unit ShA.	Slight	Severe: seepage.	Severe: too sandy; cutbanks cave.	Moderate: low strength.	Slight	Severe: too sandy.	Slight
Silverado: SoA, SoB, SRD	Slight where slopes are 0 to 8 percent. Moderate where slopes are 8 to 15 percent.	Severe: seepage.	Severe: too sandy; cutbanks cave; small stones.	Slight where slopes are 0 to 8 percent. Moderate where slopes are 8 to 15 percent.	Slight where slopes are 0 to 8 percent. Moderate where slopes are 8 to 15 percent.	Severe: too sandy; small stones; seepage.	Slight where slopes are 0 to 8 percent. Moderate where slopes are 8 to 15 percent.
StA	Severe: floods.	Severe: seepage; floods.	Severe: too sandy; cutbanks cave; small stones; floods.	Severe: floods.	Severe: floods.	Severe: too sandy; small stones; seepage; floods.	Severe: floods.
Siri: SUF	Severe: slope.	Severe: slope.	Severe: slope; small stones.	Severe: slope.	Severe: slope.	Severe: slope; small stones.	Severe: slope.
Stampede: SVB	Severe: cemented pan; percs slowly.	Severe: cemented pan.	Severe: too clayey; cemented pan.	Severe: shrink-swell potential.	Severe: shrink-swell potential; cemented pan.	Severe: too clayey; cemented pan.	Slight

engineering properties—Continued

Degree and kind of limitation for—Cont.	Suitability as source of—			Soil features affecting—				Hydrologic group
Local roads and streets	Cover material for area landfill	Road fill	Sand and gravel	Embankments, dikes, and levees	Pond reservoir areas	Irrigation	Drainage for crops and pasture	
Severe: potential frost action.	Good	Poor: potential frost action.	Unsuited	Low strength; piping; compressible.	Favorable	Favorable	Favorable	C
Severe: potential frost action.	Good	Poor: potential frost action.	Unsuited	Low strength; piping; compressible; excess salts.	Favorable	Wet: excess salts.	Wet: excess salts.	C
Severe: floods.	Good	Poor: potential frost action.	Unsuited	Low strength; piping; compressible; floods.	Favorable	Floods	Floods	C
Severe: potential frost action; low strength.	Good	Fair: potential frost action.	Poor for sand: excess fines. Fair for gravel: excess fines.	Low strength; piping; compressible.	Seepage	Droughty	Cutbanks cave.	(1)
Slight where slopes are 0 to 8 percent. Moderate where slopes are 8 to 15 percent.	Poor: too sandy; small stones.	Good	Poor for sand: excess fines. Fair for gravel: excess fines.	Seepage; hard to pack.	Slope; seepage.	Slope; percs rapidly; droughty.	Slope	B
Severe: floods.	Poor: too sandy; small stones.	Good	Poor for sand: excess fines. Fair for gravel: excess fines.	Seepage; hard to pack.	Seepage	Floods; droughty; percs rapidly.	Floods	B
Severe: slope.	Poor: slope; small stones.	Poor: slope.	Unsuitable for sand. Poor for gravel.	Seepage; hard to pack.	Slope; seepage.	Slope; droughty.	Slope	B
Severe: shrink-swell potential; low strength.	Poor: too clayey; thin layer.	Poor: thin layer; shrink-swell potential; area reclaim.	Unsuited	Shrink-swell potential; thin layer.	Slope; cemented pan.	Slope; percs slowly; rooting depth.	Slope; cemented pan; percs slowly.	D

TABLE 9.—*Interpretations of*

Soil series and map symbols	Degree and kind of limitation for—						
	Septic tank absorption fields	Sewage lagoons	Shallow excavations	Dwellings without basements	Dwellings with basements	Sanitary landfill (trench type)	Sanitary landfill (area type)
Tahquats: TAD	Severe: percs slowly.	Moderate where slopes are 4 to 7 percent. Severe where slopes are 7 to 15 percent.	Severe: too clayey; small stones.	Moderate: shrink-swell potential.	Moderate: shrink-swell potential.	Severe: too clayey; small stones.	Slight where slopes are less than 8 percent. Moderate where slopes are 8 to 15 percent.
Tica: TCF, TK Rock outcrop part of TK not rated.	Severe: slope; depth to rock.	Severe: slope; depth to rock.	Severe: slope; depth to rock.	Severe: slope; depth to rock.	Severe: slope; depth to rock.	Severe: slope; depth to rock.	Severe: slope.
Tonkin:							
Tn	Moderate: percs slowly.	Moderate: seepage.	Severe: too sandy; cutbanks cave.	Moderate: shrink-swell potential.	Moderate: shrink-swell potential.	Severe: too sandy.	Slight
To	Severe: wet.	Severe: wet.	Severe: too sandy; cutbanks cave.	Moderate: shrink-swell potential.	Moderate: shrink-swell potential; wet.	Severe: too sandy; wet.	Moderate: wet.
Umil: UMB, US	Severe: cemented pan.	Severe: cemented pan	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Slight where slopes are 2 to 8 percent. Moderate where slopes are 8 to 15 percent. Severe where slopes are 15 to 50 percent.
Vinsad: VN	Severe: wet.	Severe: wet.	Severe: wet.	Severe: low strength; potential frost action.	Severe: low strength; potential frost action.	Severe: wet.	Moderate: wet.

[1] Not placed in a hydrologic group.
[2] Slight limitation if protected from flooding.

generally favorable for the rated use, or in other words, limitations that are minor and easily overcome. *Moderate* means that some soil properties are unfavorable but can be overcome or modified by special planning and design. *Severe* means soil properties so unfavorable and so difficult to correct or overcome as to require major soil reclamation, special designs, or intensive maintenance.

Soil suitability is rated by the terms *good, fair,* and *poor,* which have, respectively, meanings approximately parallel to the terms slight, moderate, and severe.

Following are explanations of some of the columns in table 9.

Septic tank absorption fields are subsurface systems of tile or perforated pipe that distribute effluent from

engineering properties—Continued

Degree and kind of limitation for—Cont.	Suitability as source of—			Soil features affecting—				Hydrologic group
Local roads and streets	Cover material for area landfill	Road fill	Sand and gravel	Embankments, dikes, and levees	Pond reservoir areas	Irrigation	Drainage for crops and pasture	
Moderate: frost action.	Poor: too clayey; small stones.	Fair: shrink-swell potential.	Unsuited ----	Favorable ---	Slope -------	Slope -------	Slope: percs slowly.	C
Severe: slopes; depth to rock.	Poor: thin layer.	Poor: slope; thin layer.	Unsuited ----	Thin layer; large stones.	Slope; depth to rock.	Slope; rooting depth.	Slope; depth to rock.	D
Severe: potential frost action.	Poor: too sandy.	Fair: potential frost action.	Fair for sand: excess fines. Unsuitable for gravel.	Favorable ---	Seepage ----	Percs rapidly; droughty.	Cutbanks cave; excess salts.	B
Severe: potential frost action.	Poor: too sandy.	Fair: potential frost action.	Fair for sand: excess fines. Unsuitable for gravel.	Favorable ---	Seepage ----	Percs rapidly; droughty; wet; excess salts.	Cutbanks cave; excess salts.	B
Severe: cemented pan.	Poor: thin layer.	Poor: thin layer.	Unsuited ----	Thin layer; low strength; compressible; piping.	Slope; cemented pan.	Slope; rooting depth.	Slope; cemented pan.	D
Severe: potential frost action; low strength.	Fair: too clayey.	Poor: potential frost action; low strength; wet.	Unsuited ----	Excess salts; low strength; compressible; piping; unstable fill.	Favorable ---	Excess salts; percs slowly; wet.	Percs slowly; excess salts; poor outlets.	C

[3] Located below hardpan.

a septic tank into natural soil. The soil material between depths of 18 inches and 6 feet is evaluated. The soil properties considered are those that affect both absorption of effluent and construction and operation of the system. Properties that affect absorption are permeability, depth of water table or rock, and susceptibility to flooding. Slope affects difficulty of layout and construction, and also the risk of soil erosion, lateral seepage, and downslope flow of effluent. Large rocks or boulders increase construction costs. Soils that have moderately slow permeability are rated as moderate in consideration of the semiarid climate. Ratings assume a tile depth of 2 feet.

Sewage lagoons are shallow ponds constructed to hold sewage within a depth of 2 to 5 feet long enough for bacteria to decompose the solids. A lagoon has a

nearly level floor surrounded by embankments of compacted soil material. The assumption is made that the embankment is compacted to medium density and the pond is protected from flooding. Properties are considered that affect the pond floor and the embankment. Those that affect the pond floor are permeability, organic matter, and slope, and if the floor needs to be leveled, depth to bedrock becomes important. The soil properties that affect the embankment are the engineering properties of the embankment material as interpreted from the Unified soil classification, and the amounts of stones, if any, which influences the ease of excavation and compaction of the embankment material.

Shallow excavations are those that require digging or trenching to a depth of less than 6 feet; as for example, excavations for pipelines, sewerlines, telephone and power transmission lines, basements, open ditches, and cemeteries. Desirable soil properties are good workability, moderate resistance to sloughing, gentle slopes, absence of rock outcrops or lug stones, and freedom from flooding or a high water table.

Dwellings as rated in table 9 are not more than three stories high and are supported by foundation footings placed in undisturbed soil at a depth of at least 2 feet. The features that affect the rating of a soil for dwellings are those that relate to capacity to support load and resist settlement under load, and those that relate to ease of excavation. Soil properties that affect capacity to support load are wetness, susceptibility to flooding, density, plasticity, texture, and shrink-swell potential. Those that affect excavation are wetness, slope, depth to bedrock, and content of stones and rocks. Frost action is not considered as a criterion in table 9 except on wet soils. (For slab structures, see frost action potential in table 8.)

Sanitary landfill is a method of disposing of refuse. The waste is spread in thin layers, compacted, and covered with soil throughout the disposal period. Landfill areas are subject to heavy vehicular traffic. Some soil properties that affect suitability for landfill are ease of excavation, hazard of polluting ground water, and trafficability. The best soils have moderately slow permeability, withstand heavy traffic, and are friable and easy to excavate. Permeability, however, is not considered as a criterion in table 9, because of the semiarid climate. Unless otherwise stated the ratings apply only to a depth of about 6 feet, and therefore limitation ratings of *slight* or *moderate* may not be valid if trenches are to be much deeper than that. For some soils, reliable predictions can be made to a depth of 10 to 15 feet; but regardless of that, every site should be investigated before it is selected.

Local roads and streets have an all-weather surface expected to carry automobile traffic all year. They have a subgrade of underlying soil material; a base of gravel, crushed rock, or soil material stabilized with lime or cement; and a flexible or rigid surface, commonly of asphalt or concrete. These roads are graded to shed water and have ordinary provisions for drainage. They are built mainly from soil at hand, and most cuts and fills are less than 6 feet deep.

Soil properties that most affect design and construction of roads and streets are load supporting capacity and stability of the subgrade and the workability and quantity of cut and fill material available. The AASHTO and Unified classifications of the soil material, and also the shrink-swell potential, indicate traffic supporting capacity. Wetness and flooding affect stability of the material. Slope, depth to hard rock, content of stones and rocks, and wetness affect ease of excavation and amount of cut and fill needed to reach an even grade. Ratings for roads and streets in table 9 assume that the upper 12 inches of the soil has been removed.

Cover for area landfill should be soil that is easy to excavate and spread over the compacted fill during both wet and dry weather. Soils that are loamy or silty and free of stones or boulders are better suited than other soils. Clayey soils may be sticky and difficult to spread; sandy soils may be subject to soil blowing.

In addition to these features, the soils selected for final cover of landfills should be suitable for growing plants. In comparison with other horizons, the A horizon in most soils has the best workability, more organic matter, and the best potential for growing plants. Thus stockpiling material from the A horizon for use as the surface layer of the final cover is desirable.

Where it is necessary to bring in soil material for daily or final cover, thickness of suitable material and depth to a seasonal high water table in soils surrounding the sites should be evaluated. Other factors to be evaluated are those that affect reclamation of the borrow areas, such as slope, erodibility, and potential for plant growth.

Road fill is soil material used in embankments for roads. The suitability ratings reflect (1) the predicted performance of soil after it has been placed in an embankment that has been properly compacted and provided with adequate drainage and (2) the relative ease of excavating the material at borrow areas.

Sand and gravel are used in great quantities in many kinds of construction. The ratings in table 9 provide guidance about where to look for probable sources. A soil rated as a *good* or *fair* source of sand or gravel generally has a layer at least 3 feet thick, the top of which is within a depth of 6 feet. The ratings do not take into account thickness of overburden, location of the water table, or other factors that affect mining of the materials, nor do they indicate quality of the deposit.

Embankments, dikes, and levees require soil material resistant to seepage and piping and of favorable stability, shrink-swell potential, shear strength, and compactibility. Stones or organic material in a soil are among factors that are unfavorable.

Pond reservoir areas hold water behind a dam or embankment. Soils suitable for pond reservoir areas have low seepage, which is related to their permeability and depth to fractured or permeable bedrock or other permeable material.

Irrigation of a soil is affected by such features as slope, susceptibility to stream overflow, water erosion or soil blowing, soil texture, content of stones, accumulations of salts and alkali, depth of root zone, rate of water intake at the surface, permeability of soil layers below the surface layer and in fragipans or other layers that restrict movement of water, amount of water held available to plants, need for drainage, and depth to water table or bedrock.

Drainage for crops and pasture is affected by such soil properties as permeability, texture, structure, depth to a claypan or other layer that influences rate of water movement, depth to the water table, slope, stability of ditchbanks, susceptibility to flooding, salinity and alkalinity, and availability of outlets for drainage.

Soil hydrologic groups

Information about runoff is essential to flood-control planning. In an engineering handbook (*8*) developed by hydrologists of the Soil Conservation Service, the Forest Service, and other agencies, the major soils of the United States have been placed in four hydrologic groups. These groups are based on intake of water at the end of long-duration storms, after prior wetting and opportunity for swelling, with consideration of the protective effects of vegetation. The criteria for the four groups are as follows:

Group A soils have high infiltration rates even when thoroughly wetted. These soils consist mainly of deep, well drained to excessively drained sand or gravel, or both. They have a high rate of water transmission and a low runoff potential.

Group B soils have moderate infiltration rates when thoroughly wetted. These soils are mainly moderately deep to deep, moderately well drained to well drained, and moderately fine textured to moderately coarse textured. They have a moderate rate of water transmission.

Group C soils have slow infiltration rates when thoroughly wetted. These soils consist mainly of soils that have a layer that impedes the downward movement of water or soils that have moderately fine to fine texture and a slow infiltration rate. They have a slow rate of water transmission.

Group D soils have very slow infiltration rates when thoroughly wetted. These soils are chiefly clayey soils that have a high swelling potential, soils that have a high permanent water table, or soils that have a claypan or clay layer at or over nearly impervious material. They have a very slow rate of water transmission.

Recreation

Knowledge of soils is necessary in planning, developing, and maintaining areas used for recreation. In table 10 the soils of Diamond Valley Area are rated according to limitations that affect their suitability for camp areas, paths and trails, picnic areas, and playgrounds.

The soils are rated as having slight, moderate, or severe limitations for the specified uses. For all of these ratings, it is assumed that a good cover of vegetation can be established and maintained. A limitation of *slight* means that soil properties are generally favorable and limitations are so minor that they easily can be overcome. A *moderate* limitation can be overcome or modified by planning, by design, or by special maintenance. A *severe* limitation means that costly soil reclamation, special design, intense maintenance, or a combination of these is required.

Camp areas are used intensively for tents and small camp trailers and the accompanying activities of outdoor living. Little preparation of the site is required, other than shaping and leveling for tent and parking areas. Camp areas are subject to heavy foot traffic and limited vehicular traffic. The best soils have mild slopes, good drainage, a surface free of rocks and coarse fragments, freedom from flooding during periods of heavy use, and a surface that is firm after rains but not dusty when dry.

Paths and trails are used for local and cross-country travel by foot or horseback. Design and layout should require little or no cutting and filling. The best soils are at least moderately well drained, are firm when wet but not dusty when dry, are flooded not more than once during the season of use, have slopes of less than 15 percent, and have few or no rocks or stones on the surface.

Picnic areas are attractive natural or landscaped tracts used mainly for preparing meals and eating outdoors. These areas are subject to heavy foot traffic. Most of the vehicular traffic, however, is confined to access roads. The best soils are firm when wet but not dusty when dry, are free of flooding during the season of use, and do not have slopes or stoniness that greatly increase cost of leveling sites or of building access roads.

Playgrounds are areas used intensively for baseball, football, badminton, and similar organized games. Soils suitable for this use need to withstand intensive foot traffic. The best soils have a nearly level surface free of coarse fragments and rock outcrops, good drainage, freedom from flooding during periods of heavy use, and a surface that is firm after rains but not dusty when dry. If grading and leveling are required, depth to rock is important.

Additional interpretations of soils pertinent to recreation site facilities, such as septic tanks, roads, and foundations for low buildings, are in table 9.

Suitability of the soils for vegetation is not a part of these recreation interpretations but is an important item in the final evaluation and selection of a recreation site.

Formation and Classification of the Soils

In this section factors that have affected the formation and classification of the soils in the Diamond Valley Area are discussed. The morphological characteristics are presented, and the soils are classified into higher categories according to the soil taxonomy now in use in the United States.

Factors of Soil Formation

The factors that determine the kind of soil that forms at any given point are the composition of the rocks that furnish the parent material, the climate under which the soil formed, the relief and drainage, the plants and animals on and in the soil, and the length of time that the other factors have operated.

The parent material affects the kind of profile that forms and in extreme cases determines it almost entirely. Climate and the organisms that grow in and on the soil are the active factors of soil development. They

TABLE 10.—*Interpretations of soil properties for recreation*

[An asterisk in the first column indicates that at least one mapping unit in this series is made up of two or more kinds of soil. The soils in such mapping units may have different properties and limitations, and for this reason it is necessary to follow carefully the instructions for referring to other series that appear in the first column of this table]

Soil series and map symbol	Degree and kind of limitation for—			
	Camp areas	Paths and trails	Picnic areas	Playgrounds
*Alhambra: Ab, Abc, Ak, As — For Kobeh part of Ak, see Kobeh series. For Shipley part of As, see Shipley series, unit ShA. For Shipley variant part of Ak, see Shipley variant.	Moderate: fine sandy loam surface layer; dusty.	Moderate: fine sandy loam surface layer; dusty.	Moderate: fine sandy loam surface layer; dusty.	Moderate: fine sandy loam surface layer; dusty.
Ac, Ad	Moderate: silt loam surface layer; dusty.	None to slight	Moderate: silt loam surface layer; dusty.	Moderate: silt loam surface layer; dusty.
Ah	Severe: silt loam surface layer; strongly saline-alkali; dusty.	Severe: silt loam surface layer; strongly saline-alkali; dusty.	Severe: silt loam surface layer; strongly saline-alkali; dusty.	Severe: silt loam surface layer; strongly saline-alkali; dusty.
Am — For Kobeh part, see Kobeh series.	Severe: fine sandy loam surface layer; moderately saline-alkali; dusty.	Severe: fine sandy loam surface layer; moderately saline-alkali; dusty.	Severe: fine sandy loam surface layer; moderately saline-alkali; dusty.	Severe: fine sandy loam surface layer; moderately saline-alkali; dusty.
Alpha	Moderate where slopes are 8 to 15 percent. Severe where slopes are greater than 15 percent.	None to slight where slopes are 8 to 15 percent. Moderate where slopes are 15 to 25 percent. Severe where slopes are greater than 25 percent.	Moderate where slopes are 8 to 15 percent. Severe where slopes are greater than 15 percent.	Severe: slope.
*Atrypa: AT, AY — For Hopeka part of AY, see Hopeka series.	None to slight where slopes are 4 to 8 percent. Moderate where slopes are 8 to 15 percent. Severe where slopes are greater than 15 percent.	None to slight where slopes are 4 to 15 percent. Moderate where slopes are 15 to 25 percent. Severe where slopes are greater than 25 percent.	None to slight where slopes are 4 to 8 percent. Moderate where slopes are 8 to 15 percent. Severe where slopes are greater than 15 percent.	Moderate where slopes are 4 to 6 percent. Severe where slopes are greater than 6 percent.
Badland. Too variable to rate.				
*Bartine: BA, BC — For Overland part of BA and Siri part of BC, see their respective series.	Severe: slope	Moderate where slopes are 15 to 25 percent. Severe where slopes are greater than 25 percent.	Severe: slope	Severe: slope.
*Bicondoa: BD — For Dianev part, see Dianev series, unit DO.	Severe: poorly drained; water table at a depth of 0 to 2 feet.	Severe: poorly drained; water table at a depth of 0 to 2 feet.	Severe: poorly drained; water table at a depth of 0 to 2 feet.	Severe: poorly drained; water table at a depth of 0 to 2 feet.
Bobs: BGD	Moderate: coarse fragments on surface.	Moderate: coarse fragments on surface.	Moderate: coarse fragments on surface.	Severe: slope; coarse fragments on surface; hard pan at a depth of less than 20 inches.
*Bruffy: Br, Bs, Bu — For Kobeh part of Bu, see Kobeh series.	Moderate: occasional overflow.	None to slight	None to slight	Moderate: occasional overflow.

TABLE 10.—*Interpretations of soil properties for recreation*—Continued

Soil series and map symbol	Degree and kind of limitation for—			
	Camp areas	Paths and trails	Picnic areas	Playgrounds
Credo:				
CfB	None to slight	None to slight	None to slight	Moderate: moderately slow permeability; slopes are 2 to 4 percent; dusty.
CgC	Moderate: coarse fragments on surface.	Moderate: coarse fragments on surface.	Moderate: coarse fragments on surface.	Severe: coarse fragments on surface.
*Croesus: CS For Sheege part, see Sheege series.	Severe: slope	Severe: slope	Severe: slope	Severe: slope.
Cyan: CY	Severe: more than 50 percent coarse fragments on surface.	Severe: more than 50 percent coarse fragments on surface.	Severe: more than 50 percent coarse fragments on surface.	Severe: more than 20 percent coarse fragments on surface.
Devoy:				
DC Rock outcrop part not rated.	Severe: more than 50 percent coarse fragments on surface.	Severe: more than 50 percent coarse fragments on surface.	Severe: more than 50 percent coarse fragments on surface.	
DE	Moderate where slopes are less than 15 percent: 20 to 50 percent coarse fragments on surface. Severe where slopes are greater than 15 percent.	Moderate where slopes are less than 25 percent: 20 to 50 percent coarse fragments on surface. Severe where slopes are greater than 25 percent.	Moderate where slopes are less than 15 percent: 20 to 50 percent coarse fragments on surface. Severe where slopes are greater than 15 percent.	Severe: more than 20 percent coarse fragments on surface; slope.
Dianev:				
DN	Moderate: moderately slow permeability; clay loam surface; moderately well drained.	Moderate: clay loam surface.	Moderate: clay loam surface; moderately well drained.	Moderate: moderately well drained; moderately slow permeability; clay loam surface.
DO	Severe: silty clay loam surface layer; strongly saline-alkali; dusty.	Severe: silty clay loam surface layer; strongly saline-alkali; dusty.	Severe: silty clay loam surface layer; strongly saline-alkali; dusty.	Severe: silty clay loam surface layer; strongly saline-alkali; dusty.
Fairydell: FAE	Severe: slope	Moderate where slopes are less than 25 percent: 20 to 50 percent coarse fragments on surface. Severe where slopes are greater than 25 percent.	Severe: slope	Severe: slope; more than 20 percent coarse fragments on surface.
*Fera: FR For Roca part, see Roca series.	Severe: slope; more than 50 percent coarse fragments on surface.	Severe: more than 50 percent coarse fragments on surface.	Severe: slope; more than 50 percent coarse fragments on surface.	Severe: slope; more than 20 percent coarse fragments on surface.
*Fusulina: FU For Sheege part, see Sheege series.	Severe: slope; more than 50 percent coarse fragments on surface.	Severe: slope; more than 50 percent coarse fragments on surface.	Severe: slope; more than 50 percent coarse fragments on surface.	Severe: slope; more than 20 percent coarse fragments on surface.
Gabel: GAE, GB Badland part of GB too variable to rate.	Severe: slope	Moderate where slopes are 15 to 25 percent; 20 to 50 percent coarse fragments on surface. Severe where slopes are greater than 25 percent.	Severe: slope	Severe: slope; more than 20 percent coarse fragments on surface.

TABLE 10.—*Interpretations of soil properties for recreation*—Continued

Soil series and map symbol	Degree and kind of limitation for—			
	Camp areas	Paths and trails	Picnic areas	Playgrounds
Hamacer: HaA	Moderate: loamy fine sand surface layer; dusty.	Moderate: loamy fine sand surface layer; dusty.	Moderate: loamy fine sand surface layer; dusty.	Moderate: loamy fine sand surface layer; dusty.
Handy: HDD	Moderate: slowly permeable; 20 to 50 percent coarse fragments on surface.	Moderate: slowly permeable; 20 to 50 percent coarse fragments on surface.	Moderate: 20 percent coarse fragments on surface.	Severe: more than 20 percent coarse fragments on surface.
*Hayeston: HE For Silverado part, see Silverado series.	Moderate: 20 to 50 percent coarse fragments on surface.	Moderate: 20 to 50 percent coarse fragments on surface.	Moderate: 20 to 50 percent coarse fragments on surface.	Severe: more than 20 percent coarse fragments on surface.
Holtle: HlA, HNB	None to slight	None to slight	None to slight	None to slight.
HmA	Moderate: occasional flooding.	None to slight	None to slight	Moderate: occasional flooding.
*Hopeka: HO, HS For Labshaft part of HO and Sheege part of HS, see their respective series.	Severe: slope; more than 50 percent coarse fragments on surface.	Severe: more than 50 percent coarse fragments on surface.	Severe: slope; more than 50 percent coarse fragments on surface.	Severe: slope; more than 20 percent coarse fragments on surface.
Hussa: HUB	Moderate: occasional flooding.	None to slight	Moderate: occasional flooding.	Moderate: occasional flooding.
Kobeh: KbA, KgA, KHB	None to slight	None to slight	None to slight	None to slight.
Kobeh variant: Km	None to slight	None to slight	None to slight	None to slight.
*Labshaft: LAE, LAF, LK For Locane part of LAE and LAF, see Locane series. Rock outcrop part of LK not rated.	Severe: slope	Moderate where slopes are 15 to 25 percent: 20 to 50 percent coarse fragments on surface. Severe where slopes are greater than 25 percent.	Severe: slope	Severe: slope; more than 20 percent coarse fragments on surface; rock at a depth of less than 20 inches.
Locane	Severe: slope; more than 50 percent coarse fragments on surface.	Severe: slope; more than 50 percent coarse fragments on surface.	Severe: slope; more than 50 percent coarse fragments on surface.	Severe: slope; more than 20 percent coarse fragments on surface; rock at a depth of less than 20 inches.
*Lone: LmA, LnB, LR For Credo and Rito parts of LR, see their respective series.	None to slight	None to slight	None to slight	None to slight.
Mau: MAE	Severe: slope	Moderate where slopes are 15 to 25 percent: coarse fragments on surface. Severe where slopes are greater than 25 percent.	Severe: slope	Severe: slope; more than 20 percent coarse fragments on surface.

TABLE 10.—*Interpretations of soil properties for recreation*—Continued

Soil series and map symbol	Degree and kind of limitation for—			
	Camp areas	Paths and trails	Picnic areas	Playgrounds
*Nayped: NaB	Moderate: loamy very fine sand surface; dusty.	Moderate: loamy very fine sand surface; dusty.	Moderate: loamy very fine sand surface; dusty.	Moderate: loamy very fine sand surface; dusty.
NdA, NdB, NK. For Kobeh part of NK, see Kobeh series.	None to slight	None to slight	None to slight	None to slight.
Nevka: Ns	Severe: silt loam surface; strongly saline-alkali; dusty.	Severe: silt loam surface; strongly saline-alkali; dusty.	Severe: silt loam surface; strongly saline-alkali; dusty.	Severe: silt loam surface; strongly saline-alkali; dusty.
Overland	Severe: slope	Moderate where slopes are 15 to 25 percent. Severe where slopes are greater than 25 percent.	Severe: slope	Severe: slope.
Pedoli: PeB	Moderate: 20 to 50 percent coarse fragments on surface.	Moderate: 20 to 50 percent coarse fragments on surface.	Moderate: 20 to 50 percent coarse fragments on surface.	Severe: more than 20 percent coarse fragments on surface.
*Playas: PL, PS. Too variable to rate. For Dianev part of PS, see Dianev series, unit DN.				
Ratto: RAC, RCD	Moderate: slow permeability; 20 to 50 percent coarse fragments on surface.	Moderate: 20 to 50 percent coarse fragments on surface.	Moderate: slow permeability; 20 to 50 percent coarse fragments on surface.	Severe: more than 20 percent coarse fragments on surface.
*Ridit: RD. For Alpha part, see Alpha series.	Severe: more than 50 percent coarse fragments on surface.	Severe: more than 50 percent coarse fragments on surface.	Severe: more than 50 percent coarse fragments on surface.	Severe: slope; more than 20 percent coarse fragments on surface.
Rito	Moderate: 20 to 50 percent coarse fragments on surface.	Moderate: 20 to 50 percent coarse fragments on surface.	Moderate: 20 to 50 percent coarse fragments on surface.	Severe: more than 20 percent coarse fragments on surface.
Roca	Severe: very slow permeability; slope.	Moderate where slopes are less than 25 percent: 20 to 50 percent coarse fragments on surface. Severe where slopes are greater than 25 percent.	Severe: slope	Severe: slope; very slow permeability; more than 20 percent coarse fragments on surface.
Rock outcrop. Not rated.				
Rubyhill: RfA, RHC, RL.	None to slight	None to slight	None to slight	None to slight where slopes are less than 2 percent. Moderate where slopes are 2 to 6 percent. Severe where slopes are greater than 6 percent.

TABLE 10.—*Interpretations of soil properties for recreation*—Continued

Soil series and map symbol	Degree and kind of limitation for—			
	Camp areas	Paths and trails	Picnic areas	Playgrounds
Sader: SA, SD	Moderate: somewhat poorly drained; slow to very slow permeability.	Moderate: somewhat poorly drained.	Moderate: somewhat poorly drained.	Moderate: somewhat poorly drained; slow to very slow permeability.
*Sheege: SE. For Croesus part, see Croesus series.	Severe: slope; more than 50 percent coarse fragments on surface.	Severe: more than 50 percent coarse fragments on surface.	Severe: slope; more than 50 percent coarse fragments on surface.	Severe: slope; rock at a depth of less than 20 inches; more than 20 percent coarse fragments on surface.
Shipley:				
SfB, ShA	Moderate: silt loam surface layer; dusty.	None to slight	Moderate: silt loam surface layer; dusty.	Moderate: silt loam surface layer; dusty.
SlA	Moderate: moderately well drained; silt loam surface layer; dusty.	Moderate: moderately well drained; silt loam surface layer; dusty.	Moderate: moderately well drained; silt loam surface layer; dusty.	Moderate: moderately well drained; silt loam surface layer; dusty.
SMA	Moderate: occasional overflow; silt loam surface layer; dusty.	None to slight	Moderate: occasional overflow; silt loam surface layer; dusty.	Moderate: occasional overflow; silt loam surface layer; dusty.
*Shipley variant: Sn. For Shipley part, see Shipley series, unit ShA.	Moderate: dusty	None to slight	Moderate: dusty	Moderate: dusty.
Silverado:				
SoA, SoB	None to slight	None to slight	None to slight	None to slight.
SRD	Moderate: slope; 20 to 50 percent coarse fragments on surface.	Moderate: 20 to 50 percent coarse fragments on surface.	Moderate: slope; 20 to 50 percent coarse fragments on surface.	Severe: most slopes are greater than 6 percent; 20 to 50 percent coarse fragments on surface.
StA	Moderate: occasional overflow.	None to slight	Moderate: occasional overflow.	Moderate: occasional overflow.
Siri: SUF	Severe: slope; more than 50 percent coarse fragments on surface.	Severe: slope; more than 50 percent coarse fragments on surface.	Severe: slope; more than 50 percent coarse fragments on surface.	Severe: slope; more than 50 percent coarse fragments on surface.
Stampede: SVB	Moderate: very slow	None to slight	Moderate: very slow permeability.	Severe: very slow permeability.
Tahquats: TAD	Moderate: 20 to 50 percent coarse fragments on surface.	Moderate: 20 to 50 percent coarse fragments on surface.	Moderate: 20 to 50 percent coarse fragments on surface.	Severe: more than 20 percent coarse fragments on surface.
Tica: TCF, TK. Rock outcrop part not rated.	Severe: slope; more than 50 percent coarse fragments on surface.	Severe: slope; more than 50 percent coarse fragments on surface.	Severe: slope; more than 50 percent coarse fragments on surface.	Severe: slope; more than 50 percent coarse fragments on surface.
Tonkin: Tn, To	None to slight	None to slight	None to slight	None to slight.

TABLE 10.—*Interpretations of soil properties for recreation*—Continued

Soil series and map symbol	Degree and kind of limitation for—			
	Camp areas	Paths and trails	Picnic areas	Playgrounds
Umil:				
UMB, US (loam part).	None to slight	None to slight	None to slight	Moderate: slope.
US (Cobbly loam part).	Severe: slope; 20 to 50 percent coarse fragments on surface.	Severe: slope; 20 to 50 percent coarse fragments on surface.	Severe: slope; 20 to 50 percent coarse fragments on surface.	Severe: slope; more than 20 percent coarse fragments on surface.
Vinsad: VN	Moderate: somewhat poorly drained.	Moderate: somewhat poorly drained.	Moderate: somewhat poorly drained.	Moderate: somewhat poorly drained.

alter the soil material and bring about the development of the soil characteristics. Relief, mainly by its effect on temperature and moisture relationships, modifies the effect of climatological and biological factors. Finally, time is needed to change the parent material into a soil. Generally, a long time is required for the development of distinct horizons.

Parent material

The parent materials in which the soils of Diamond Valley Area formed is widely varied. This is the main reason that there is such a wide variety of soils in this Area.

Much of the parent material in which the soils on the flood plains developed originated in the mountains surrounding Antelope, Monitor, and Kobeh Valleys. These materials were transported into Diamond Valley during rainy periods in ages past. The amount of material deposited as valley fill is great, as indicated by an exploratory oil well drilled in sec. 30, T. 23 N., R. 54 E.: 7,485 feet of alluvial material was penetrated before bedrock was encountered.

Three separate and distinct patterns of watercourses made in the Recent Epoch can be seen on aerial photographs of the valley floor.

The uppermost layer of the valley floor is dominated by siliceous materials, which are mainly susceptible to mechanical weathering. Consequently, the particles are of sand and gravel size. Much of the silt and clay fraction of these soils was deposited as loess and incorporated in the upper few inches of the profile.

Residuum from parent rocks weathered in place provided the material for the rest of the soils in the survey area. The Diamond Range consists mainly of limestone, shale, and conglomerate. The Sulphur Springs Range is mainly dolomite and some siliceous conglomerate and shale. Whistler Mountain is entirely an intrusive igneous rock tentatively identified as alaskite. The Mahogany Hills and Mountain Boy Range are thick-bedded limestone. The mountains near Eureka are varied; they include limestone, quartzite, shale, sandstone, and intrusive and extrusive igneous and conglomerate rocks. This area is highly mineralized and has been extensively mined for lead-silver ores. Volcanic cones, which are mostly olivine basalt, are in the northwestern part of the area and near Eureka.

The soils that have a strongly developed Bt horizon formed in residuum or alluvium from basalt, andesite, and some shales. Soils that developed in material weathered entirely from limestone, dolomite, and siliceous rocks show little development.

Volcanic ash, both local and from distant sources, has affected Diamond Valley soils significantly. Its main effect is to provide the source of silica from which the silica-lime hardpans developed.

Climate

Diamond Valley Area has a semiarid, midlatitude, steppe climate that has a range in average annual precipitation of 8 to 20 inches. The amount of precipitation increases in proportion to elevation and is somewhat affected by exposure and rain shadow effects. The average annual air temperature ranges from 44° to 46° F in the area in which cultivated crops are grown. It decreases to about 35° F high in the mountains. The diurnal fluctuation in temperature is wide because of the dry air and dominantly clear sky. In addition, temperature inversions are common in the valley bottom. The climate is described in more detail in the section "General Nature of the Area."

Climate affects soil formation through its influence on vegetation, physical and chemical weathering of parent materials, and runoff and its resultant erosion and deposition. The main climatic factors that affect soil formation are precipitation and temperature.

The soils on the valley bottom reflect the present climatic conditions as they relate to soil formation. The low amount of precipitation wets only the upper 1 to 3 feet of the profile in most years. This produces a soil that has a zone of carbonate accumulation at the lower boundary of wetting. The limited rainfall and temperature extremes limit the kinds and amount of vegetation found. Kobeh and Alhambra soils are examples of this climatic regime.

The soils in the areas of higher rainfall are characterized by more complete or deeper leaching of the products of weathering. They also have a wide variety of native plants growing on them. Croesus and Tica soils are typical of this climate.

Many of the soils in Diamond Valley formed under climatic conditions that were warmer and more humid than is typical of the present climate. These soils have a well developed Bt horizon and in some cases a thick, indurated hardpan, as in soils of the Pedoli and Ratto series.

Water is the source of hydrogen ions, the principal agent employed in chemical weathering, and water is the means by which the products of weathering are transported in the profile. The rate of plant growth and hence the amount of organic matter is also directly related to the amount of precipitation; therefore, the soils of the valley bottom show little development and have organic-matter content of less than 1 percent, by weight. As the precipitation increases with elevation, the amount of organic matter and the thickness and darkness of the A1 horizon increase accordingly. Chemical weathering processes are slowed by the drop in temperature associated with increase in elevation; therefore, the development of the Bt horizon is not so pronounced in the cold soils of high elevation.

Plants and animals

The greatest biological influences in soil development are the vascular plants that provide the bulk of the organic material to the soil and the micro-organisms that break this material down. Larger animals such as earthworms, rodents, and man contribute somewhat less to the development of the soil characteristic. Biological activity within the soil contributes to the general soil fertility. Organic matter in the soil darkens the color, increases the available water capacity, improves tilth, increases water movement into and through the soil, and provides available plant nutrients.

On the valley floor, where precipitation is least, the vegetative cover is big sagebrush and a sparse understory of grasses and forbs. This provides only small to moderate amounts of organic matter to the soil. Consequently, the color of the A1 horizon is light and the micro-organism population is generally low. The organic-matter content is less than 1 percent. Alhambra and Kobeh soils, for example, developed under these conditions.

The soils on some of the alluvial fans and canyon bottoms also receive low rainfall, but they receive extra water as run-on from higher and steeper soils. They have a heavier and denser cover of vegetation and a thick A1 horizon that contains more than 1 percent organic matter. They may also receive material eroded from the higher lying soils. Soils of the Holtle, Hussa, and Rito series exemplify this condition.

The soils on the higher mountains receive enough moisture to support a good stand of trees, brush, and grasses. Examples of these are Croesus and Devoy soils. Shallow soils in the areas that have higher precipitation, such as Sheege soils, are not able to retain enough of the moisture to support a thick stand of vegetation.

The vegetation on the soils that have a high water table is determined by the soil aeration and soluble salt content. Bicondoa soils, where not affected by salt and alkali, have a cover of wiregrass, sedges, and bluejoint ryegrass. These plants tolerate poor soil aeration and thrive on the plentiful supply of water. Saline-alkali affected soils, even though plentifully supplied with water, are physiologically droughty. These soils support a cover of mainly greasewood, saltgrass, and alkali sacaton. These plants grow slowly and provide little organic matter to the soil. The greasewood takes up a large amount of salt in its normal growth functions and deposits it with the leaf litter around the plants, further contributing to the saline-alkali condition of the upper horizons.

Micro-organisms, in addition to their role in releasing plant nutrients from organic matter, help to break down the parent rock. In addition, certain kinds of nitrogen-fixing bacteria change nitrogen from the atmosphere to a form usable by plants.

The earthworm population depends on organic matter from plants and on a moist soil environment. Earthworms leave worm casts, which are round, granular excretions. Worm activities contribute to available plant nutrients and to the aeration and drainage of the soil.

Man has affected the soils of Diamond Valley Area by introducing plant species not naturally found here and by providing irrigation water for them. His management practices, such as addition of plant nutrients and plowing under of crop residue, have altered the organic-matter content and consequently the tilth and fertility of the soils.

Relief and drainage

Diamond Valley Area is characterized by broad, flat valleys separated by low, moderate-sized, very steep and steep mountain ranges that run north and south. The valley floor is separated from the mountains by a narrow to moderately wide band of gently sloping to strongly sloping coalescing alluvial fans and lake terraces.

Relief influences soil mostly by its effect on the amount of water that enters the soil. If other factors are equal, the degree of soil formation depends on the amount of water that percolates through the profile and the amount of water that is available for plant growth. Steep soils lose water by runoff; the adjacent lower soils that have more gentle slopes receive and absorb it. These conditions are exemplified by soils of the Fusulina and Holtle series, respectively. Erosion and deposition also affect the thickness of the A1 horizon and the amount of organic matter in the soil.

Aspect, the direction that the slope faces, also influences temperature and moisture relationships. South-facing slopes have higher mean summer soil temperatures and lower mean winter temperatures than north-facing slopes. The effective moisture is also lower on south-facing slopes. In winter the snow melts and runs off the south-facing slopes readily, leaving the soil exposed to freezing temperatures most of the time. The north-facing slopes are insulated most of the winter by a blanket of snow that keeps the soil from freezing and enables the melting snow to enter the soil slowly. In summer, on the other hand, the sun's direct rays on southern exposures dry the soil more rapidly and warm it more than soils that face north. Soils of the Fera-Roca association and the Ridit-Alpha association receive the same total amounts of precipitation but have developed different soil characteristics because of aspect. High-elevation soils, such as Fusulina

and Croesus soils, are at somewhat lower elevations where they face north than where they face south because of the difference in aspect.

Soils that have restricted drainage are near the playa. These soils are characterized by low chroma or mottling, or both. Iron is the principal source of the reddish and brownish colors in well-drained soils, where it is in the ferric form. Ferric iron is not soluble in the soil solution if air is present. A profile saturated with water and containing organic matter provides a reducing medium in which the iron is changed to its ferrous form. Ferrous iron imparts a yellowish, greenish, or bluish color to the saturated horizons. This process is called gleying. Where the water table fluctuates, the iron precipitates out and oxidizes to ferric oxide which, in turn, imparts blotches of bright color mottles in a matrix of dull colors. Bicondoa and Dianev soils exhibit mottling in their upper horizons and in some places are gleyed in their lower horizons. Hussa soils are typically poorly drained, but in this Area they have been drained by entrenchment of stream channels. The properties associated with wetness that characterize this series are still evident, but the high water table is absent. Some other soils in this area that are presently well drained formed under poor drainage conditions, and relict mottles persist in some profiles. Bruffy soils exhibit this condition.

Salt and alkali accumulations are another result of a high water table in this Area. Since Diamond Valley is an undrained basin and contained a lake during the Pleistocene Epoch, soluble salts accumulated and concentrated when the lake evaporated. The ground water in the vicinity of the playa contains considerable amounts of dissolved salt. This salt accumulates on the surface or in lower horizons when the water evaporates.

Time

Time is required for the formation of soil. The amount of time required depends on the other soil-forming factors. The degree of expression of genetic soil horizons is directly related to the length of time that other soil-forming factors have exerted their influence on the parent material. A young soil is one on which climate, plant and animal life, and relief have only begun to alter the parent material. Thus, the age of a soil is determined by the degree to which the parent material has been changed toward the development of a soil that has its own unique set of characteristics.

In Diamond Valley Area the existence of flood plains, sequences of alluvial fans, lacustrine basin and shoreline features, and stability characteristics of upland surfaces indicate the relative age of soils that formed on these landscapes.

Flood plains, presently aggrading alluvial fans, and uplands undergoing rapid erosion or deposition are the most recent parent materials. Soils on these recent landscapes have little or no profile development other than the formation of an A horizon. Bruffy soils on flood plains, Hayeston and Shipley soils on alluvial fans, and Hopeka soils on uplands are examples of soils that formed in recent parent material.

The intensity of soil development increases in sequence from recent to older landscapes. On alluvial fans, terraces, and stable mountain surfaces that are believed to date back to the close of the Pleistocene Epoch, the soils have developed an A horizon, a cambic B horizon or a weak B2t horizon, and often a Csica horizon. Alpha, Fairydell, Kobeh, and Silverado soils formed on landscapes of this age.

On landscapes believed to date back to interpluvial periods of the Wisconsin Stage, the soils have developed a distinct A horizon, a B2t horizon, and in some soils a cemented Csicam horizon. The B2t horizon of soils on landscapes of this age is more strongly expressed and ranges in texture from clay loam to clay. The silica-cemented Csicam horizon is massive and contains indurated layers. Credo, Cyan, and Pedoli soils with a well developed B2t horizon and Lone and Rubyhill soils with a Csicam horizon date back to the late Wisconsin Stage.

Older alluvial fans, stream and lake terraces, and stable uplands are believed to date back to an earlier part of the Wisconsin Stage. Soils on these landscapes have an A1 horizon and a fine textured, prismatic B2t horizon. Handy, Ratto, and Stampede soils reflect the total effects of soil development since the early part of the Wisconsin stage.

Comparison of soil profiles and the relative age of landscapes indicate that some soils that have a distinct argillic (Bt) horizon may have developed their primary characteristics during the Wisconsin Stage of the Pleistocene Epoch. This indicates that soil development in Diamond Valley Area has not been a rapid process.

Classification of the Soils

Soils are classified so that we can more easily remember their significant characteristics. Classification enables us to assemble knowledge about the soils, to see their relationship to one another and to the whole environment, and to develop principles that help us to understand their behavior and their response to manipulation. First through classification, and then through use of soil maps, we can apply our knowledge of soils to specific fields and other tracts of land.

The narrow categories of classification, such as those used in detailed soil surveys, allow us to organize and apply knowledge about soils in managing farms, fields, and woodlands; in developing rural areas; in engineering work; and in many other ways. Soils are placed in broad classes to facilitate study and comparison in large areas, such as countries and continents.

The system of soil classification currently used was adopted by the National Cooperative Soil Survey in 1965 (*7*). Because this system is under continual study, readers interested in developments of the current system should search the latest literature available.[6]

The current system of classification has six categories. Beginning with the broadest, these categories are order, suborder, great group, subgroup, family, and series. In this system the criteria used as a basis for classification are soil properties that can be observed in the field, or that can be inferred either from other properties observable in the field or from the combined

[6] See the unpublished working document "Selected Chapters from the Unedited Text of the Soil Taxonomy," available in the SCS State Office, Reno, Nevada.

learning of soil science or other disciplines. The properties are chosen, however, so that the soils of similar genesis, or mode of origin, are grouped. In table 11, the soil series of Diamond Valley Area are placed in four categories of the current system. Classes of the current system are defined briefly in the following paragraphs.

ORDERS: Ten soil orders are recognized. The differentiae for the orders are based on the kind and degree of the dominant sets of soil forming processes that have gone on. Each order is named with a word of three or four syllables ending in *sol.* An example is Ent-i-sol.

SUBORDERS: Each order is divided into suborders that are based mainly on those soil characteristics that influence soil genesis and that are important to plant growth, or were selected to reflect what seemed to be the most important variables within the orders. The names of suborders have two syllables. The last syllable indicates the order. An example is *Fluvents* (*Fluv,* meaning recently deposited soils, and *ent,* from Entisol).

GREAT GROUPS: Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of expression of pedogenic horizons, in soil moisture and temperature regimes, and in base status. The name of a great group has three or four syllables and ends with the name of the suborder. The prefix added to the name of the suborder suggests something about the properties and

TABLE 11.—*Classification of soil series*

Series	Family	Subgroup	Order
Alhambra	Coarse-loamy, mixed (calcareous), frigid	Durorthidic Xeric Torrifluvents	Entisols.
Alpha	Fine-loamy, mixed, frigid	Aridic Duric Haploxerolls	Mollisols.
Atrypa	Loamy, mixed, frigid, shallow	Calciorthidic Haploxerolls	Mollisols.
Bartine	Loamy-skeletal, carbonatic	Typic Cryoborolls	Mollisols.
Bicondoa	Fine, montmorillonitic (calcareous), frigid	Fluvaquentic Haplaquolls	Mollisols.
Bobs	Loamy, carbonatic, frigid, shallow	Petrocalcic Palexerolls	Mollisols.
Bruffy	Fine-loamy, mixed (calcareous), frigid	Xeric Torrifluvents	Entisols.
Credo	Fine-loamy, mixed, frigid	Xerollic Haplargids	Aridisols.
Croesus	Loamy-skeletal, mixed	Pachic Cryoborolls	Mollisols.
Cyan	Loamy-skeletal, mixed, frigid	Durixerollic Haplargids	Aridisols.
Devoy	Clayey-skeletal, montmorillonitic	Argic Cryoborolls	Mollisols.
Dianev	Fine-loamy, mixed (calcareous), frigid	Aeric Haplaquepts	Inceptisols.
Fairydell	Loamy-skeletal, mixed	Typic Cryoborolls	Mollisols.
Fera	Clayey-skeletal, montmorillonitic, frigid	Aridic Argixerolls	Mollisols.
Fusulina	Loamy, mixed, shallow	Typic Cryoborolls	Mollisols.
Gabel	Loamy-skeletal, mixed, frigid	Durixerollic Haplargids	Aridisols.
Hamacer	Mixed, frigid	Durorthidic Xeric Torripsamments	Entisols.
Handy	Fine, montmorillonitic, frigid	Xerollic Haplargids	Aridisols.
Hayeston	Coarse-loamy, mixed (calcareous), frigid	Xeric Torriorthents	Entisols.
Holtle	Coarse-loamy, mixed, frigid	Aridic Duric Haploxerolls	Mollisols.
Hopeka	Loamy-skeletal, carbonatic, frigid	Lithic Xeric Torriorthents	Entisols.
Hussa	Fine-loamy, mixed (calcareous), frigid	Fluvaquentic Haplaquolls	Mollisols.
Kobeh	Loamy-skeletal, mixed, frigid	Durixerollic Camborthids	Aridisols.
Kobeh variant	Coarse-loamy, mixed, frigid	Durixerollic Camborthids	Aridisols.
Labshaft	Loamy-skeletal, mixed	Lithic Cryoborolls	Mollisols.
Locane	Clayey-skeletal, montmorillonitic, frigid	Lithic Xerollic Haplargids	Aridisols.
Lone	Loamy-skeletal, mixed, frigid	Xerollic Durorthids	Aridisols.
Mau	Clayey-skeletal, montmorillonitic, frigid	Durixerollic Haplargids	Aridisols.
Nayped	Fine-loamy, mixed, frigid	Durixerollic Camborthids	Aridisols.
Nevka	Fine-loamy, mixed, frigid	Aquic Calciorthids	Aridisols.
Overland	Loamy-skeletal, carbonatic, frigid	Xerollic Calciorthids	Aridisols.
Pedoli	Fine-loamy, mixed, frigid	Xerollic Haplargids	Aridisols.
Ratto	Clayey, montmorillonitic, frigid, shallow	Xerollic Durargids	Aridisols.
Ridit	Loamy-skeletal, mixed, frigid	Xerollic Durorthids	Aridisols.
Rito	Loamy-skeletal, mixed, frigid	Calciorthidic Haploxerolls	Mollisols.
Roca	Clayey-skeletal, montmorillonitic, frigid	Xerollic Haplargids	Aridisols.
Rubyhill	Fine-loamy, mixed, frigid	Haploxerollic Durorthids	Aridisols.
Sader	Fine, montmorillonitic, frigid	Aquic Natrargids	Aridisols.
Sheege	Loamy-skeletal, carbonatic	Cryic Lithic Rendolls	Mollisols.
Shipley	Coarse-loamy, mixed (calcareous), frigid	Xeric Torriorthents	Entisols.
Shipley variant	Coarse-loamy over sandy or sandy-skeletal, mixed (calcareous), frigid.	Xeric Torriorthents	Entisols.
Silverado	Coarse-loamy, mixed, frigid	Durixerollic Camborthids	Aridisols.
Siri	Loamy-skeletal, mixed, frigid	Xerollic Calciorthids	Aridisols.
Stampede	Fine, montmorillonitic, frigid	Aridic Durixerolls	Mollisols.
Tahquats	Loamy-skeletal, mixed	Argic Cryoborolls	Mollisols.
Tica	Clayey-skeletal, montmorillonitic	Argic Lithic Cryoborolls	Mollisols.
Tonkin	Fine-loamy, mixed, frigid	Durixerollic Calciorthids	Aridisols.
Umil	Fine-loamy, mixed, frigid	Xerollic Durorthids	Aridisols.
Vinsad	Coarse-loamy, mixed, frigid	Typic Salorthids	Aridisols.

soil. An example is Torrifluvents (*Torr*, meaning hot and dry soils, *fluv* for recently deposited soils, and *ent* from Entisols).

SUBGROUPS: Each great group is divided into three kinds of subgroups. The central (typic) concept of the great groups; the intergrades, or transitional forms to other orders, suborders, or great groups; and extragrades which have some properties that are representative of the great groups but that do not indicate transitions to any other known kind of soil. The names of subgroups are derived by placing one or more adjectives before the name of the great group. An example is Xeric Torrifluvents (*Xeric*, meaning annual dry season; *torr*, for hot and dry soils; *fluv*, for recently deposited soils; and *ent*, from Entisols).

FAMILIES: Each subgroup is divided into families of soils that have similar enough physical and chemical properties that responses to management and manipulation for use are nearly the same for comparable phases. Among the properties considered are texture, mineralogy, reaction, soil temperature, permeability, thickness of horizons, and consistence. A family name consists of a series of adjectives preceding the subgroup name. The adjectives are the class names for texture, mineralogy, and so on that are used as family differentiae. An example is the fine-loamy, mixed (calcareous), frigid family of Xeric Torrifluvents.

SERIES: The series is a group of soils that formed from a particular kind of parent material and have horizons that, except for texture of the surface layer, are similar in differentiating characteristics and in arrangement in the soil profile. Among these characteristics are color, texture, structure, reaction, consistence, and mineralogical and chemical composition. Soil series are named for a geographic location near the place where the series was first observed and mapped. The series is further explained in the section "How this Survey Was Made."

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Glossary

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as crumbs, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alkali soil. Generally, a highly alkaline soil. Specifically, an alkali soil has so high a degree of alkalinity (pH 8.5 or higher) or so high a percentage of exchangeable sodium (15 percent or more of the total exchangeable bases), or both, that the growth of most crop plants is low from this cause.

Alluvial fan. A fan-shaped deposit of sand, gravel, and fine material dropped by a stream where its gradiant lessens abruptly.

Alluvium. Soil material, such as sand, silt, or clay, that has been deposited on land by streams.

Amendment. Any material, such as lime, gypsum, sawdust, or synthetic conditioner, that is worked into the soil to make it more productive. A fertilizer is also an amendment, but the term "amendment" is used most commonly for material other than fertilizer that is added to soil.

Aquifer. A porous soil or geological formation that yields ground water to wells and springs.

Area reclaim. Area difficult to reclaim after removal of soil. Revegetation and erosion control are extremely difficult.

Aspect (forestry). The direction toward which a slope faces. Synonym: Exposure.

Available water capacity (also termed available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil and by the soil profile as follows:

Very low	less than 2.5 inches
Low	2.5 to 5 inches
Moderate	5 to 7.5 inches
High	more than 7.5 inches

Base saturation. The degree to which material that has base-exchange properties is saturated with exchangeable cations other than hydrogen, expressed as a percentage of the cation-exchange capacity.

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

Bunch grass. A grass that grows in tufts, in contrast to a sod-forming grass.

Calcareous soil. A soil containing enough calcium carbonate (often with magnesium carbonate) to effervesce (fizz) visibly when treated with cold, dilute hydrochloric acid.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of clay on the surface of a soil aggregate. Synonyms: clay coat, clay skin.

Climax vegetation (potential vegetation). The stabilized plant community on a particular site; it reproduces itself and does not change so long as the environment does not change.

Coarse fragments. Mineral or rock particles more than 2 millimeters in diameter.

Coarse-textured soil. Sand and loamy sand.

Colluvium. Soil material, rock fragments, or both, moved by creep, slide, or local wash and deposited at the base of steep slopes.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure

between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material, and tends to stretch somewhat and pull apart, rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard and brittle; little affected by moistening.

Continental climate. The climate in areas distant from the ocean; characterized by considerable variation in temperature and in other weather conditions.

Cutbanks cave. Unstable walls of cuts made by earthmoving equipment. The soil sloughs easily.

Delta. An alluvial deposit, formed largely beneath the water, where a stream or river drops its load of sediment on entering a body of more quiet water. Commonly triangular in shape.

Depth, soil. Depth of soil profile; depth to which the roots of common plants penetrate; depth to underlying bedrock, duripan or other resistant layer. Soil depth classes are: *very shallow,* less than 10 inches; *shallow,* 10 to 20 inches; *moderately deep,* 20 to 40 inches; *deep,* 40 to 60 inches; and *very deep,* over 60 inches.

Disperse. To break up compound soil particles.

Dune. A mound or ridge of loose sand piled up by the wind.

Durinode. Weakly silica cemented to indurated nodules which do not slack down in water or strong acid but are soluble in hot concentrated alkali or with alternate treatment with hot concentrated alkali and acid.

Duripan. A silica cemented subsurface layer in which the cementation is strong enough not to slack in water or strong acid but is soluble in hot concentrated alkali and acid.

Erosion. The wearing away of the land surface by wind (sandblast), running water, and other geological agents.

Erosion pavement. A layer of gravel or stones on the ground surface that remains after the fine particles are removed by wind or water. Desert pavements result from exposure to dry winds.

Fine-textured soils. *Moderately fine textured:* Clay loam, sandy clay loam, silty clay loam; *Fine-textured:* sandy clay, silty clay, and clay. Roughly, soil that contains 35 percent or more of clay.

Flood plain. Nearly level land, consisting of stream sediments, that borders a stream and is subject to flooding unless protected artificially.

Forage. Plant material that can be used as feed by domestic animals; it may be grazed or cut for hay.

Forb. Any herbaceous plant, neither a grass nor a sedge, that is grazed on western ranges.

Genesis, soil. The manner in which a soil originates. Refers especially to the processes initiated by climate and organisms that are responsible for the development of the solum, or true soil, from the unconsolidated parent material, as conditioned by relief and age of landform.

Ground water (geology). Water that fills all the unblocked pores of underlying material below the water table, which is the upper limit of saturation.

Habitat. The natural abode of a plant or animal; it refers to the kind of environment in which a plant or animal normally lives as opposed to its range, or geographical distribution.

Hardpan. A hardened or cemented soil horizon, or layer. The soil material may be sandy or clayey, and it may be cemented by iron oxide, silica, calcium carbonate, or other substance.

Herb. A plant that dies down annually or after flowering; grasses and forbs, as distinguished from shrubs and trees.

Horizon, soil. A layer of soil, approximately parallel to the surface, that has distinct characteristics produced by soil-forming processes. These are the major horizons:

O horizon.—The layer of organic matter on the surface of a mineral soil. This layer consists of decaying plant residues.

A horizon.—The mineral horizon at the surface or just below an O horizon. This horizon is the one in which living organisms are most active and therefore is marked by the accumulation of humus. The horizon may have lost one or more of soluble salts, clay, and sesquioxides (iron and aluminum oxides).

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of change from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics caused (1) by accumulation of clay, sesquioxides, humus, or some combination of these; (2) by prismatic or blocky structure; (3) by redder or stronger colors than the A horizon; or (4) by some combination of these. Combined A and B horizons are usually called the solum, or true soil. If a soil lacks a B horizon, the A horizon alone is the solum.

C horizon.—The weathered rock material immediately beneath the solum. In most soils this material is presumed to be like that from which the overlying horizons were formed. If the material is known to be different from that in the solum, a Roman numeral precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock usually underlies a C horizon but may be immediately beneath an A or B horizon.

Igneous rock. Rock that has been formed by the cooling of molten mineral material. Examples: Granite, syenite, diorite, and gabbro.

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

Invaders. On range, plants that come in and grow after the climax vegetation has been reduced by grazing. Generally, invader plants are those that follow disturbance of the surface. (Most weeds are "invaders").

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are—

Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Basin.—Water is applied rapidly to relatively level plots surrounded by levees or dikes.

Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops, or in orchards, to confine the flow of water to one direction.

Furrow.—Water is applied in small ditches made by cultivation implements used for tree and row crops.

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding.—Irrigation water, released at high points, flows onto the field without controlled distribution.

Lacustrine deposit (geology). Material deposited in lake water and exposed by lowering of the water level or elevation of the land.

Leaching. The removal of soluble materials from soils or other material by percolating water.

Lime. Chemically, lime is calcium oxide (CaO), but its meaning has been extended to include all limestone-derived materials applied to neutralize acid soils. Agricultural lime can be obtained as ground limestone, hydrated lime, or burned lime, with or without magnesium minerals. Basic slag, oystershells, and marl also contain calcium.

Low strength. Inadequate strength for supporting loads.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical mineral, and biological properties of the various horizons, and their thickness and arrangement in the soil profile.

Mottled. Irregularly marked with spots of different colors that vary in number and size. Mottling in soils usually indicates poor aeration and lack of drainage. Descriptive terms are as follows: abundance—*few, common,* and *many;* size—*fine, medium,* and *coarse;* and contrast—*faint, distinct,* and

prominent. The size measurements are these: *fine,* less than 5 millimeters (about 0.2 inch) in diameter along the greatest dimension; *medium,* ranging from 5 millimeters to 15 millimeters (about 0.2 to 0.6 inch) in diameter along the greatest dimension; and *coarse,* more than 15 millimeters (about 0.6 inch) in diameter along the greatest dimension.

Munsell notation. A system for designating color by degrees of the three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with a hue of 10YR, a value of 6, and a chroma of 4.

Drainage class (natural). Refers to the conditions of frequency and duration of periods of saturation or partial saturation that existed during the development of the soil, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven different classes of natural soil drainage are recognized.

Excessively drained soils are commonly very porous and rapidly permeable and have a low available water capacity.

Somewhat excessively drained soils are also very permeable and are free from mottling throughout their profile.

Well-drained soils are nearly free from mottling and are commonly of intermediate texture.

Moderately well drained soils commonly have a slowly permeable layer in or immediately beneath the solum. They have uniform color in the A and upper B horizons and mottling in the lower B and the C horizons.

Somewhat poorly drained soils are wet for significant periods but not all the time, and some soils commonly have mottling at a depth below 6 to 16 inches.

Poorly drained soils are wet for long periods and are light gray and generally mottled from the surface downward, although mottling may be absent or nearly so in some soils.

Very poorly drained soils are wet nearly all the time. They have a dark-gray or black surface layer and are gray or light gray, with or without mottling, in the deeper parts of the profile.

Neutral soil. In practice, a soil having a pH value between 6.6 and 7.3. Strictly speaking, a soil that has a pH value of 7.0.

Nitrogen-fixing plant. A plant that can take in and fix the free nitrogen in the atmosphere by the aid of bacteria living in the root nodules. Legumes with the associated rhizobium bacteria in the nodules of roots are the most important nitrogen-fixing plants. Fixation brought about by the aid of bacteria in plant roots is called symbiotic fixation; if done by free-living organisms acting independently, it is referred to as nonsymbiotic fixation.

Nodule. A structure developed on the roots of most legumes and a few other plants in response to the stimulus of root-nodule bacteria. Legumes bearing these nodules are nitrogen-fixing plants that use atmospheric nitrogen instead of depending on nitrogen compounds in the soil.

Nutrient, plant. Any element taken in by a plant, essential to its growth, and used by it in the production of food and tissue. Nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, zinc, and perhaps other elements obtained largely from the air and water, are plant nutrients.

Organic matter. A general term for plant and animal material, in or on the soil, in all stages of decomposition. Readily decomposed organic matter is often distinguished from the more stable forms that are past the stage of rapid decomposition.

Overgrazing. Grazing so heavy as to impair future forage production and to deteriorate plants, soil, or both. Contrasts with undergrazing.

Parent material. Disintegrated and partly weathered rock from which soil has formed.

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Percs slowly. Slow movement of water through the soil adversely affects the specified use.

Piping. Formation by moving water of subsurface tunnels or pipelike cavities.

Potential vegetation. See climax vegetation.

Profile, soil. A vertical section of the soil through all its horizons and extending into the parent material.

Range (or rangeland). Land that, for the most part, produces native plants suitable for grazing by livestock; includes land on which there are some forest trees.

Range seeding. Establishing perennial grasses of improved reseeding grasses or legumes on rangeland to prevent the loss of soil and water and to restore the productivity of native grassland.

Range site. An area of range where climate, soil, and relief are sufficiently uniform to produce a distinct kind of climax vegetation.

Reaction, soil. The degree of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is precisely neutral in reaction because it is neither acid nor alkaline. An acid, or "sour," soil is one that gives an acid reaction; an alkaline soil is one that is alkaline in reaction. In words, the degrees of acidity or alkalinity are expressed thus:

	pH		*pH*
Extremely acid	Below 4.5	Neutral	6.6 to 7.3
Very strongly acid	4.5 to 5.0	Mildly alkaline	7.4 to 7.8
Strongly acid	5.1 to 5.5	Moderately alkaline	7.9 to 8.4
Medium acid	5.6 to 6.0	Strongly alkaline	8.5 to 9.0
Slightly acid	6.1 to 6.5	Very strongly alkaline	9.1 and higher

Relief. The elevations or inequalities of a land surface, considered collectively.

Saline-alkali soil. A soil that contains a harmful concentration of salts and exchangeable sodium; or contains harmful salts and has a highly alkaline reaction; or contains harmful salts and exchangeable sodium and is strongly alkaline in reaction. The salts, exchangeable sodium, and alkaline reaction occur in the soil in such locations that growth of most crop plants is less than normal.

Saline soil. A soil that contains soluble salts in amounts that impair growth of plants but that does not contain excess exchangeable sodium.

Sand. Individual rock or mineral fragments in a soil that range in diameter from 0.05 to 2.0 millimeters. Most sand grains consist of quartz, but they may be of any mineral composition. The textural class name of any soil that contains 85 percent or more sand and not more than 10 percent clay.

Sedimentary rock. A rock composed of particles deposited from suspension in water. The chief sedimentary rocks are conglomerate, from gravel; sandstone, from sand; shale, from clay; and limestone, from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sands have been consolidated into sandstone.

Seepage. Rapid movement of water through the soil adversely affects the specified use.

Silica. Silica is a combination of silicon and oxygen. The mineral form is called quartz.

Silica-alumina ratio. The molecular ratio of silica to alumina in soil, clay, or other alumino-silicate mineral.

Silt. Individual mineral particles in a soil that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). Soil of the silt textural class is 80 percent or more silt and less than 12 percent clay.

Slope, soil. Percent slope gradient and adjectives used are:

Nearly level	0 to 2 percent
Gently sloping	2 to 4 percent
Moderately sloping	4 to 8 percent
Strongly sloping	8 to 15 percent
Moderately steep	15 to 30 percent
Steep	30 to 50 percent
Very steep	more than 50 percent

Soil variant. A soil having properties sufficiently different from those other known soils to suggest establishing a new soil series, but a soil of such limited known area that creation of a new series is not believed to be justified.

Stratified. Composed of, or arranged in, strata, or layers, such as stratified alluvium. The term is confined to geological material. Layers in soils that result from the processes of soil formation are called horizons; those inherited from the parent material are called strata.

Structure, soil. The arrangement of primary soil particles into compound particles or clusters that are separated from adjoining aggregates and have properties unlike those of an equal mass of unaggregated primary soil particles. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering together without any regular cleavage, as in many claypans and hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsoiling. Tillage of a soil below normal depth ordinarily to shatter a hardpan or claypan.

Substratum. Technically, the part of the soil below the solum.

Surface layer. A term used in nontechnical soil descriptions for one or more layers above the subsoil. Includes A horizon and part of B horizon; has no depth limit.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that it may soak into the soil or flow slowly to a prepared outlet without harm. Terraces in fields are generally built so they can be farmed. Terraces intended mainly for drainage have a deep channel that is maintained in permanent sod.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Understory. The part of a forest that is below the upper crown canopy. Contrasts with overstory.

Upland (geology). Land consisting of material unworked by water in recent geologic time and lying, in general, at a higher elevation than the alluvial plain or stream terrace. Land above the lowlands along rivers.

Water table. The highest part of the soil or underlying rock material that is wholly saturated with water. In some places an upper, or perched, water table may be separated from a lower one by a dry zone.

GUIDE TO MAPPING UNITS

For a full description of a mapping unit, read both the description of the mapping unit and that of the soil series to which the mapping unit belongs. For information on irrigated and dryland capability units refer to pages 57 through 61. Range sites are described on pages 62 through 66.

HIGH INTENSITY SURVEY

Map symbol	Mapping unit	Page	Capability unit Irrigated	Capability unit Dryland	Range site	Windbreak or Woodland suitability group 1/	Wildlife suitability group Irrigated	Wildlife suitability group Dryland
			Symbol	Symbol	Symbol	Symbol	Symbol	Symbol
Ab	Alhambra fine sandy loam	15	IIIc-2	VIc	NV 28-21	NV 28-2	2-41I	3-43
AbC	Alhambra fine sandy loam, hummocky	15	IIIc-2	VIc	NV 28-21	NV 28-2	2-41I	3-43
Ac	Alhambra silt loam	15	IIIc-2	VIc	NV 28-21	NV 28-2	2-41I	3-43
Ad	Alhambra silt loam, silty substratum	16	IIIc-2	VIc	NV 28-21	NV 28-1	2-41I	3-43
Ah	Alhambra complex	16	--------	VIIs	--------	-------	-----	4-44
	Alhambra silt loam, strongly saline-alkali	--	--------	----	NV 28-26	-------	-----	----
	Alhambra gravelly sandy loam, slightly saline-alkali	--	--------	----	NV 28-23	-------	-----	----
Ak	Alhambra-Kobeh complex	16	IVs-115	VIIs	NV 28-21	NV 28-2	3-42I	4-44
Am	Alhambra-Kobeh complex, saline	17	IVs-116	VIIs	--------	-------	2-33I	4-44
	Alhambra fine sandy loam, moderately saline-alkali	--	--------	----	NV 28-23	NV 28-4	-----	----
	Kobeh fine sandy loam, slightly saline-alkali	--	--------	----	NV 28-21	NV 28-2	-----	----
As	Alhambra-Shipley complex	17	IIIc-2	VIc	--------	-------	2-41I	3-43
	Alhambra fine sandy loam	--	--------	----	NV 28-21	NV 28-2	-----	----
	Shipley silt loam, sandy subsoil variant	--	--------	----	NV 28-21	NV 28-2	-----	----
	Shipley silt loam, 0 to 2 percent slopes	--	--------	----	NV 28-25	NV 28-1	-----	----
Br	Bruffy silt loam	21	IIIw-120	VIw	NV 28-24	NV 28-2	2-41I	3-43
Bs	Bruffy silt loam, alkali	21	IIIw-120	VIw	NV 28-24	NV 28-2	2-41I	3-43
Bu	Bruffy-Kobeh complex	21	IVs-115	VIIs	--------	-------	-----	----
	Bruffy silt loam, alkali	--	--------	----	NV 28-24	NV 28-2	2-42I	4-44
	Kobeh sandy loam, 0 to 2 percent slopes	--	--------	----	NV 28-21	NV 28-2	2-42I	4-44
CfB	Credo fine sandy loam, 2 to 4 percent slopes	23	IIIe-40	VIc	NV 28-21	NV 28-2	2-41I	3-43
CgC	Credo gravelly loam, 4 to 8 percent slopes	23	IIIe-40	VIc	NV 28-21	NV 28-2	2-41I	3-43
HaA	Hamacer loamy fine sand, 0 to 2 percent slopes	28	IIIs-115	VIs	NV 28-28	NV 28-2	2-41I	4-43
HlA	Holtle loam, 0 to 2 percent slopes	30	IIIc-2	VIc	NV 28-20	NV 28-1	2-41I	3-43
HmA	Holtle loam, occasionally flooded, 0 to 2 percent slopes	30	IIIw-120	VIw	NV 28-20	NV 28-1	2-41I	3-43
KbA	Kobeh sandy loam, 0 to 2 percent slopes	32	IVs-115	VIIs	NV 28-21	NV 28-2	2-42I	4-44
KgA	Kobeh gravelly sandy loam, 0 to 2 percent slopes	32	IVs-115	VIIs	NV 28-21	NV 28-2	3-42I	4-44
Km	Kobeh sandy loam, sandy subsoil variant	33	IIIc-2	VIc	NV 28-21	NV 28-2	2-41I	3-43
LmA	Lone gravelly sandy loam, 0 to 2 percent slopes	35	IVs-115	VIIs	NV 28-21	NV 28-5	3-42I	4-44
LnB	Lone gravelly loam, undulating	35	IVe-45	VIIs	NV 28-21	NV 28-5	3-42I	4-44
NaB	Nayped loamy very fine sand, 2 to 4 percent slopes	37	IIIe-40	VIc	NV 28-21	NV 28-1	2-41I	3-43
NdA	Nayped loam, 0 to 2 percent slopes	37	IIIc-2	VIc	NV 28-21	NV 28-1	2-41I	3-43
NdB	Nayped loam, 2 to 4 percent slopes	37	IIIe-40	VIc	NV 28-21	NV 28-1	2-41I	3-43
Ns	Nevka silt loam	38	--------	VIIw	NV 28-23	-------	2-12I	4-23
PeB	Pedoli gravelly fine sandy loam, 2 to 4 percent slopes	39	IIIe-40	VIc	NV 28-21	NV 28-2	2-41I	4-44
RfA	Rubyhill fine sandy loam, 0 to 2 percent slopes	43	IVs-115	VIIs	NV 28-21	NV 28-5	2-41I	4-43

Map symbol	Mapping unit	Page	Capability unit Irrigated	Capability unit Dryland	Range site	Windbreak or Woodland suitability group 1/	Wildlife suitability group Irrigated	Wildlife suitability group Dryland
			Symbol	Symbol	Symbol	Symbol	Symbol	Symbol
SfB	Shipley fine sandy loam, 2 to 4 percent slopes	46	IIIe-40	VIc	NV 28-21	NV 28-1	2-41I	3-43
ShA	Shipley silt loam, 0 to 2 percent slopes	46	IIIc-2	VIc	NV 28-25	NV 28-1	2-41I	3-43
SlA	Shipley silt loam, moderately saline-alkali, 0 to 2 percent slopes	46	IIIw-121	VIw	NV 28-23	NV 28-4	2-33I	3-33
Sn	Shipley complex	47	IIIc-2	VIc	--------	-------	-----	----
	Shipley silt loam, sandy subsoil variant	--	--------	----	NV 28-21	NV 28-2	2-41I	3-43
	Shipley silt loam, 0 to 2 percent slopes	--	--------	----	NV 28-25	NV 28-1	2-41I	3-43
SoA	Silverado sandy loam, 0 to 2 percent slopes	47	IVs-115	VIIs	NV 28-21	NV 28-3	2-41I	4-44
SoB	Silverado sandy loam, 2 to 4 percent slopes	47	IVe-45	VIIs	NV 28-21	NV 28-3	2-41I	4-44
StA	Silverado silt loam, occasionally flooded, 0 to 2 percent slopes	48	IVw-120	VIIw	NV 28-21	NV 28-3	2-41I	4-44
Tn	Tonkin fine sandy loam	51	IIIc-2	VIc	NV 28-21	NV 28-1	2-41I	3-43
To	Tonkin fine sandy loam, slightly wet	51	IIIw-121	VIw	NV 28-23	NV 28-4	2-12I	4-23
	LOW INTENSITY SURVEY							
AT	Atrypa association	18	--------	VIIs	--------	3x1	-----	4-43
AY	Atrypa-Hopeka association	18	--------	----	--------	-------	-----	----
	Atrypa very gravelly loam, 50 to 75 percent slopes	--	--------	VIIs	--------	3x1	-----	4-43
	Hopeka very gravelly loam, 50 to 75 percent slopes	--	--------	VIIs	--------	3d1	-----	4-44
	Rock outcrop	--	--------	VIIIs	--------	-------	-----	----
BA	Bartine-Overland association	19	--------	----	--------	3x1	-----	----
	Bartine gravelly loam, 15 to 50 percent slopes	--	--------	VIIe	--------	-------	-----	4-43
	Overland very gravelly loam, 15 to 50 percent slopes	--	--------	VIIs	--------	-------	-----	4-44
BC	Bartine-Siri association	19	--------	----	--------	-------	-----	----
	Bartine gravelly loam, 30 to 50 percent slopes	--	--------	VIIe	--------	3x1	-----	4-43
	Siri very gravelly loam, 30 to 50 percent slopes	--	--------	VIIs	NV 28-29	-------	-----	4-43
BD	Bicondoa-Dianev association	20	--------	VIIw	--------	-------	-----	----
	Bicondoa silty clay loam	--	--------	----	NV 28-27	-------	-----	3-13
	Dianev silty clay loam, strongly saline-alkali	--	--------	----	NV 28-26	-------	-----	4-23
BGD	Bobs gravelly loam, 4 to 15 percent slopes	20	--------	VIIs	NV 28-22	-------	-----	4-44
CS	Croesus-Sheege association	23	--------	----	--------	3x2	-----	----
	Croesus gravelly loam, 30 to 50 percent slopes	--	--------	VIIe	--------	-------	-----	4-43
	Sheege very cobbly loam, 30 to 75 percent slopes	--	--------	VIIs	--------	-------	-----	4-44
CY	Cyan association	24	--------	VIIs	NV 28-29	-------	-----	4-43
DC	Devoy-Rock outcrop complex	24	--------	VIIs	--------	-------	-----	----
	Devoy very stony loam, 30 to 50 percent slopes	--	--------	----	--------	3x1	-----	4-43
	Rock outcrop	--	--------	----	--------	-------	-----	----
DE	Devoy association	25	--------	VIIs	--------	3x1	-----	4-43
DN	Dianev silt loam	25	IIIs-111	VIs	NV 28-23	NV 28-4	2-31I	3-33
DO	Dianev silty clay loam	25	--------	VIIw	NV 28-26	-------	-----	4-23

Map symbol	Mapping unit	Page	Capability unit Irrigated	Capability unit Dryland	Range site	Windbreak or Woodland suitability group 1/	Wildlife suitability group Irrigated	Wildlife suitability group Dryland
			Symbol	Symbol	Symbol	Symbol	Symbol	Symbol
FAE	Fairydell gravelly loam, 15 to 30 percent slopes	26	--------	VIe	--------	3x1	-----	4-43
FR	Fera-Roca association	26	--------	VIIs	--------	3x1	-----	4-43
FU	Fusulina-Sheege association	27	--------	----	--------	3x2	-----	4-44
	Fusulina shaly loam, 50 to 75 percent slopes	--	--------	VIIe	--------	-------	-----	----
	Sheege very cobbly loam, 15 to 75 percent slopes	--	--------	VIIs	--------	-------	-----	----
GAE	Gabel gravelly loam, 15 to 30 percent slopes	27	--------	VIIe	NV 28-22	-------	-----	4-44
GB	Gabel-Badland association	27	--------	----	--------	-------	-----	----
	Gabel gravelly loam, 15 to 30 percent slopes	--	--------	VIIe	NV 28-22	-------	-----	4-44
	Badland	--	--------	VIIIe	--------	-------	-----	----
HDD	Handy gravelly loam, 4 to 15 percent slopes	29	--------	VIs	NV 28-29	-------	-----	3-43
HE	Hayeston-Silverado association	29	IVe-45	VIc	NV 28-21	NV 28-3	2-41I	4-44
HNB	Holtle loam, 0 to 4 percent slopes	30	IIIe-40	VIc	NV 28-20	NV 28-1	2-41I	3-43
HO	Hopeka-Labshaft association	31	--------	VIIs	--------	-------	-----	4-44
	Hopeka very gravelly loam, 15 to 50 percent slopes	--	--------	----	--------	3d1	-----	----
	Labshaft stony loam, 15 to 50 percent slopes	--	--------	----	--------	3x1	-----	----
HS	Hopeka-Sheege association	31	--------	VIIs	--------	-------	-----	4-44
	Hopeka very gravelly loam, 15 to 50 percent slopes	--	--------	----	--------	3d1	-----	----
	Sheege very cobbly loam, 30 to 75 percent slopes	--	--------	----	--------	3x2	-----	----
HUB	Hussa loam, 0 to 4 percent slopes	31	IIIw-120	VIw	NV 28-20	NV 28-1	2-31I	3-33
KHB	Kobeh gravelly fine sandy loam, 2 to 4 percent slopes	33	IVe-45	VIIs	NV 28-21	NV 28-2	3-42I	4-44
LAE	Labshaft-Locane association, steep	34	--------	VIIs	--------	3x1	-----	4-44
LAF	Labshaft-Locane association, very steep	34	--------	VIIs	--------	3x1	-----	4-44
LK	Labshaft-Rock outcrop complex	34	--------	VIIs	--------	-------	-----	----
	Labshaft stony loam, 15 to 30 percent slopes	--	--------	----	--------	3x1	-----	4-44
	Rock outcrop	--	--------	----	--------	-------	-----	----
LR	Lone-Rito association	35	--------	----	NV 28-21	-------	-----	----
	Lone gravelly loam, 4 to 8 percent slopes	--	IVe-45	VIIs	--------	NV 28-5	3-42I	4-44
	Credo gravelly loam, 4 to 8 percent slopes	--	IIIe-40	VIc	--------	NV 28-2	2-41I	3-43
	Rito gravelly loam, 4 to 8 percent slopes	--	IVe-45	VIIs	--------	NV 28-5	2-41I	4-44
MAE	Mau stony loam, 15 to 30 percent slopes	36	--------	VIIe	NV 28-29	-------	-----	4-43
NK	Nayped-Kobeh association	37	--------	----	NV 28-21	-------	-----	----
	Nayped loam, 0 to 2 percent slopes	--	IIIc-2	VIc	--------	NV 28-1	2-41I	3-43
	Kobeh gravelly sandy loam, 0 to 2 percent slopes	--	IVs-115	VIIs	--------	NV 28-2	3-42I	4-44
PL	Playas	39	--------	VIIIw	--------	-------	-----	----
PS	Playas-Dianev complex	40	--------	VIIIw	--------	-------	-----	----
	Playas	--	--------	----	--------	-------	-----	----
	Dianev silt loam, moderately saline-alkali	--	--------	----	NV 28-23	-------	2-31I	3-33
RAC	Ratto gravelly fine sandy loam, 2 to 8 percent slopes	40	--------	VIIs	NV 28-29	-------	-----	4-44

Map symbol	Mapping unit	Page	Capability unit Irrigated	Capability unit Dryland	Range site	Windbreak or Woodland suitability group 1/	Wildlife suitability group Irrigated	Wildlife suitability group Dryland
			Symbol	Symbol	Symbol	Symbol	Symbol	Symbol
RCD	Ratto very stony loam, 4 to 15 percent slopes	41	--------	VIIs	NV 28-29	-------	-----	4-44
RD	Ridit-Alpha association	41	--------	----	NV 28-29	-------	-----	----
	Ridit gravelly loam, 8 to 30 percent slopes	--	--------	VIIe	--------	-------	-----	4-43
	Alpha loam, 8 to 30 percent slopes	--	--------	VIe	--------	-------	-----	3-43
RHC	Rubyhill fine sandy loam, 2 to 8 percent slopes	43	IVe-45	VIIs	NV 28-21	NV 28-5	-----	4-43
RL	Rubyhill association	43	IVe-45	VIIs	NV 28-21	NV 28-5	-----	4-43
SA	Sader loam	44	IIIw-124	VIw	NV 28-26	NV 28-4	2-12I	3-13
SD	Sader loam, occasionally flooded	44	IIIw-124	VIw	NV 28-26	NV 28-4	2-12I	3-13
SE	Sheege-Croesus association	45	--------	----	--------	3x2	-----	----
	Sheege very cobbly loam, 30 to 75 percent slopes	--	--------	VIIs	--------	-------	-----	4-44
	Croesus gravelly loam, 30 to 50 percent slopes	--	--------	VIIe	--------	-------	-----	4-43
SMA	Shipley silt loam, occasionally flooded, 0 to 2 percent slopes	46	IIIw-120	VIw	NV 28-21	NV 28-1	2-41I	3-43
SRD	Silverado gravelly sandy loam, 4 to 15 percent slopes	47	IVe-45	VIIs	NV 28-21	NV 28-3	2-41I	4-44
SUF	Siri very gravelly loam, 30 to 50 percent slopes	48	--------	VIIs	NV 28-29	-------	-----	4-43
SVB	Stampede loam, 2 to 4 percent slopes	49	--------	VIIs	NV 28-29	-------	-----	4-43
TAD	Tahquats stony loam, 4 to 15 percent slopes	49	--------	VIIs	NV 28-29	-------	-----	3-43
TCF	Tica very stony loam, 30 to 50 percent slopes	50	--------	VIIs	--------	3x1	-----	4-44
TK	Tica-Rock outcrop complex	50	--------	VIIs	--------	-------	-----	----
	Tica very stony loam, 30 to 50 percent slopes	--	--------	----	--------	3x1	-----	4-44
	Rock outcrop	--	--------	----	--------	-------	-----	----
UMB	Umil loam, 2 to 4 percent slopes	51	--------	VIIs	NV 28-22	-------	-----	4-44
US	Umil association	52	--------	VIIs	NV 28-22	-------	-----	4-44
VN	Vinsad very fine sandy loam	53	--------	VIIw	NV 28-26	-------	-----	4-44

1/ Windbreak suitability groups shown by symbols such as NV 28-2; woodland suitability groups by 3x1.

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N

SOIL ASSOCIATIONS

SOILS OF OLD LAKE BOTTOMS, OLD FLOOD PLAINS, LOW LAKE TERRACES, AND RECENT ALLUVIAL FANS

1 — Nayped-Shipley association: Nearly level and gently sloping, well drained, very deep soils; on alluvial fans and lake terraces

2 — Playas-Dianev association: Playas and nearly level, somewhat poorly drained, very deep soils; on old lake bottoms and low lake terraces

3 — Kobeh-Alhambra association: Nearly level and gently sloping, somewhat excessively drained and well drained, very deep soils; on old flood plains and toe slopes of alluvial fans

SOILS OF OLD ALLUVIAL FANS, TERRACES, PEDIMENTS, AND FOOTHILLS

4 — Rubyhill association: Nearly level to moderately sloping, well drained soils that are moderately deep to a hardpan; on old alluvial fans

5 — Ridit-Alpha association: Strongly sloping and moderately steep, well drained, moderately deep and deep soils; on foothills

6 — Umil-Bobs association: Gently sloping to steep, well drained soils that are shallow to a hardpan; on old alluvial fans and terraces

7 — Fairydell-Gabel association: Moderately steep, well drained, very deep and moderately deep soils; on old dissected fans, pediments, and foothills

8 — Silverado-Hayeston-Credo association; Nearly level to strongly sloping, well drained, very deep soils; on old lake terraces and alluvial fans

9 — Ratto-Handy-Pedoli association: Gently sloping to strongly sloping, well drained soils that are shallow to a hardpan or are very deep; on old alluvial fans and lake terraces

SOILS OF THE HILLS AND MOUNTAINS

10 — Fera-Roca-Devoy association: Strongly sloping to steep, well drained, deep and moderately deep soils; on mountains and hills

11 — Labshaft-Hopeka association: Moderately steep to very steep, well drained to excessively drained, shallow soils; on mountains and hills

12 — Sheege-Fusulina-Croesus association: Steep and very steep, well drained, shallow and moderately deep soils; on mountains

13 — Bartine-Overland-Atrypa association: Moderately sloping to very steep, well drained, moderately deep and shallow soils; on mountains and foothills

Compiled 1979

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

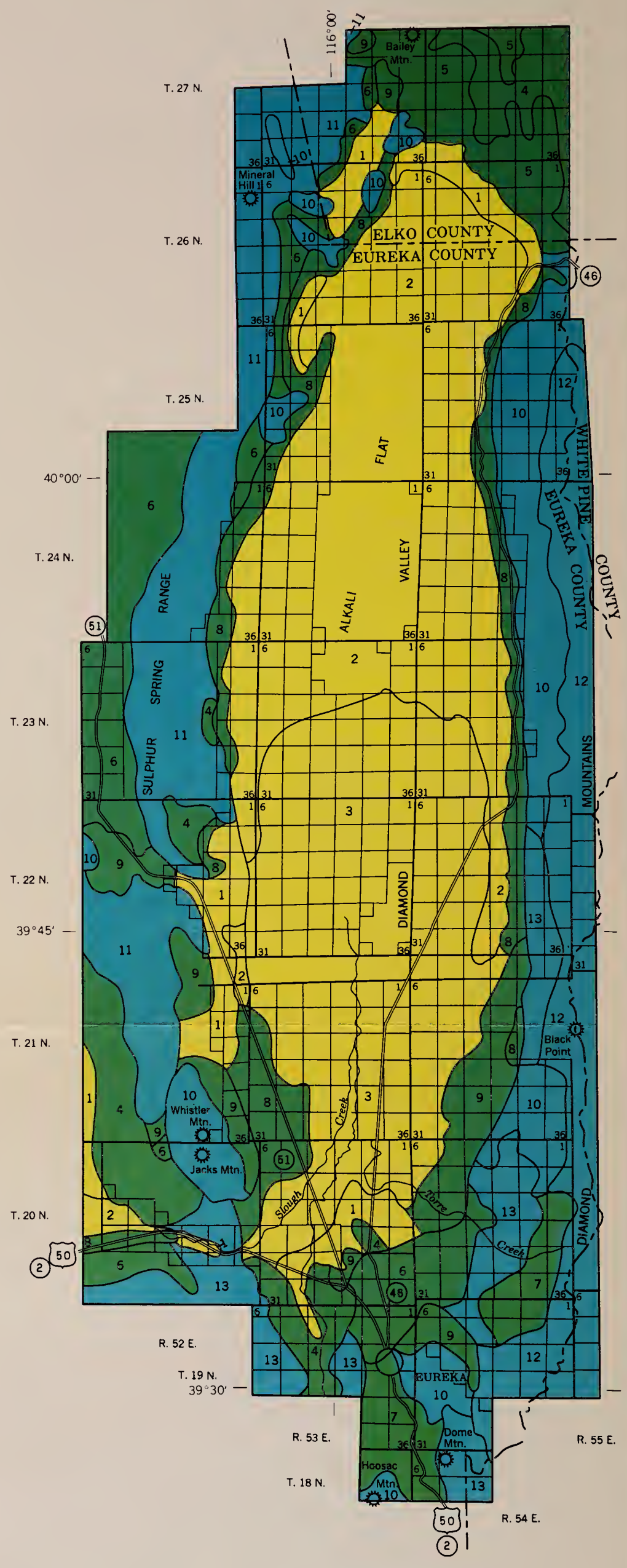
U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

NEVADA AGRICULTURAL EXPERIMENT STATION

GENERAL SOIL MAP

DIAMOND VALLEY AREA, NEVADA, PARTS OF ELKO, EUREKA, AND WHITE PINE COUNTIES

Scale 1: 316,800
1 0 1 2 3 4 5 Miles



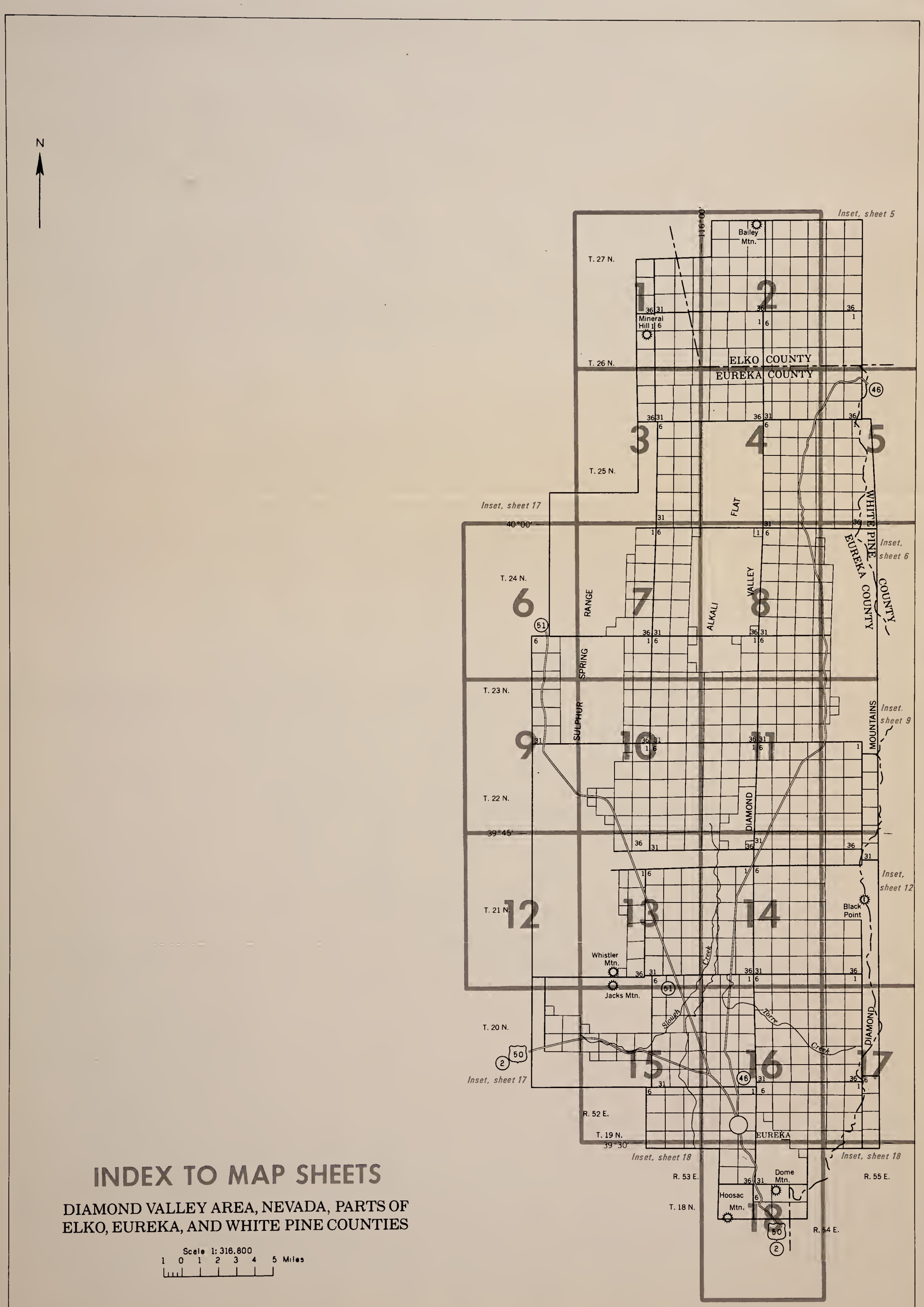
Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.

INDEX TO MAP SHEETS

DIAMOND VALLEY AREA, NEVADA, PARTS OF ELKO, EUREKA, AND WHITE PINE COUNTIES

Scale 1: 316,800

1 0 1 2 3 4 5 Miles



U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

DIAMOND VALLEY AREA, NEVADA, PARTS OF ELKO, EUREKA AND WHITE PINE COUNTIES

U.S. DEPARTMENT OF THE INTERIOR, BUREAU OF LAND MANAGEMENT
UNIVERSITY OF NEVADA AGRICULTURAL EXPERIMENT STATION

SOIL LEGEND

SYMBOL Low Intensity	SYMBOL High Intensity	NAME
	Ab	Alhambra fine sandy loam
	AbC	Alhambra fine sandy loam, hummocky
	AC	Alhambra silt loam
	Ad	Alhambra silt loam, silty substratum
	Ah	Alhambra complex
	Ak	Alhambra-Kobeh complex
	Am	Alhambra-Kobeh complex, saline
	As	Alhmabra-Shipley complex
AT		Atrypa association
AY		Atrypa-Hopeka association
BA		Bartine-Overland association
BC		Bartine-Siri association
BD		Bicondoa-Dianev association
BGD		Bobs gravelly loam, 4 to 15 percent slopes
	Br	Bruffy silt loam
	Bs	Bruffy silt loam, alkali
	Bu	Bruffy-Kobeh complex
	CfB	Credo fine sandy loam, 2 to 4 percent slopes
	CgC	Credo gravelly loam, 4 to 8 percent slopes
CS		Croesus-Sheege association
CY		Cyan association
DC		Devoy-Rock outcrop complex
DE		Devoy association
DN		Dianev silt loam
DO		Dianev silty clay loam
FAE		Fairydell gravelly loam, 15 to 30 percent slopes
FR		Fera-Roca association
FU		Fusulina-Sheege association
GAE		Gabel gravelly loam, 15 to 30 percent slopes
GB		Gabel-Badland association
	HaA	Hamacer loamy fine sand, 0 to 2 percent slopes
HDD		Handy gravelly loam, 4 to 15 percent slopes
HE		Hayeston-Silverado association
	HtA	Holtle loam, 0 to 2 percent slopes
	HmA	Holtle loam, occasionally flooded, 0 to 2 percent slopes
HNB		Holtle loam, 0 to 4 percent slopes
HO		Hopeka-Labshaft association
HS		Hopeka-Sheege association
HUB		Hussa loam, 0 to 4 percent slopes
	KbA	Kobeh sandy loam, 0 to 2 percent slopes
	KgA	Kobeh gravelly sandy loam, 0 to 2 percent slopes
KHB		Kobeh gravelly fine sandy loam, 2 to 4 percent slopes
	Km	Kobeh sandy loam, sandy subsoil variant

SYMBOL Low Intensity	SYMBOL High Intensity	NAME
LAE		Labshaft-Locane association, steep
LAF		Labshaft-Locane association, very steep
LK		Labshaft-Rock outcrop complex
	LmA	Lone gravelly sandy loam, 0 to 2 percent slopes
	LnB	Lone gravelly loam, undulating
LR		Lone-Rito association
MAE		Mau stony loam, 15 to 30 percent slopes
	NaB	Nayped loamy very fine sand, 2 to 4 percent slopes
	NdA	Nayped loam, 0 to 2 percent slopes
	NdB	Nayped loam, 2 to 4 percent slopes
NK		Nayped-Kobeh association
	Ns	Neyka silt loam
	PeB	Pedoli gravelly fine sandy loam, 2 to 4 percent slopes
PL		Playas
PS		Playas-Dianev complex
RAC		Ratto gravelly fine sandy loam, 2 to 8 percent slopes
RCD		Ratto very stony loam, 4 to 15 percent slopes
RD		Ridit-Alpha association
	RfA	Rubyhill fine sandy loam, 0 to 2 percent slopes
RHC		Rubyhill fine sandy loam, 2 to 8 percent slopes
RL		Rubyhill association
SA		Sader loam
SD		Sader loam, occasionally flooded
SE		Sheege-Croesus association
	SfB	Shipley fine sandy loam, 2 to 4 percent slopes
	ShA	Shipley silt loam, 0 to 2 percent slopes
	SlA	Shipley silt loam, moderately saline-alkali, 0 to 2 percent slopes
SMA		Shipley silt loam, occasionally flooded, 0 to 2 percent slopes
	Sn	Shipley complex
	SoA	Silverado sandy loam, 0 to 2 percent slopes
	SoB	Silverado sandy loam, 2 to 4 percent slopes
SRD		Silverado silt loam, occasionally flooded, 0 to 2 percent slopes
SUF		Siri very gravelly loam, 30 to 50 percent slopes
SVB		Stampede loam, 2 to 4 percent slopes
TAD		Tahquats stony loam, 4 to 15 percent slopes
TCF		Tica very stony loam, 30 to 50 percent slopes
TK		Tica-Rock outcrop complex
	Tn	Tonkin fine sandy loam
	To	Tonkin fine sandy loam, slightly wet
UMB		Umil loam, 2 to 4 percent slopes
US		Umil association
VN		Vinsad very fine sandy loam

CONVENTIONAL AND SPECIAL SYMBOLS LEGEND

CULTURAL FEATURES

BOUNDARIES
- National, state or province
- County or parish
- Minor civil division
- Reservation (national forest or park, state forest or park, and large airport)
- Land grant
- Limit of soil survey (label)
- Field sheet matchline & neatline

AD HOC BOUNDARY (label)
- Small airport, airfield, park, oilfield, cemetery, or flood pool — Davis Airstrip; FLOOD POOL LINE

STATE COORDINATE TICK

LAND DIVISION CORNERS (sections and land grants)

ROADS
- Divided (median shown if scale permits)
- Other roads
- Trail

ROAD EMBLEMS & DESIGNATIONS
- Interstate — 79
- Federal — 410
- State — 52
- County, farm or ranch — 378

RAILROAD

POWER TRANSMISSION LINE (normally not shown)

PIPE LINE (normally not shown)

FENCE (normally not shown)

LEVEES
- Without road
- With road
- With railroad

DAMS
- Large (to scale)
- Medium or small — water; w

PITS
- Gravel pit — G.P.
- Mine or quarry

MISCELLANEOUS CULTURAL FEATURES
- Farmstead, house (omit in urban areas)
- Church
- School
- Indian mound (label) — Indian Mound
- Located object (label) — Tower
- Tank (label) — GAS
- Wells, oil or gas
- Windmill
- Kitchen midden

WATER FEATURES

DRAINAGE
- Perennial, double line
- Perennial, single line
- Intermittent
- Drainage end
- Canals or ditches
  - Double-line (label) — CANAL
  - Drainage and/or irrigation

LAKES, PONDS AND RESERVOIRS
- Perennial — water; w
- Intermittent — int; i

MISCELLANEOUS WATER FEATURES
- Marsh or swamp
- Spring
- Well, artesian
- Well, irrigation
- Wet spot

SPECIAL SYMBOLS FOR SOIL SURVEY

SOIL DELINEATIONS AND SYMBOLS — SvE 107

ESCARPMENTS
- Bedrock (points down slope)
- Other than bedrock (points down slope)

SHORT STEEP SLOPE

GULLY

DEPRESSION OR SINK

SOIL SAMPLE SITE (normally not shown)

MISCELLANEOUS
- Blowout
- Clay spot
- Gravelly spot
- Gumbo, slick or scabby spot (sodic)
- Dumps and other similar non soil areas
- Prominent hill or peak
- Rock outcrop (includes sandstone and shale)
- Saline spot
- Sandy spot
- Severely eroded spot
- Slide or slip (tips point upslope)
- Stony spot, very stony spot
- Stockwater well

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SHEET NO. 1

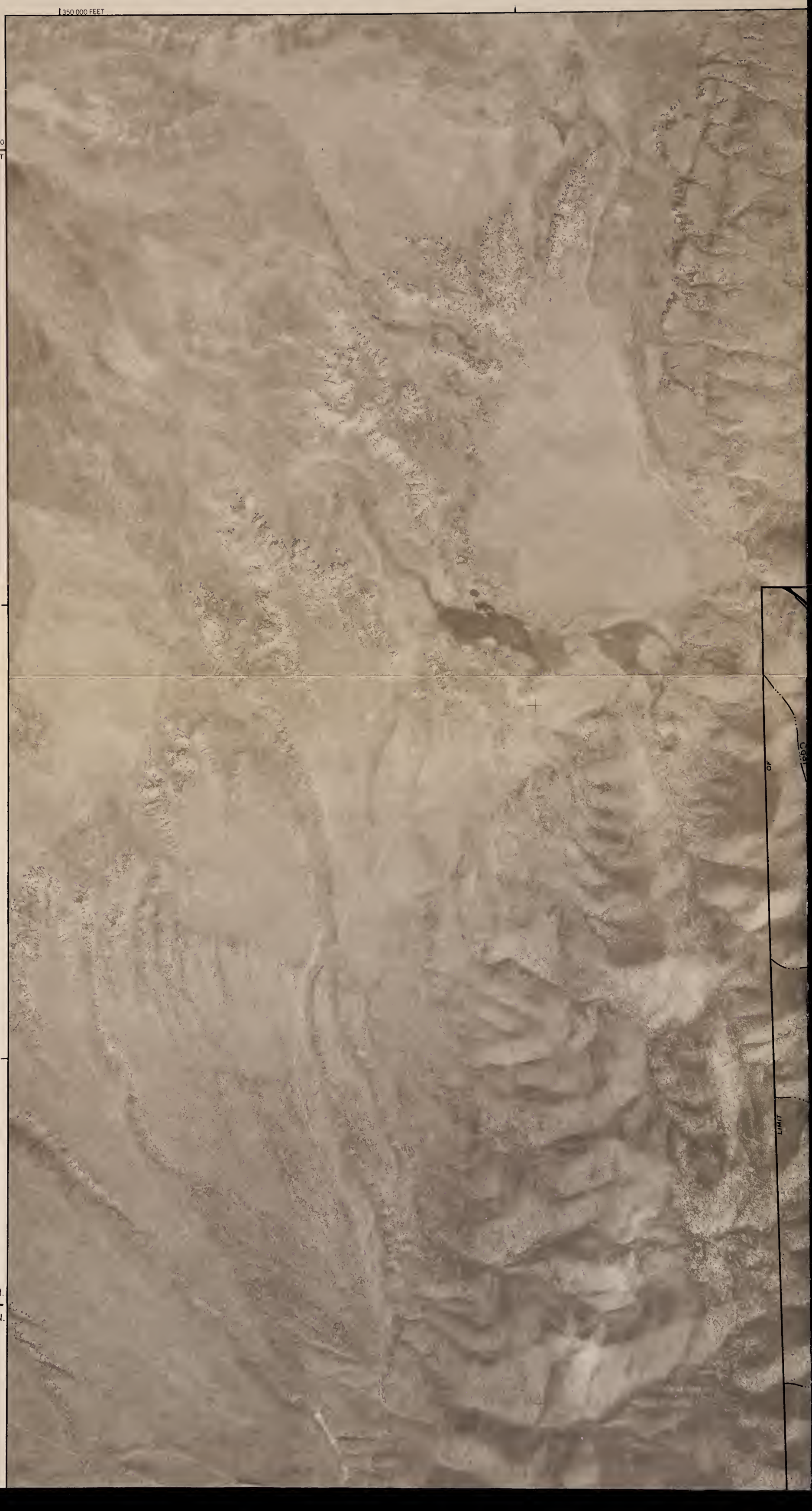
DIAMOND VALLEY AREA, PART OF EUREKA, ELKO AND WHITE PINE COUNTIES, NEVADA
(MINERAL HILL NE QUADRANGLE)

This soil survey was compiled in 1978 by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies

1 ¾ ½ ¼ 0 1 2 Miles
5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet
Scale 1:24000

Orthophotobase compiled from 1975 and 1976 aerial photography by the U. S. Department of The Interior, Geological Survey
Planimetric detail obtained from 7½ minute series maps
10,000-foot grid based on state coordinate system.

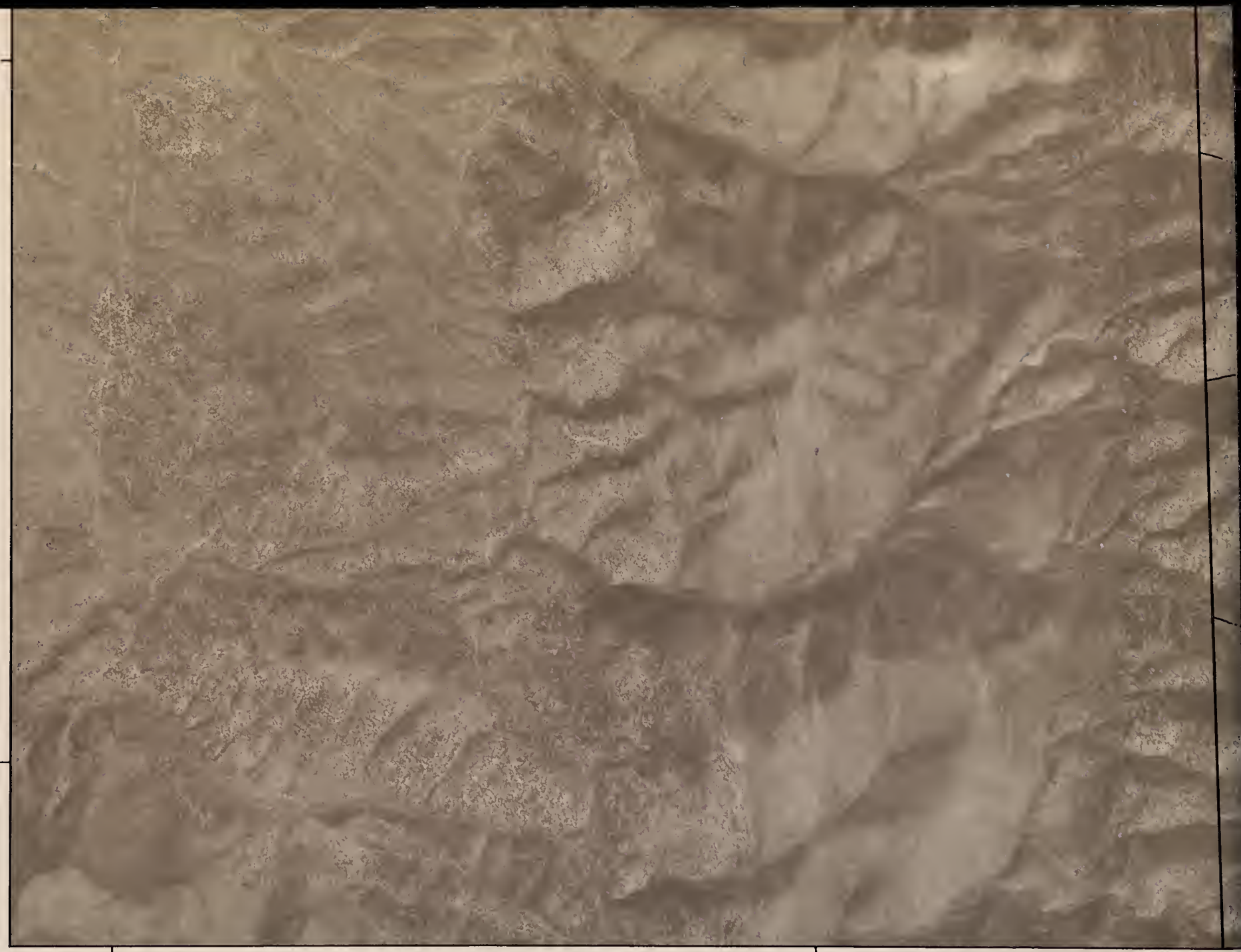
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE



SHEET NO. 1

DIAMOND VALLEY AREA, PART OF EUREKA, ELKO AND WHITE PINE COUNTIES, NEVADA

(MINERAL HILL NE QUADRANGLE)



40°07'30"
116°07'30"

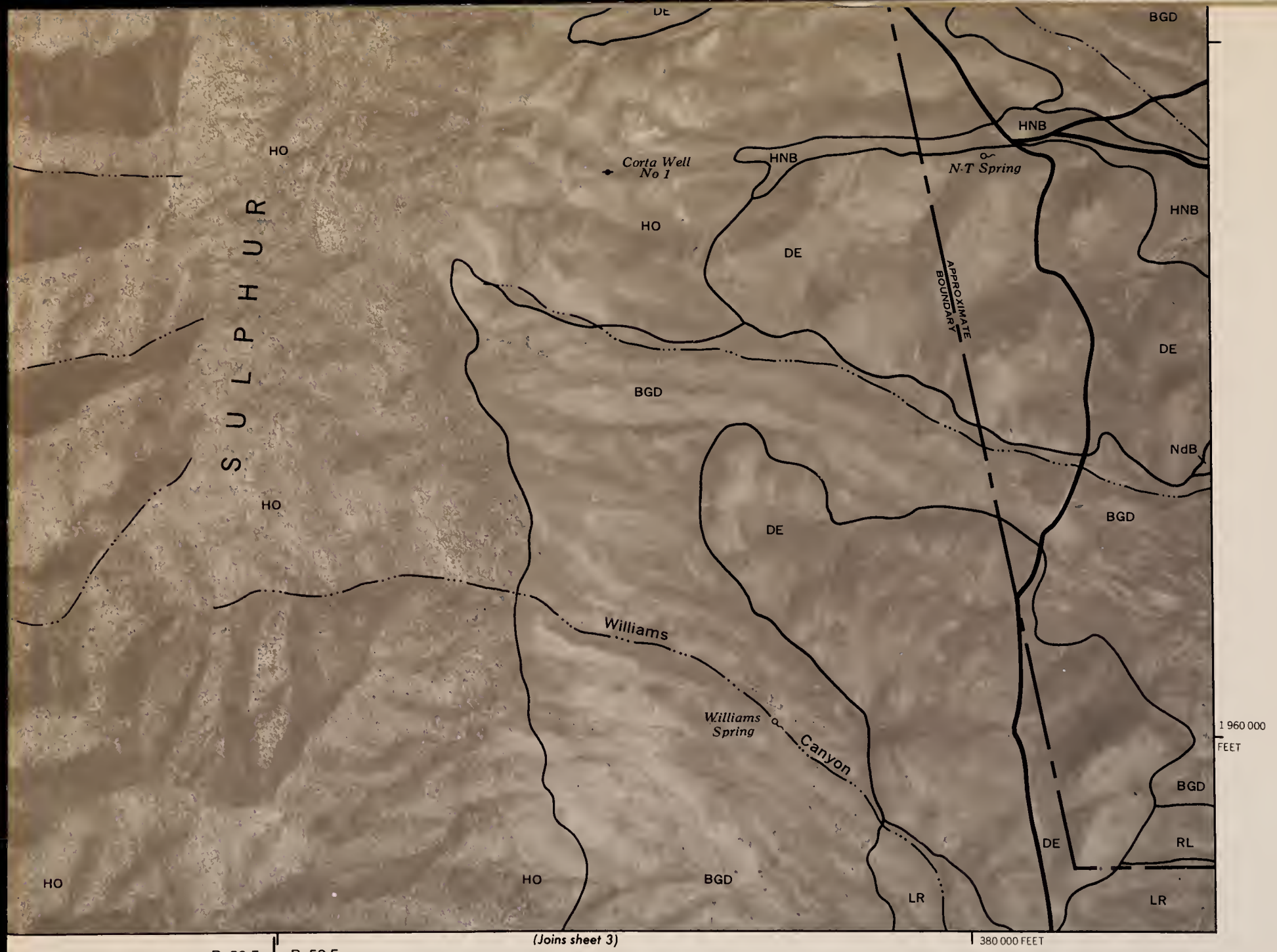
This soil survey was compiled in 1978 by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies

1 ¾ ½ ¼ 0

5000 4000 3000 2000 1000 0

Scale 1:

DIAMOND VALLEY AR



Orthophotobase compiled from 1975 and 1976 aerial photography by the U.S. Department of The Interior, Geological Survey. Planimetric detail obtained from 7½ minute series maps. 10,000-foot grid based on state coordinate system.

EA, NEVADA NO. 1

SHEET NO. 1 OF 18

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

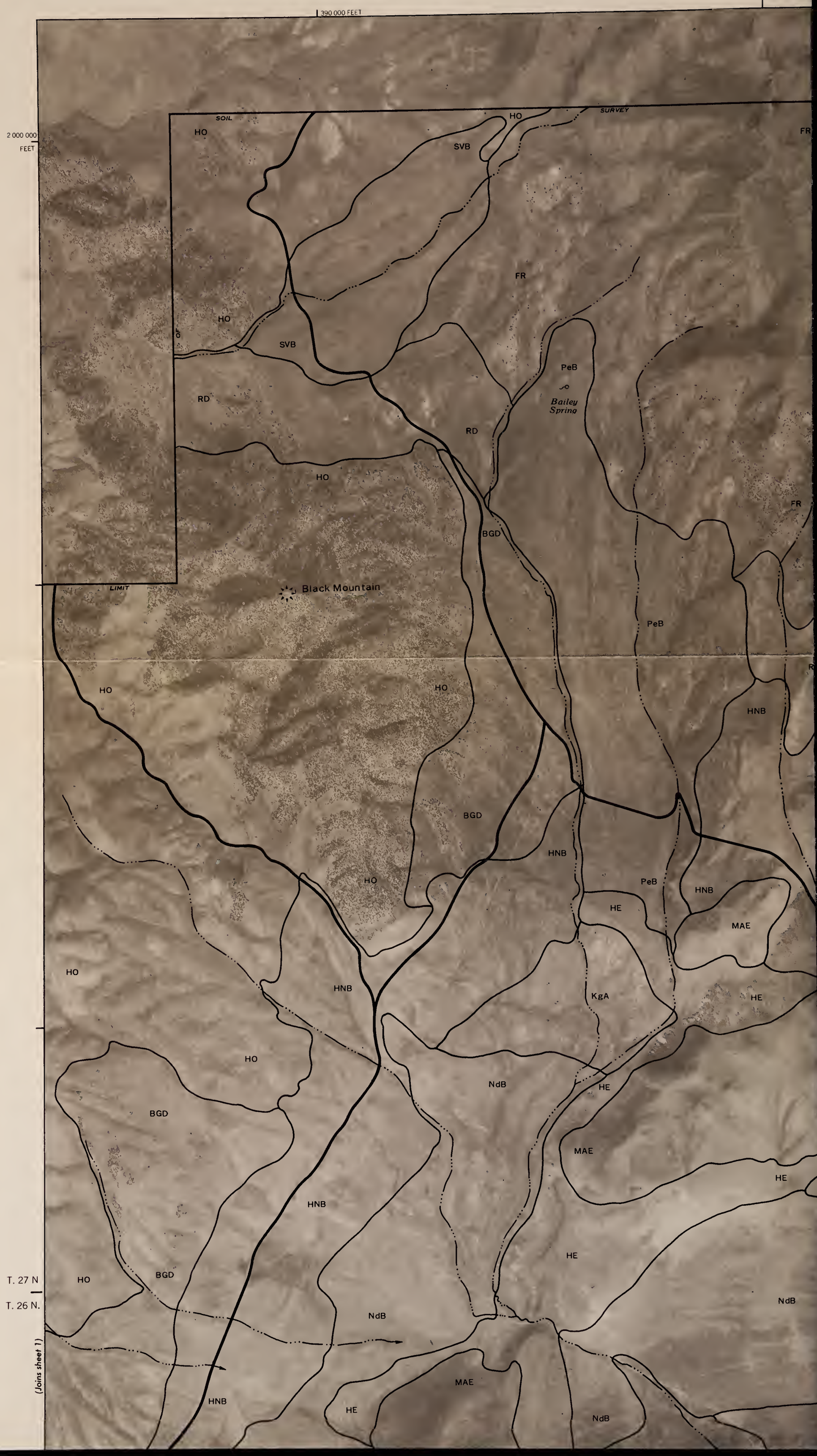
SHEET NO. 2
DIAMOND VALLEY AREA, PART OF EUREKA, ELKO AND WHITE PINE COUNTIES, NEVADA
(RAILROAD PASS NW QUADRANGLE)

1 ¾ ½ ¼ 0 1 2 Miles
5000 4000 3000 2000 1000 0 5000 10000 Feet
Scale 1:24000

This soil survey was compiled in 1978 by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies

Orthophotobase compiled from 1975 and 1976 aerial photography by the U.S. Department of The Interior, Geological Survey
Planimetric detail obtained from 7½ minute series maps
10,000-foot grid based on state coordinate system

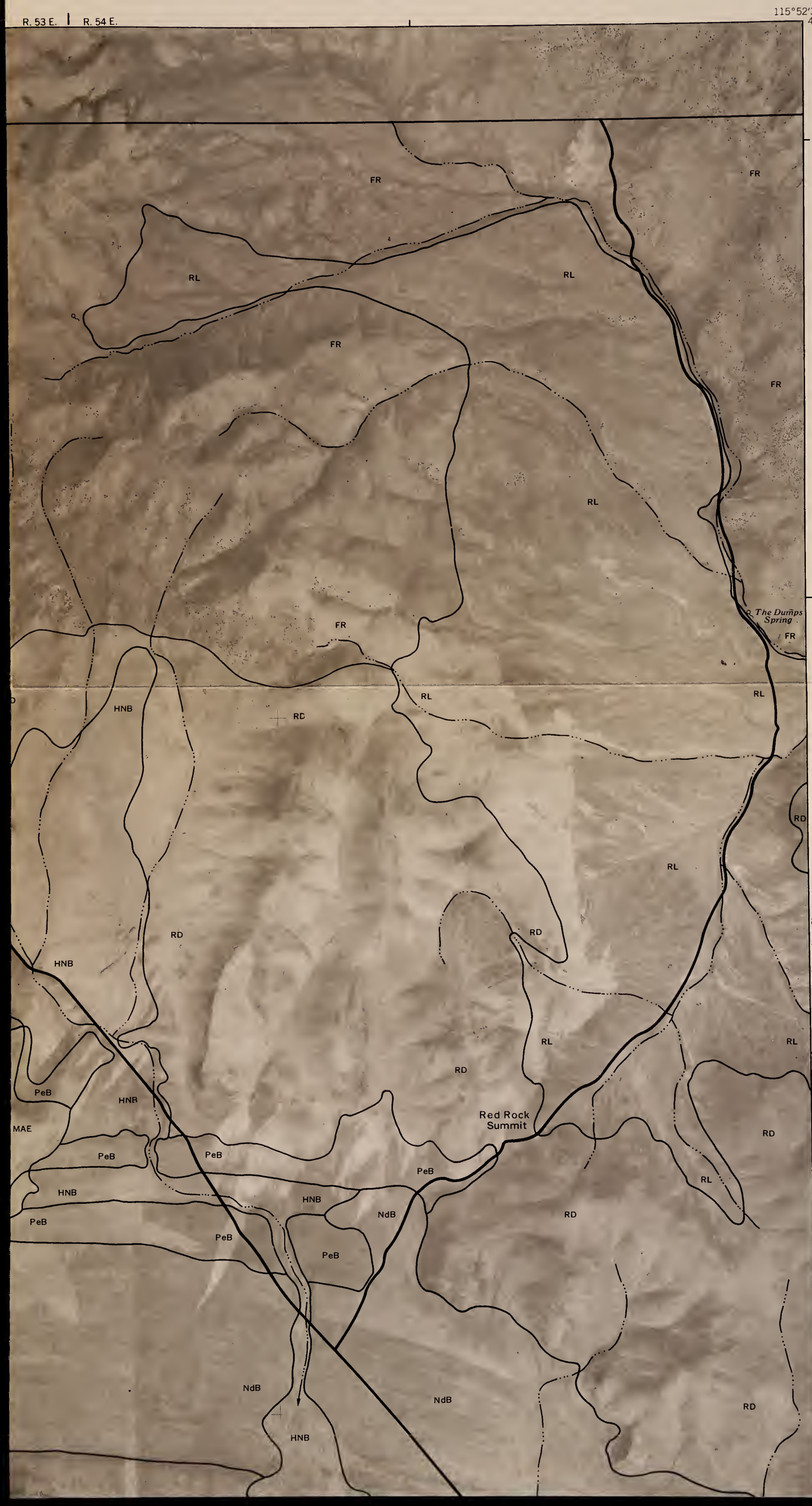
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE



SHEET NO. 2

DIAMOND VALLEY AREA, PART OF EUREKA, ELKO AND WHITE PINE COUNTIES, NEVADA

(RAILROAD PASS NW QUADRANGLE)



(Joins sheet 4)

This soil survey was compiled in 1978 by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies

1 ¾ ½ ¼ 0

5000 4000 3000 2000 1000 0

Scale 1

DIAMOND VALLEY A

1 2 Miles

5000 10000 Feet

:24000

Orthophotobase compiled from 1975 and 1976 aerial photography by the U.S. Department of The Interior, Geological Survey.
Planimetric detail obtained from 7½ minute series maps.
10,000-foot grid based on state coordinate system.

REA, NEVADA NO. 2

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SHEET NO. 3

DIAMOND VALLEY AREA, PART OF EUREKA, ELKO AND WHITE PINE COUNTIES, NEVADA
(MINERAL HILL SE QUADRANGLE)

This soil survey was compiled in 1978 by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies

1 ¾ ½ ¼ 0 1 2 Miles
5000 4000 3000 2000 1000 0 5000 10000 Feet
Scale 1:24000

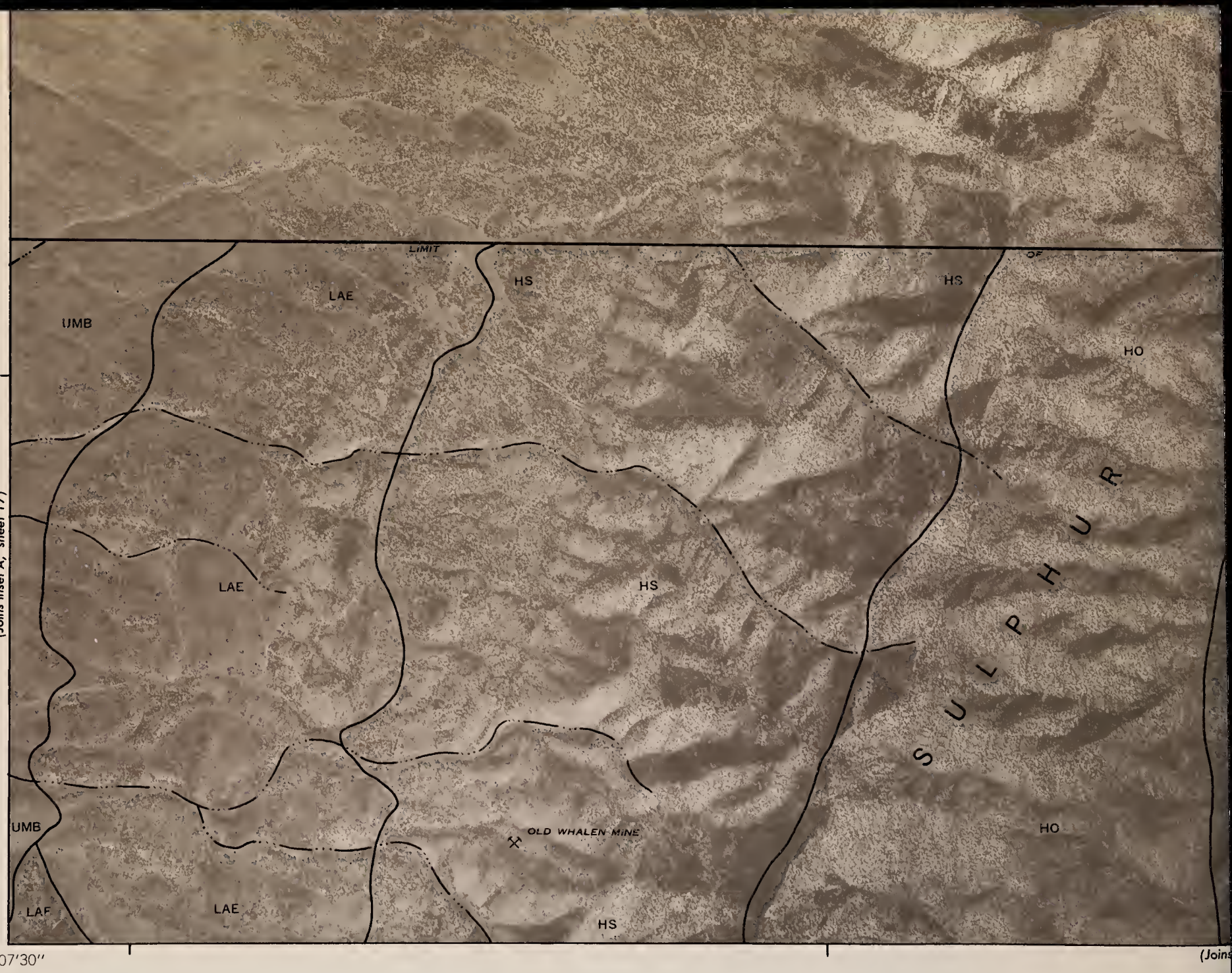
Orthophotobase compiled from 1975 and 1976 aerial photography by the U S Department of The Interior, Geological Survey
Planimetric detail obtained from 7½ minute series maps
10,000-foot grid based on state coordinate system

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SHEET NO. 3

DIAMOND VALLEY AREA, PART OF EUREKA, ELKO AND WHITE PINE COUNTIES, NEVADA

(MINERAL HILL SE QUADRANGLE)



This soil survey was compiled in 1978 by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies

1 920 000
FEET

380 000 FEET

sheet 7)

R. 52 E. | R. 53 E.

1 2 Miles

24000 5000 10000 Feet

Orthophotobase compiled from 1975 and 1976 aerial photography by the U.S. Department of The Interior, Geological Survey
Planimetric detail obtained from 7½ minute series maps.
10,000-foot grid based on state coordinate system.

EA, NEVADA NO. 3

SHEET NO. 3 OF 18

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SHEET NO. 4

DIAMOND VALLEY AREA, PART OF EUREKA, ELKO AND WHITE PINE COUNTIES, NEVADA

(RAILROAD PASS SW QUADRANGLE)

Scale 1:24000

This soil survey was compiled in 1978 by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies

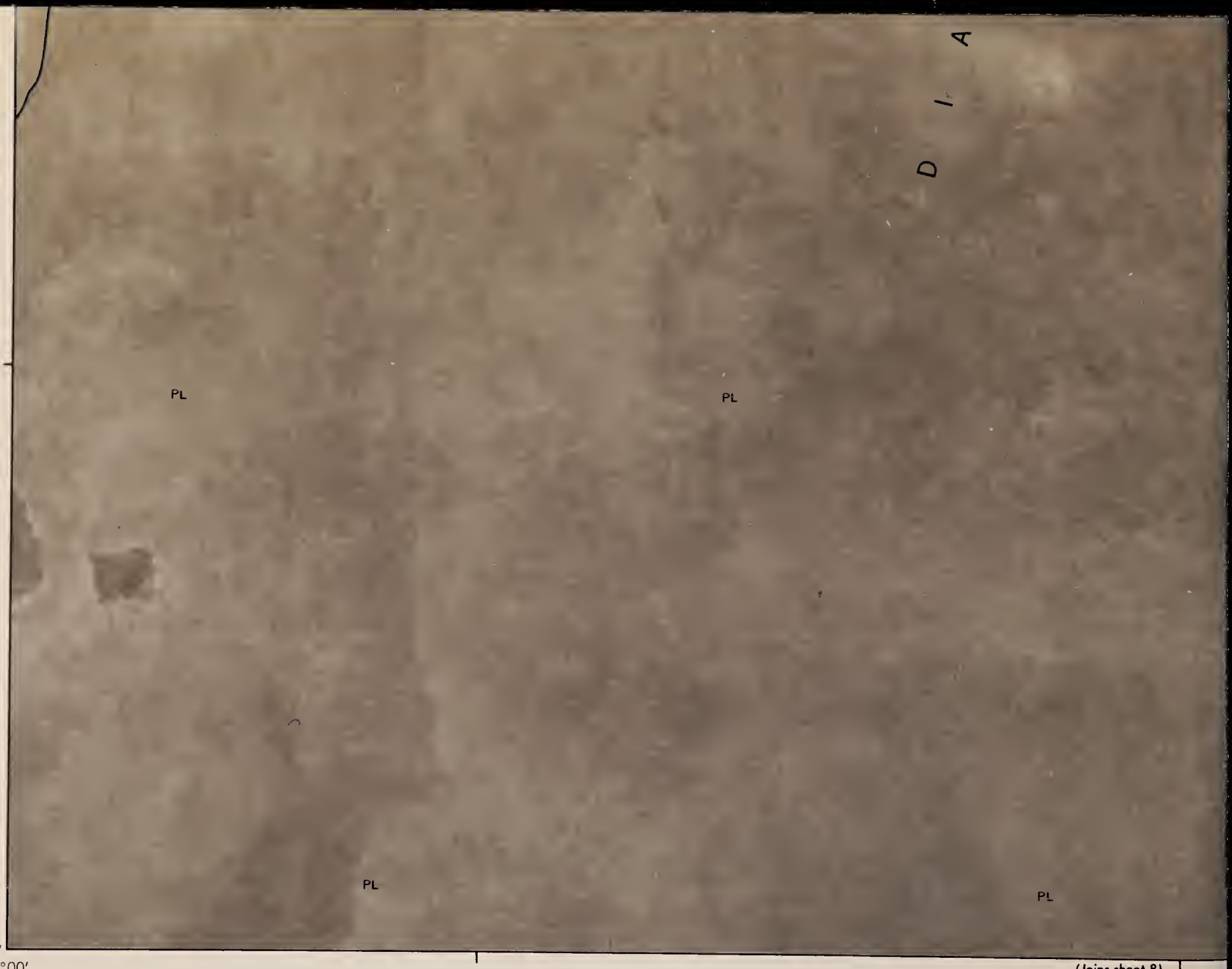
Orthophotobase compiled from 1975 and 1976 aerial photography by the U.S. Department of The Interior, Geological Survey
Planimetric detail obtained from 7½ minute series maps
10,000-foot grid based on state coordinate system

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SHEET NO. 4

DIAMOND VALLEY AREA, PART OF EUREKA, ELKO AND WHITE PINE COUNTIES, NEVADA

(RAILROAD PASS SW QUADRANGLE)

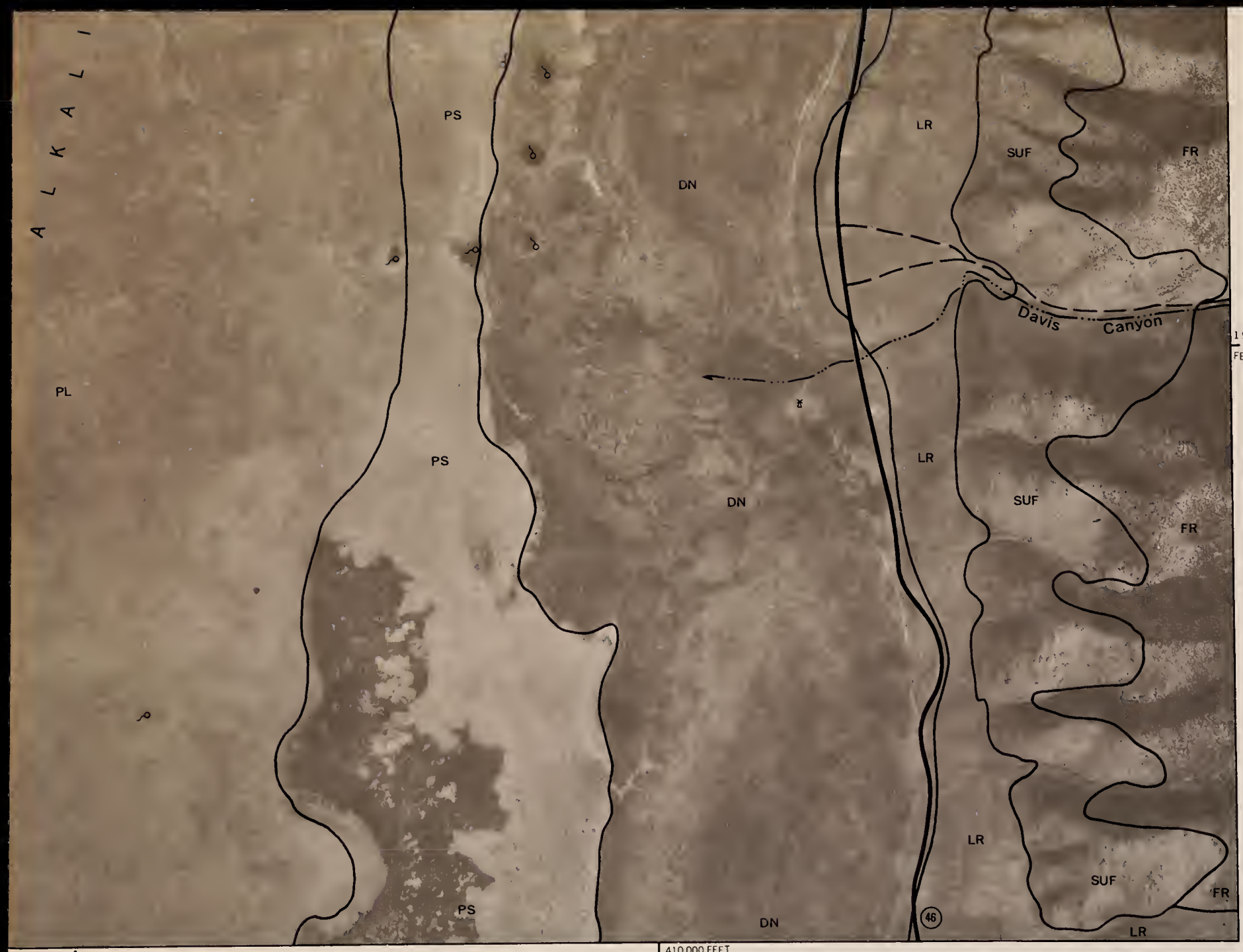


This soil survey was compiled in 1978 by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies

1 ¾ ½ ¼ 0
5000 4000 3000 2000 1000 0

Scale 1

DIAMOND VALLEY A



R. 53 E. | R. 54 E.

1 2 Miles

5000 10000 Feet

:24000

Orthophotobase compiled from 1975 and 1976 aerial photography by the U.S. Department of The Interior, Geological Survey. Planimetric detail obtained from 7½ minute series maps. 10,000-foot grid based on state coordinate system.

EA, NEVADA NO. 4

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SHEET NO. 5

DIAMOND VALLEY AREA, PART OF EUREKA, ELKO AND WHITE PINE COUNTIES, NEVADA

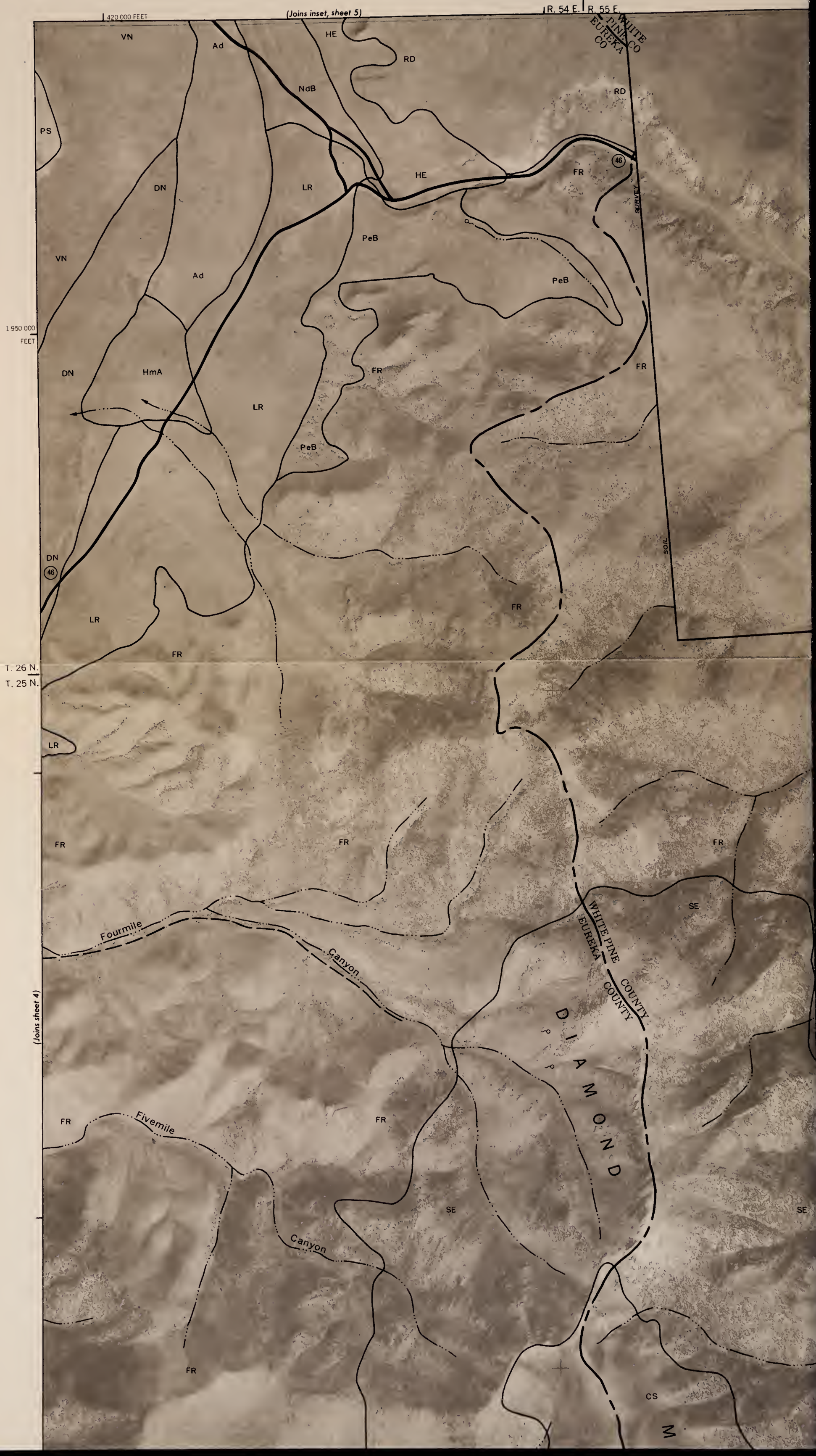
(RAILROAD PASS SE AND RAILROAD PASS NE QUADRANGLES)

This soil survey was compiled in 1978 by the U S Department of Agriculture, Soil Conservation Service and cooperating agencies

Scale 1:24000

Orthophotobase compiled from 1975 and 1976 aerial photography by the U S Department of The Interior Geological Survey
Planimetric detail obtained from 7½ minute series maps
10,000-foot grid based on state coordinate system

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE



SHEET NO. 5

DIAMOND VALLEY AREA, PART OF EUREKA, ELKO AND WHITE PINE COUNTIES, NEVADA

(RAILROAD PASS SE AND RAILROAD PASS NE QUADRANGLES)

This soil survey was compiled in 1978 by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies

1 ¾ ½ ¼ 0

5 000 4 000 3 000 2 000 1 000 0

Scale 1

DIAMOND VALLEY A

1 2 Miles

24000 5000 10000 Feet

Orthophotobase compiled from 1975 and 1976 aerial photography by the U.S. Department of The Interior, Geological Survey
Planimetric detail obtained from 7½ minute series maps.
10,000-foot grid based on state coordinate system.

EA, NEVADA NO. 5

SHEET NO. 5 OF 18

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SHEET NO. 6

DIAMOND VALLEY AREA, PART OF EUREKA, ELKO AND WHITE PINE COUNTIES, NEVADA

(GARDEN VALLEY NW AND DIAMOND SPRINGS NE QUADRANGLES)

This soil survey was compiled in 1978 by the U.S Department of Agriculture, Soil Conservation Service and cooperating agencies

1 ⅞ ¾ ½ 0 1 2 Miles
5000 4000 3000 2000 1000 0 5000 10000 Feet
Scale 1:24000

Orthophotobase compiled from 1975 and 1976 aerial photography by the U.S. Department of The Interior, Geological Survey
Planimetric detail obtained from 7½ minute series maps
10,000-foot grid based on state coordinate system.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SHEET NO. 6

DIAMOND VALLEY AREA, PART OF EUREKA, ELKO AND WHITE PINE COUNTIES, NEVADA

(GARDEN VALLEY NW AND DIAMOND SPRINGS NE QUADRANGLES)

This soil survey was compiled in 1978 by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies

1 ¾ ½ ¼ 0

5 000 4 000 3 000 2 000 1 000 0

Scale 1:

DIAMOND VALLEY AR

T. 24 N.
T. 23 N.

N.

T. 24 N.
T. 23 N.

1 870 000
FEET

39°52'30"
116°11'30"

R. 51 E. | R. 52 E.

5000 AND 10000 FOOT GRID TICKS

(Joins sheet 9)

345 000 FEET

1 2 Miles

5000 10000 Feet

24000

Orthophotobase compiled from 1975 and 1976 aerial photography
by the U.S. Department of The Interior, Geological Survey
Planimetric detail obtained from 7½ minute series maps.
10,000-foot grid based on state coordinate system.

EA, NEVADA NO. 6

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SHEET NO. 7

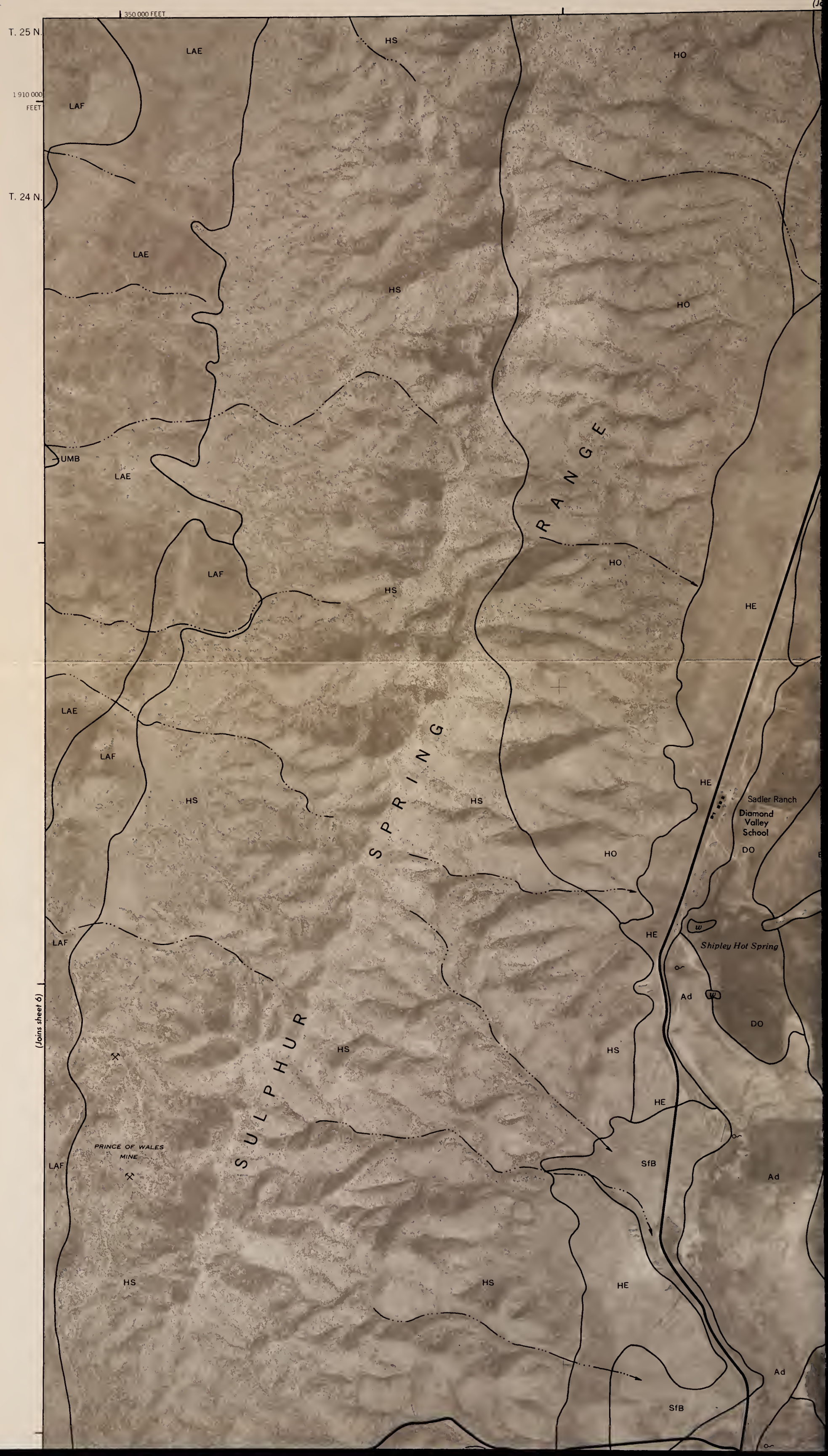
DIAMOND VALLEY AREA, PART OF EUREKA, ELKO AND WHITE PINE COUNTIES, NEVADA
(GARDEN VALLEY NE QUADRANGLE)

This soil survey was compiled in 1978 by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies

1 ¾ ½ ¼ 0 1 2 Miles
5000 4000 3000 2000 1000 0 5000 10000 Feet
Scale 1:24000

Orthophotobase compiled from 1975 and 1976 aerial photography by the U.S. Department of The Interior, Geological Survey
Planimetric detail obtained from 7½ minute series maps
10,000-foot grid based on state coordinate system.

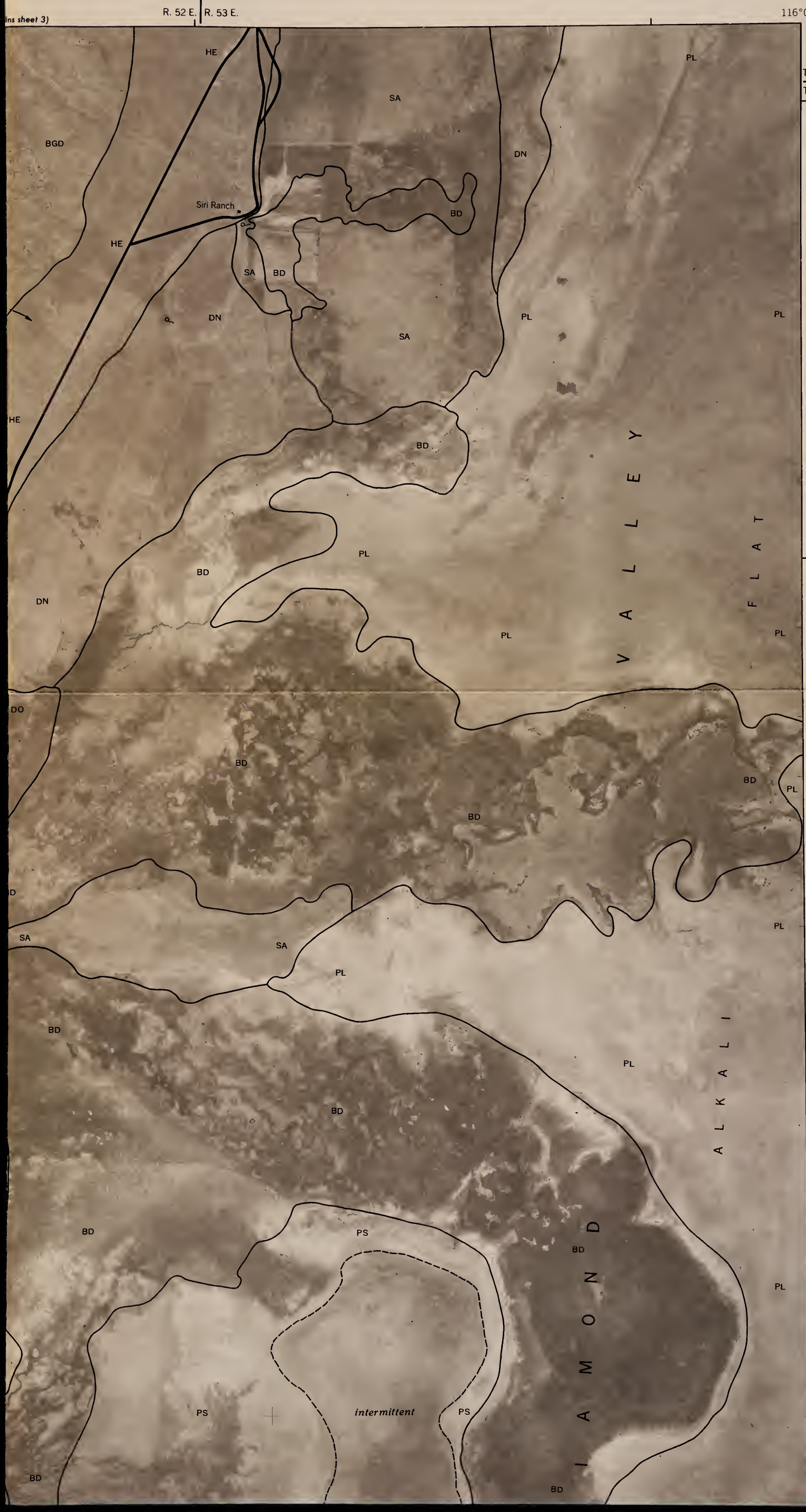
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE



SHEET NO. 7

DIAMOND VALLEY AREA, PART OF EUREKA, ELKO AND WHITE PINE COUNTIES, NEVADA

(GARDEN VALLEY NE QUADRANGLE)



T. 24 N.
T. 23 N.

LAF
HS
Bailey Pass
HS
HE
Bailey Ranch
DN
Ad
LAE
RHC
SfB
Ad
DN
DO
HS
HS
HE
RAC
LAE
HS
RHC
HS
HE
HE
ShA
SIA
Ad
DN
Romano Ranch

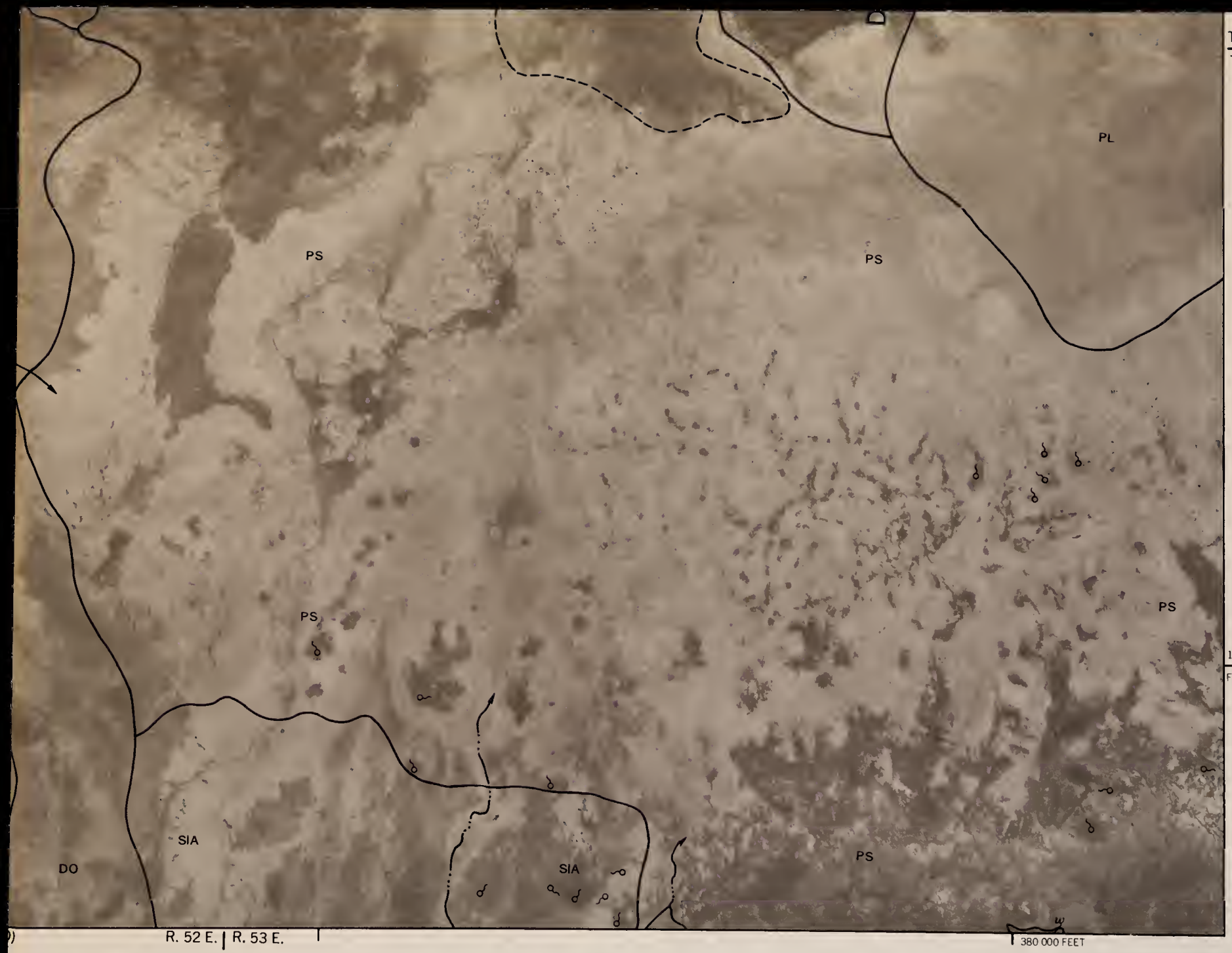
39°52′30″
116°07′30″

(Joins sheet 1

1 ¾ ½ ¼ 0
5000 4000 3000 2000 1000 0

Scale 1

This soil survey was compiled in 1978 by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies



1 2 Miles

5000 10000 Feet

:24000

Orthophotobase compiled from 1975 and 1976 aerial photography by the U.S. Department of The Interior, Geological Survey.
Planimetric detail obtained from 7½ minute series maps.
10,000-foot grid based on state coordinate system.

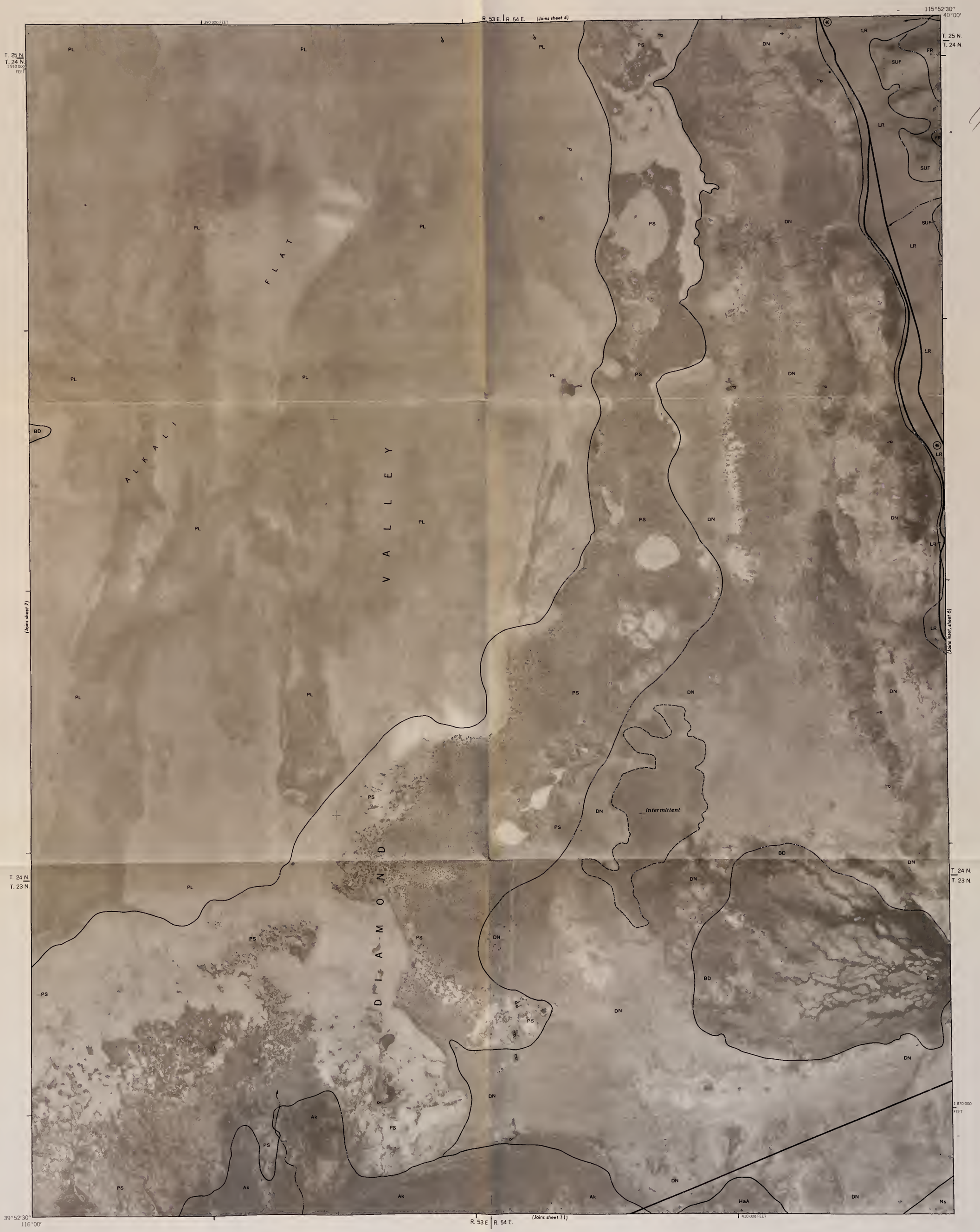
REA, NEVADA NO. 7

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SHEET NO. 8

DIAMOND VALLEY AREA, PART OF EUREKA, ELKO AND WHITE PINE COUNTIES, NEVADA

(DIAMOND SPRINGS NW QUADRANGLE)



1 ¾ ½ ¼ 0 1 2 Miles

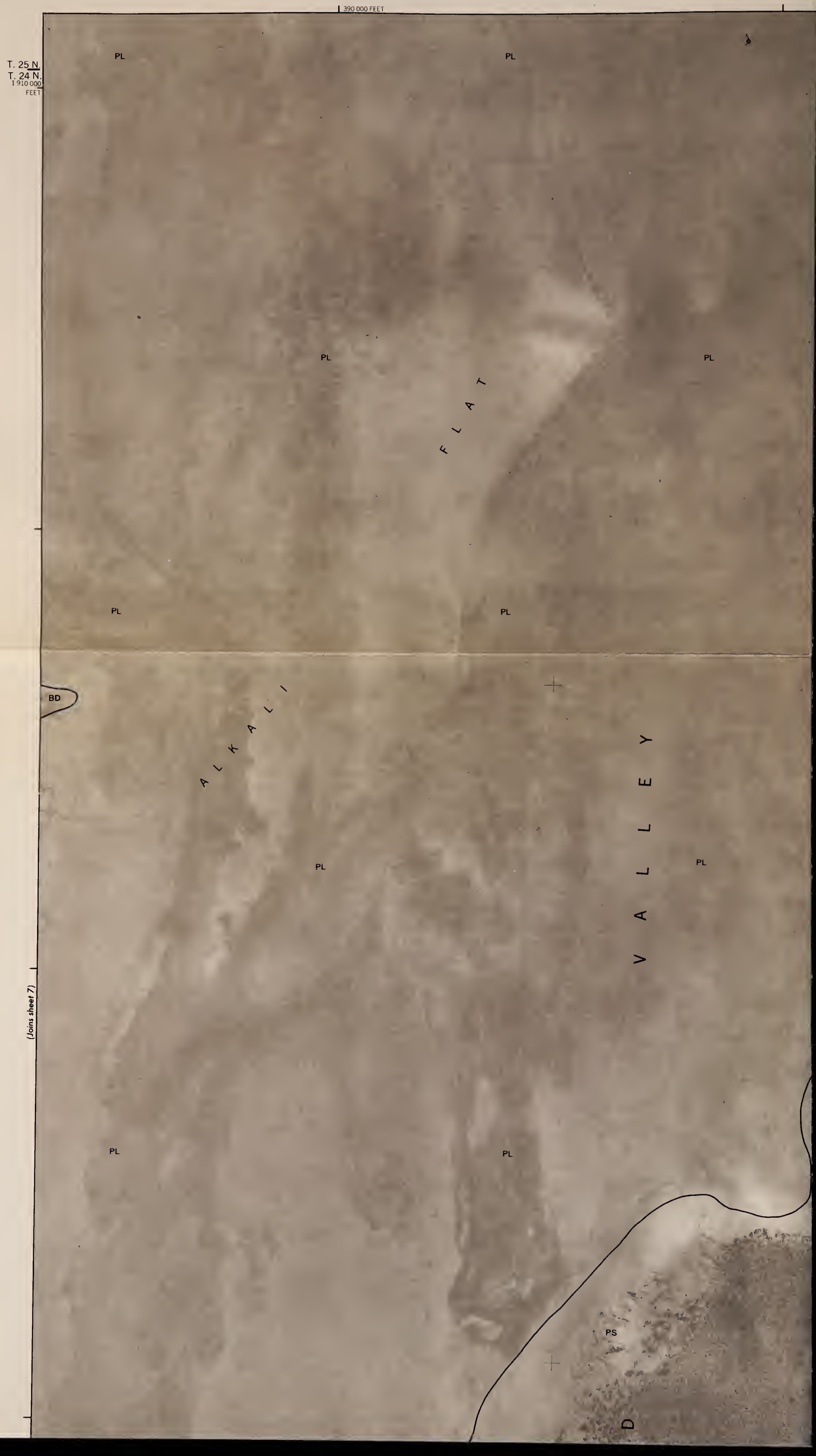
5000 4000 3000 2000 1000 0 5000 10000 Feet

Scale 1:24000

This soil survey was compiled in 1978 by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies

Orthophotobase compiled from 1975 and 1976 aerial photography by the U.S. Department of The Interior, Geological Survey
Planimetric detail obtained from 7½ minute series maps
10,000-foot grid based on state coordinate system

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

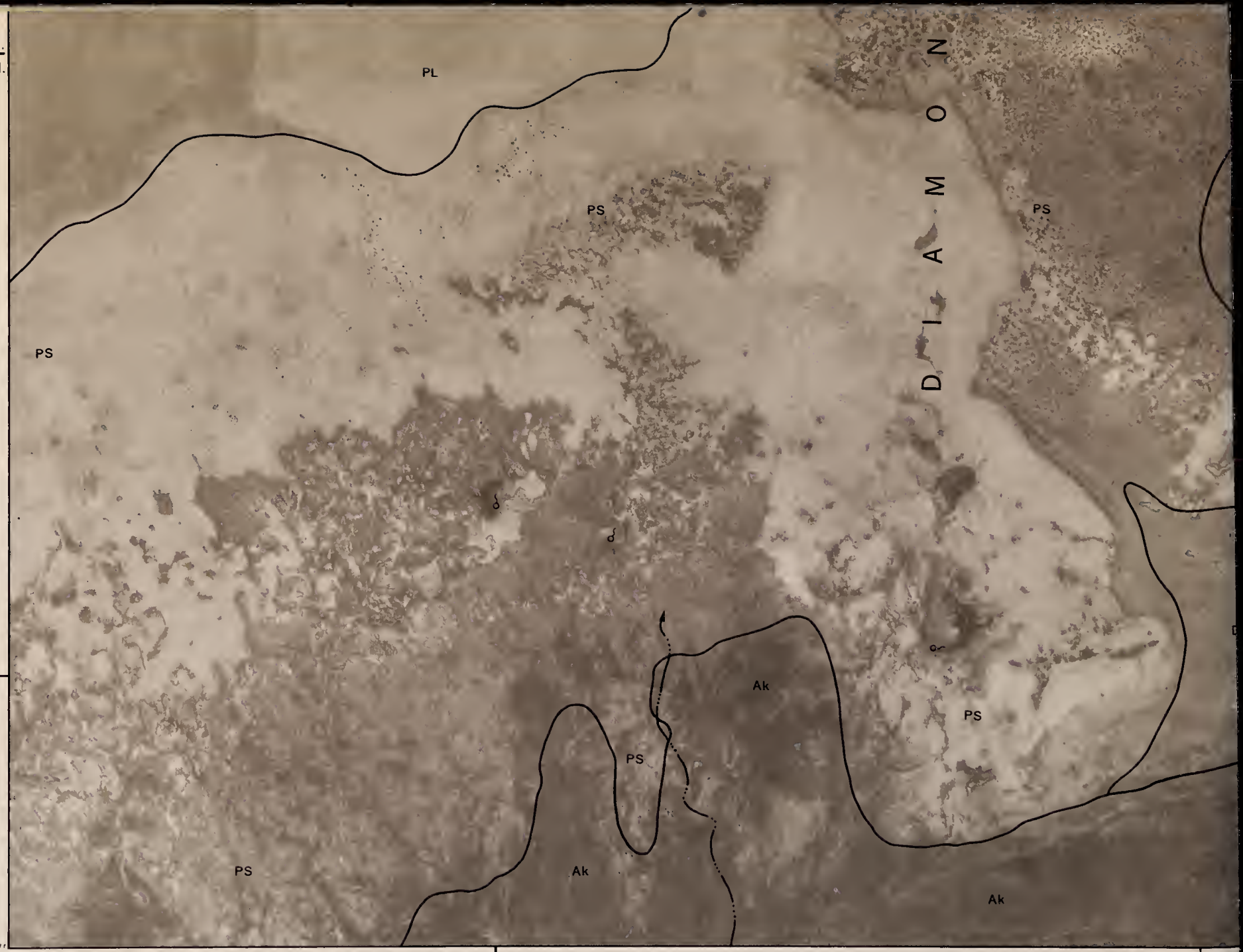


SHEET NO. 8

DIAMOND VALLEY AREA, PART OF EUREKA, ELKO AND WHITE PINE COUNTIES, NEVADA

(DIAMOND SPRINGS NW QUADRANGLE)

T. 24 N.
T. 23 N.



39°52′30″
116°00′

R. 53 E.

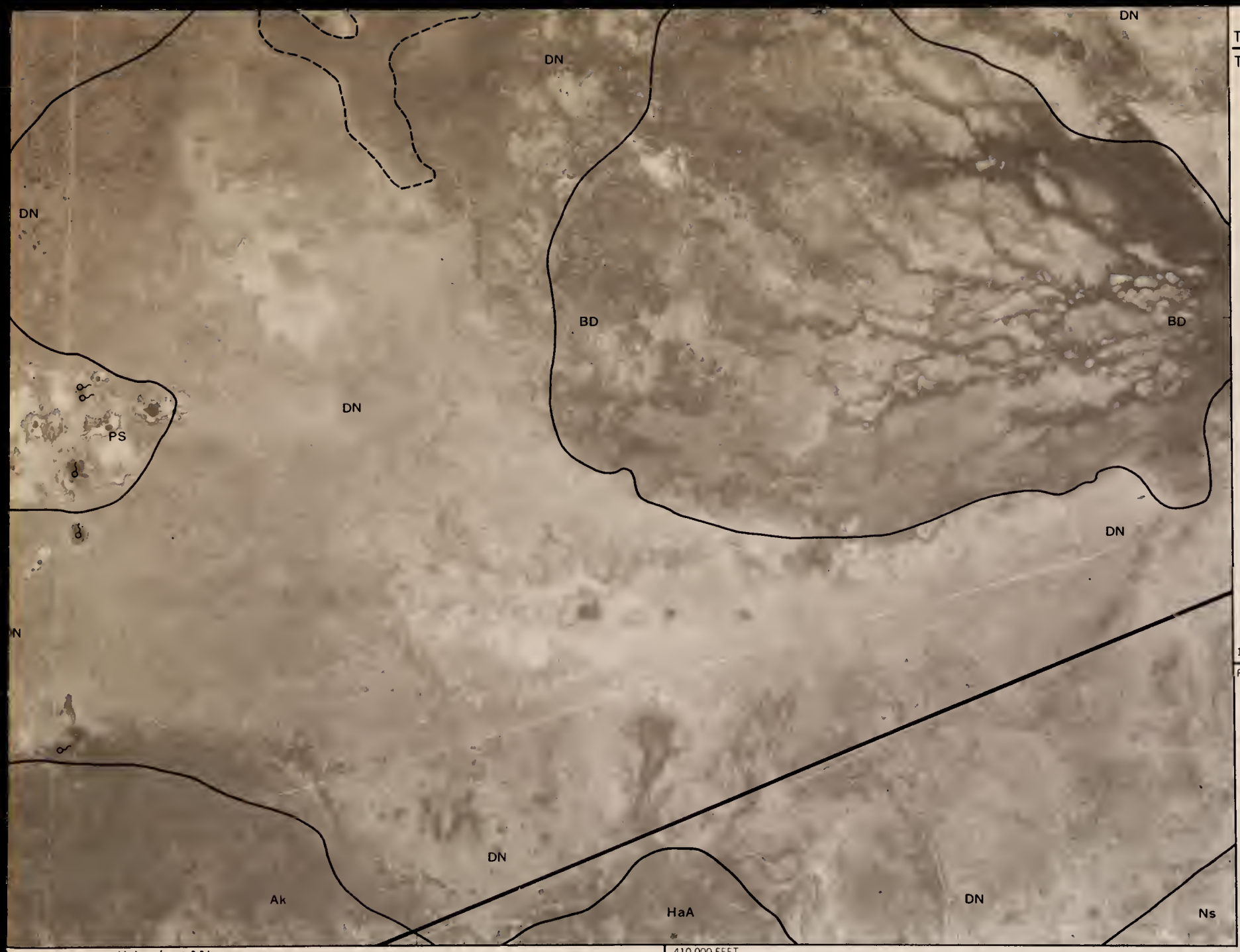
This soil survey was compiled in 1978 by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies

1 ¾ ½ ¼ 0

5000 4000 3000 2000 1000 0

Scale 1

DIAMOND VALLEY AR



T. 24 N.
T. 23 N.

1 870 000 FEET

410 000 FEET

(Joins sheet 11)

R. 54 E.

1 2 Miles

5000 10000 Feet

24000

Orthophotobase compiled from 1975 and 1976 aerial photography by the U.S. Department of The Interior, Geological Survey. Planimetric detail obtained from 7½ minute series maps. 10,000-foot grid based on state coordinate system.

EA, NEVADA NO. 8

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SHEET NO. 9

DIAMOND VALLEY AREA, PART OF EUREKA, ELKO AND WHITE PINE COUNTIES, NEVADA

(GARDEN VALLEY SW AND DIAMOND SPRINGS SE QUADRANGLES)

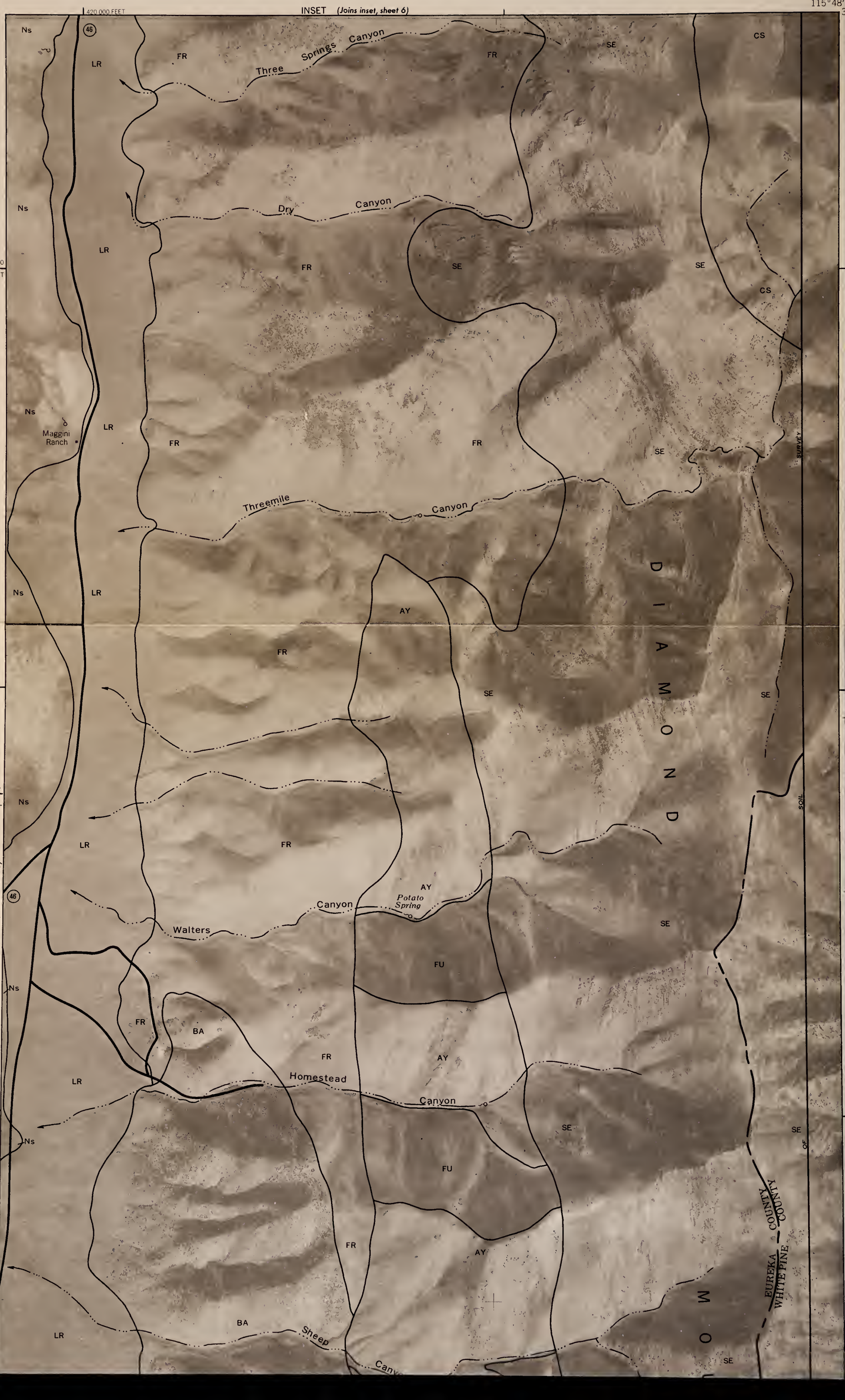
This soil survey was compiled in 1978 by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies

Orthophotobase compiled from 1975 and 1976 aerial photography by the U.S. Department of The Interior, Geological Survey
Planimetric detail obtained from 7½ minute series maps
10,000-foot grid based on state coordinate system.

Scale 1:24000

DIAMOND VALLEY AREA, NEVADA NO. 9

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE



SHEET NO. 9

DIAMOND VALLEY AREA, PART OF EUREKA, ELKO AND WHITE PINE COUNTIES, NEVADA

(GARDEN VALLEY SW AND DIAMOND SPRINGS SE QUADRANGLES)

This soil survey was compiled in 1978 by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies

1 830 000
FEET

1 830 000
FEET

39°45′
116°11′30″

R. 51 E.

R. 52 E.

5000 AND 10000-FOOT GRID TICKS

(Joins sheet 12)

345 000 FEET

1 2 Miles

24000 5000 10000 Feet

Orthophotobase compiled from 1975 and 1976 aerial photography
by the U.S. Department of The Interior, Geological Survey.
Planimetric detail obtained from 7½ minute series maps.
10,000-foot grid based on state coordinate system.

EA, NEVADA NO. 9

SHEET NO. 9 OF 18

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

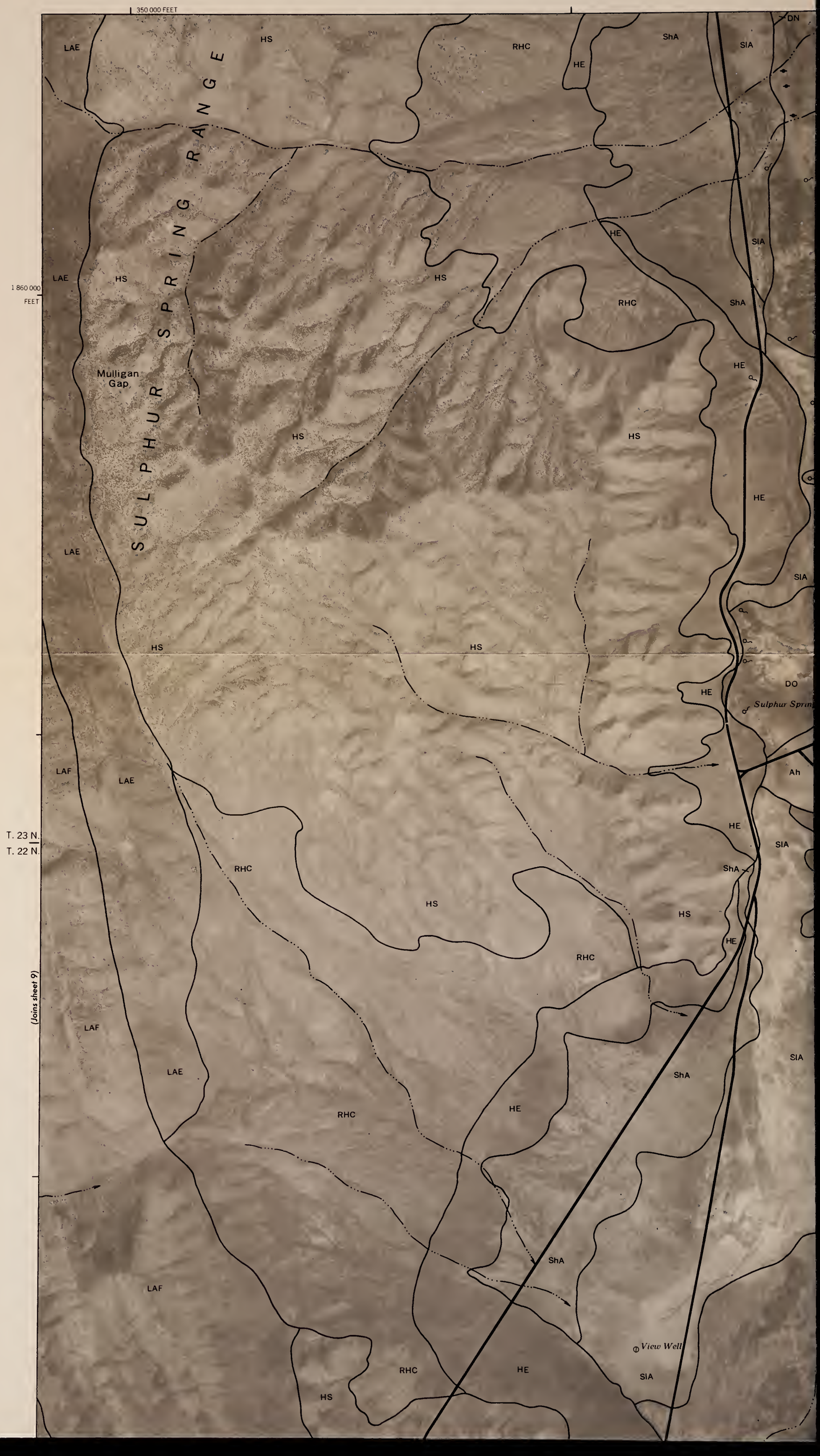
SHEET NO. 10
DIAMOND VALLEY AREA, PART OF EUREKA, ELKO AND WHITE PINE COUNTIES, NEVADA
(GARDEN VALLEY SE QUADRANGLE)

This soil survey was compiled in 1978 by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies

1 ¾ ½ ¼ 0 1 2 Miles
5000 4000 3000 2000 1000 0 5000 10000 Feet
Scale 1:24000

Orthophotobase compiled from 1975 and 1976 aerial photography by the U.S. Department of The Interior, Geological Survey
Planimetric detail obtained from 7½ minute series maps
10,000-foot grid based on state coordinate system

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE



SHEET NO. 10

DIAMOND VALLEY AREA, PART OF EUREKA, ELKO AND WHITE PINE COUNTIES, NEVADA

(GARDEN VALLEY SE QUADRANGLE)

(Joins sheet 7)

R. 52 E. | R. 53 E.

116°00′
39°52′30″

(Joins sheet 11)

39°45′
116°07′30″

(Joins

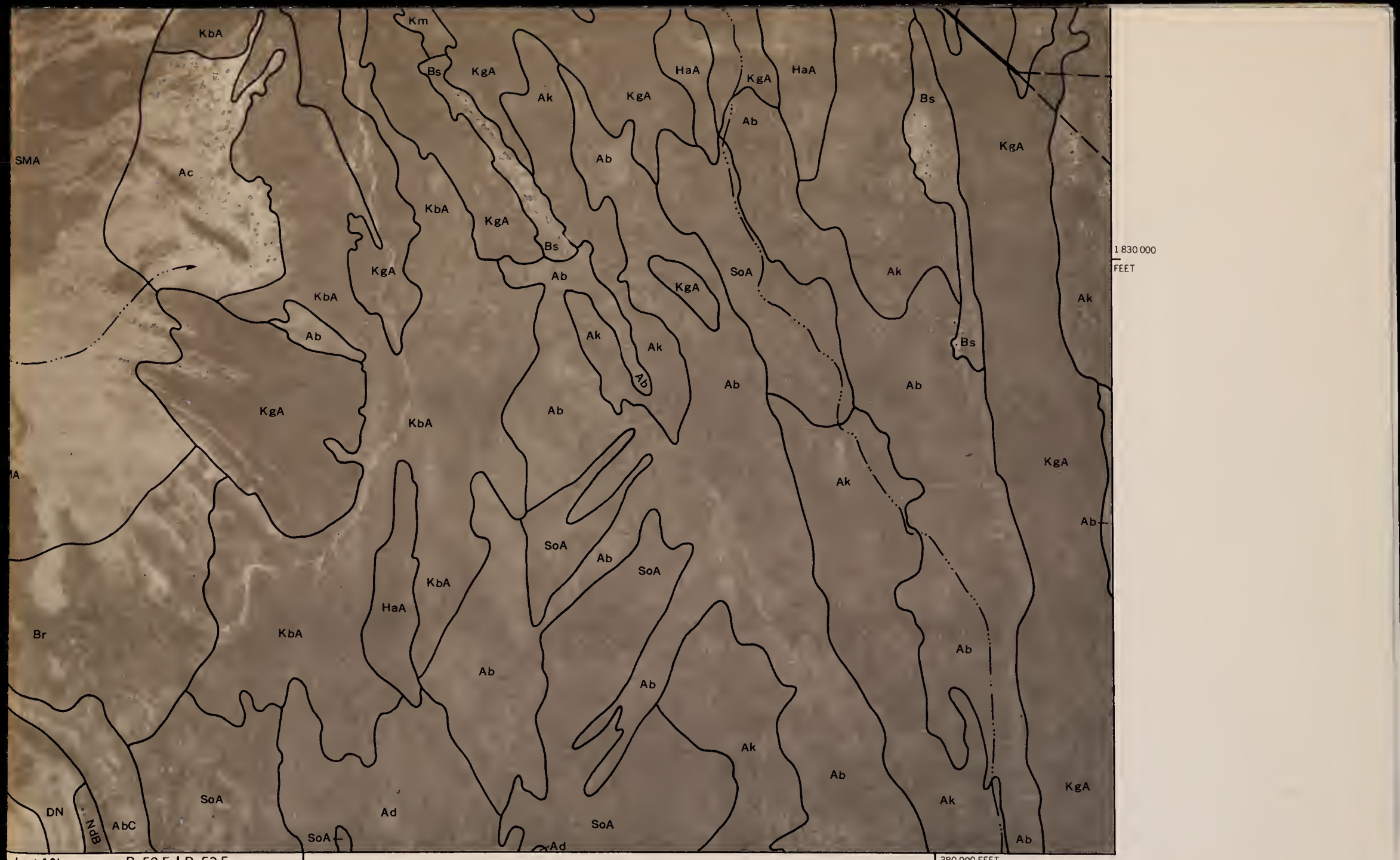
1 ¾ ½ ¼ 0

5000 4000 3000 2000 1000 0

Scale 1:

This soil survey was compiled in 1978 by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies

DIAMOND VALLEY A



Orthophotobase compiled from 1975 and 1976 aerial photography
by the U.S. Department of The Interior, Geological Survey.
Planimetric detail obtained from 7½ minute series maps.
10,000-foot grid based on state coordinate system.

EA, NEVADA NO. 10

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SHEET NO. 11
DIAMOND VALLEY AREA, PART OF EUREKA, ELKO
AND WHITE PINE COUNTIES, NEVADA
(DIAMOND SPRINGS SW QUADRANGLE)

This soil survey was compiled in 1978 by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies

1 ¾ ½ ¼ 0 1 2 Miles
5000 4000 3000 2000 1000 0 5000 10000 Feet
Scale 1:24000

Orthophotobase compiled from 1975 and 1976 aerial photography by the U S Department of The Interior, Geological Survey
Planimetric detail obtained from 7½ minute series maps
10,000-foot grid based on state coordinate system

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

R. 53 E.

390 000 FEET

1 860 000 FEET

T. 23 N.
T. 22 N.

(Joins sheet 10)

VALLEY

DIAMOND

SHEET NO. 11

DIAMOND VALLEY AREA, PART OF EUREKA, ELKO AND WHITE PINE COUNTIES, NEVADA

(DIAMOND SPRINGS SW QUADRANGLE)

R. 54 E.

115°52'30"

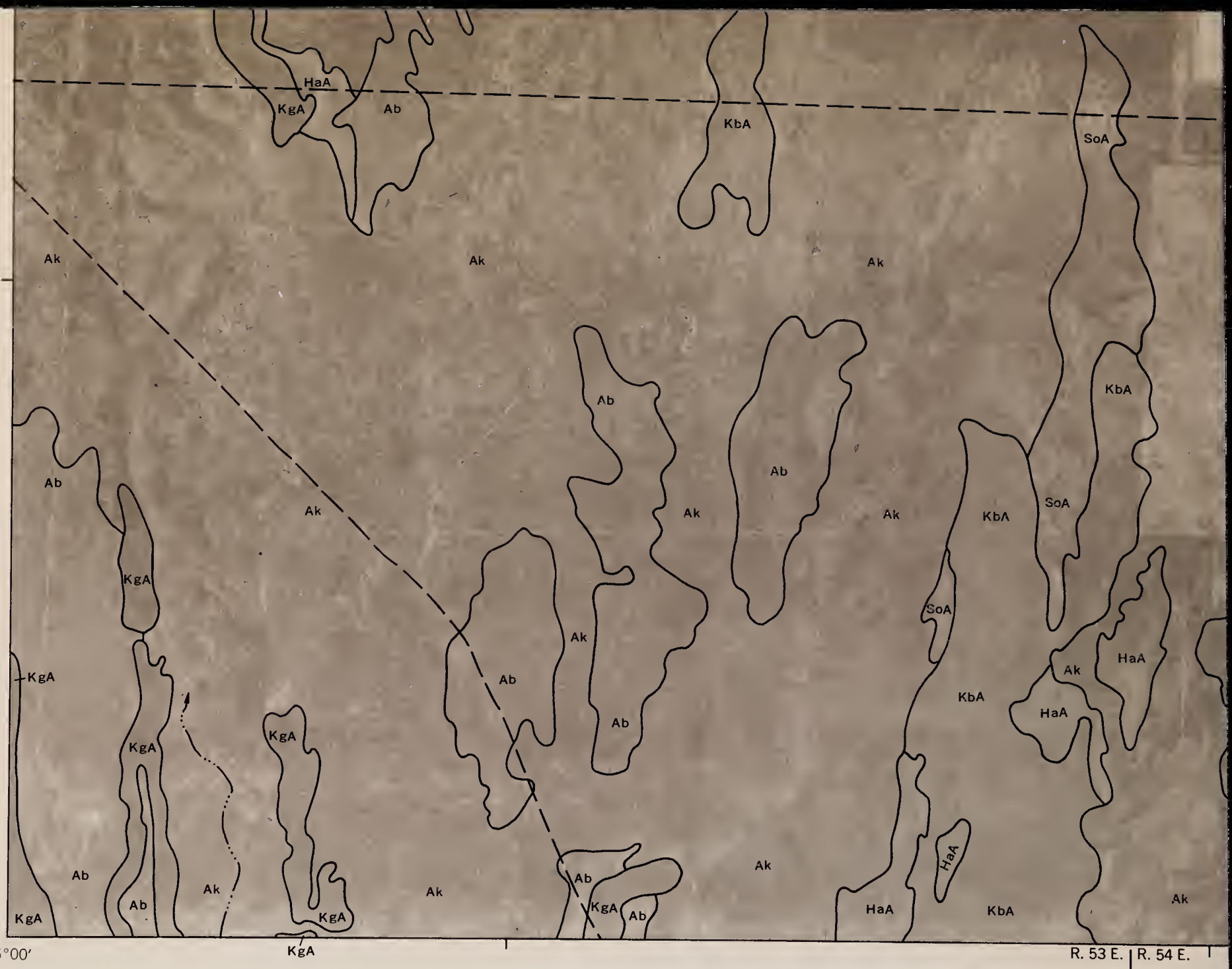
39°52'30"

T. 23 N.

T. 22 N.

(Joins sheet 8)

(Joins inset, sheet 9)



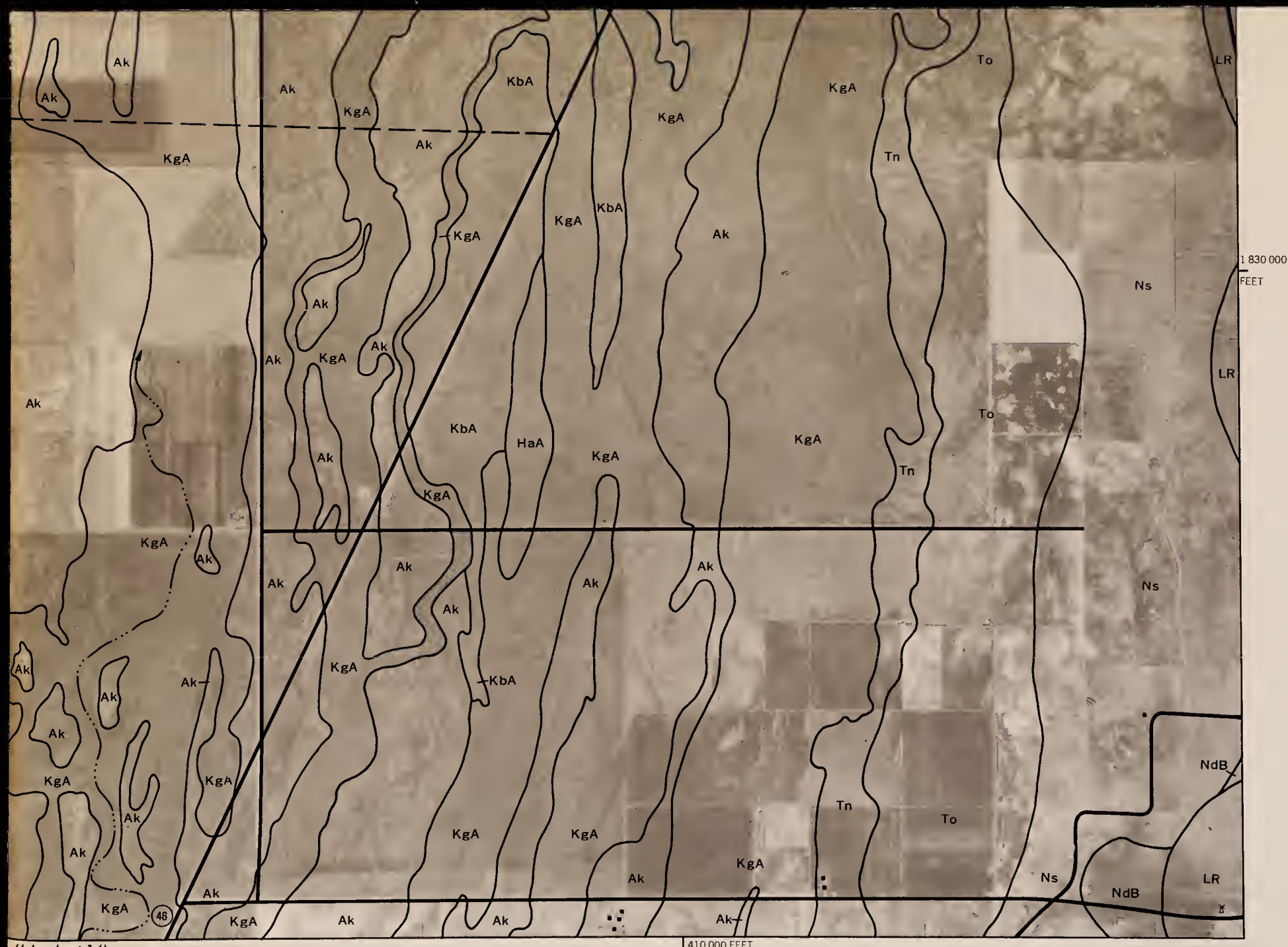
This soil survey was compiled in 1978 by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies

1 ¾ ½ ¼ 0

5000 4000 3000 2000 1000 0

Scale 1

DIAMOND VALLEY A



(Joins sheet 14)

1 2 Miles

5000 10000 Feet

:24000

Orthophotobase compiled from 1975 and 1976 aerial photography by the U.S. Department of The Interior, Geological Survey. Planimetric detail obtained from 7½ minute series maps 10,000-foot grid based on state coordinate system.

EA, NEVADA NO. 11

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SHEET NO. 12
DIAMOND VALLEY AREA, PART OF EUREKA, ELKO
AND WHITE PINE COUNTIES, NEVADA
(WHISTLER MTN. NW AND EUREKA NE QUADRANGLES)

Scale 1:24000

This soil survey was compiled in 1978 by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies

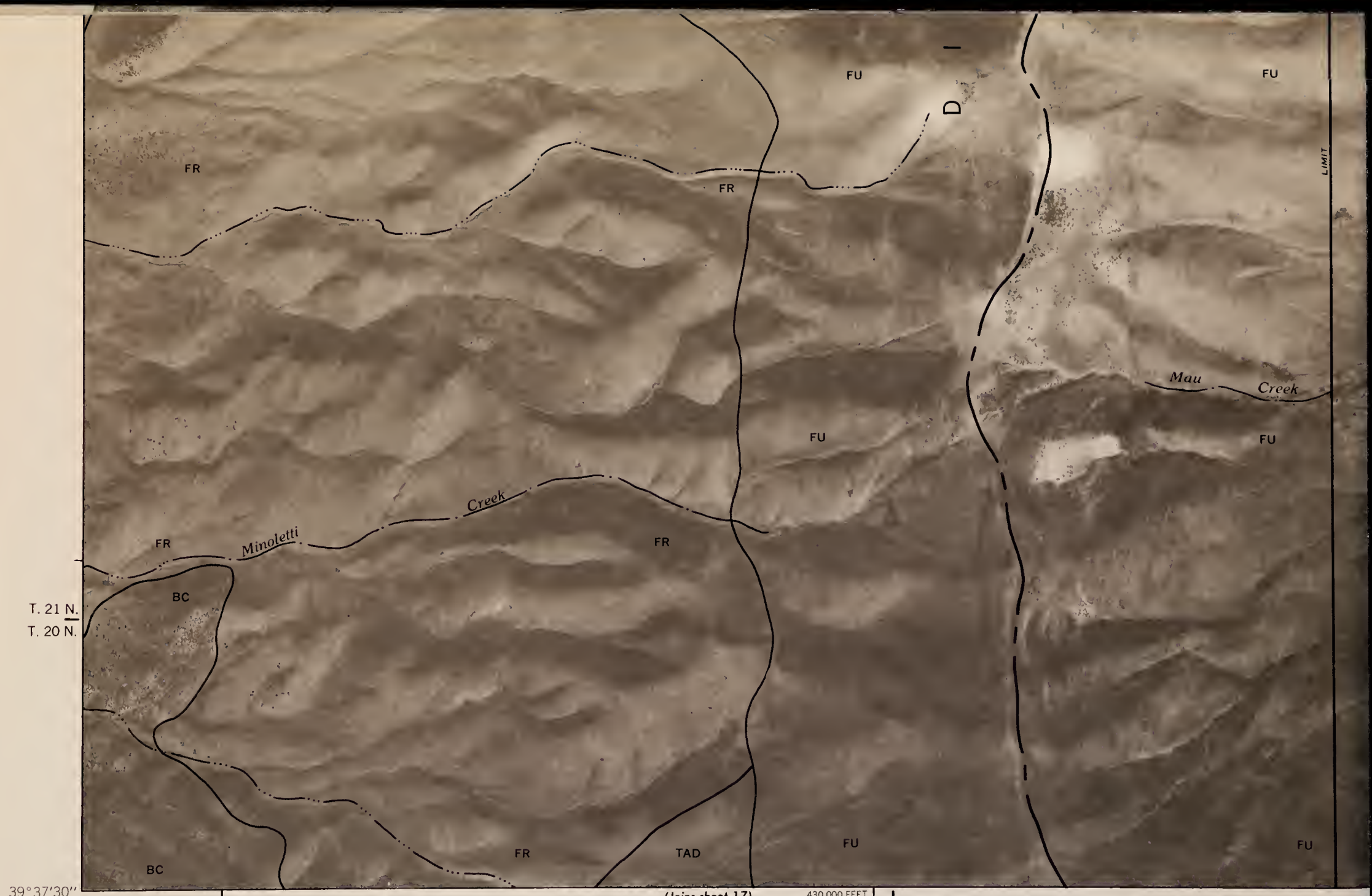
Orthophotobase compiled from 1975 and 1976 aerial photography by the U.S. Department of The Interior, Geological Survey
Planimetric detail obtained from 7½ minute series maps
10,000-foot grid based on state coordinate system

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SHEET NO. 12

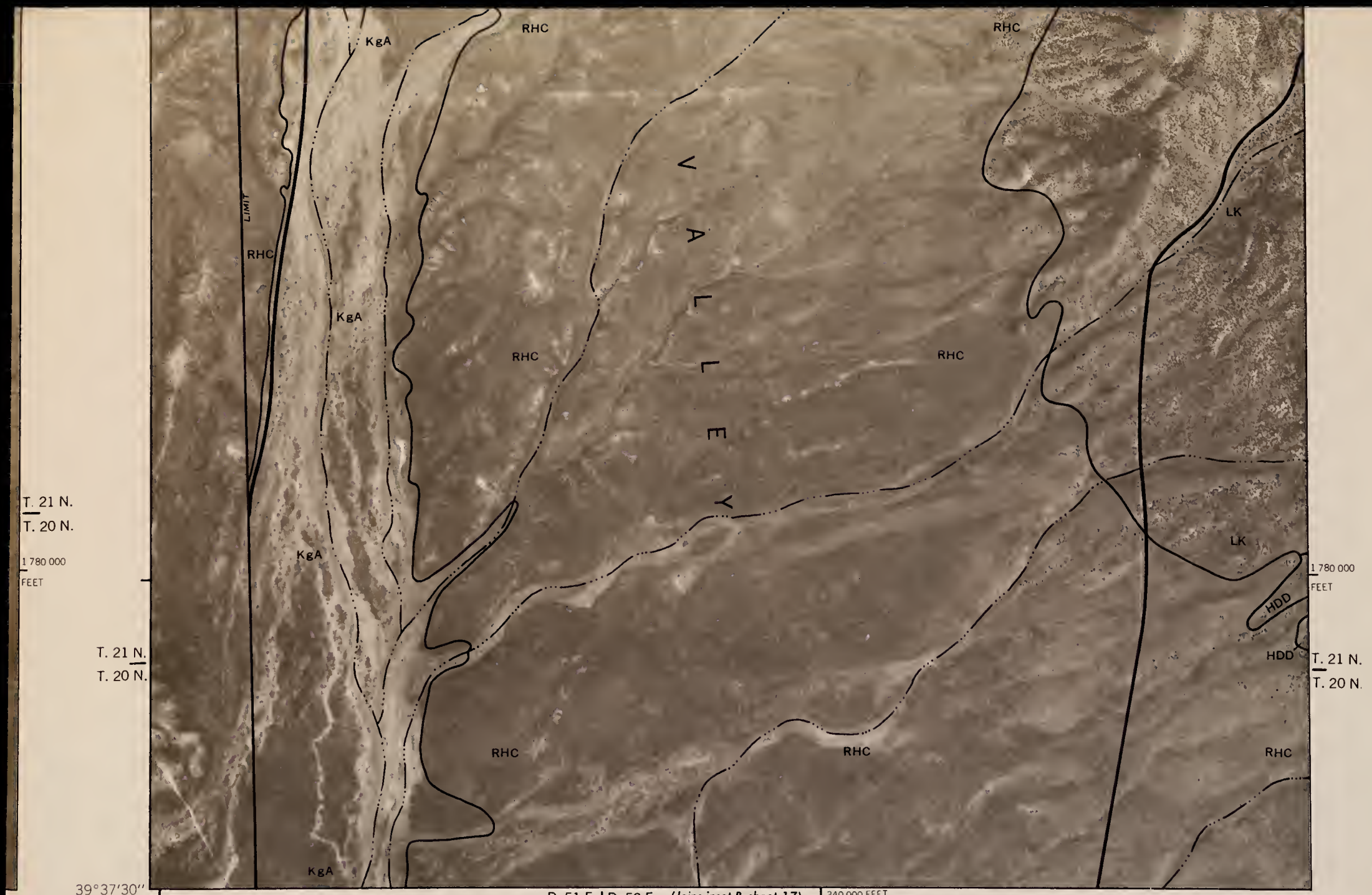
DIAMOND VALLEY AREA, PART OF EUREKA, ELKO AND WHITE PINE COUNTIES, NEVADA

(WHISTLER MTN. NW AND EUREKA NE QUADRANGLES)



This soil survey was compiled in 1978 by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies

DIAMOND VALLEY AR



1 2 Miles

5000 10000 Feet

24000

Orthophotobase compiled from 1975 and 1976 aerial photography by the U.S. Department of The Interior, Geological Survey. Planimetric detail obtained from 7½ minute series maps. 10,000-foot grid based on state coordinate system.

EA, NEVADA NO. 12

SHEET NO.12 OF 18

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

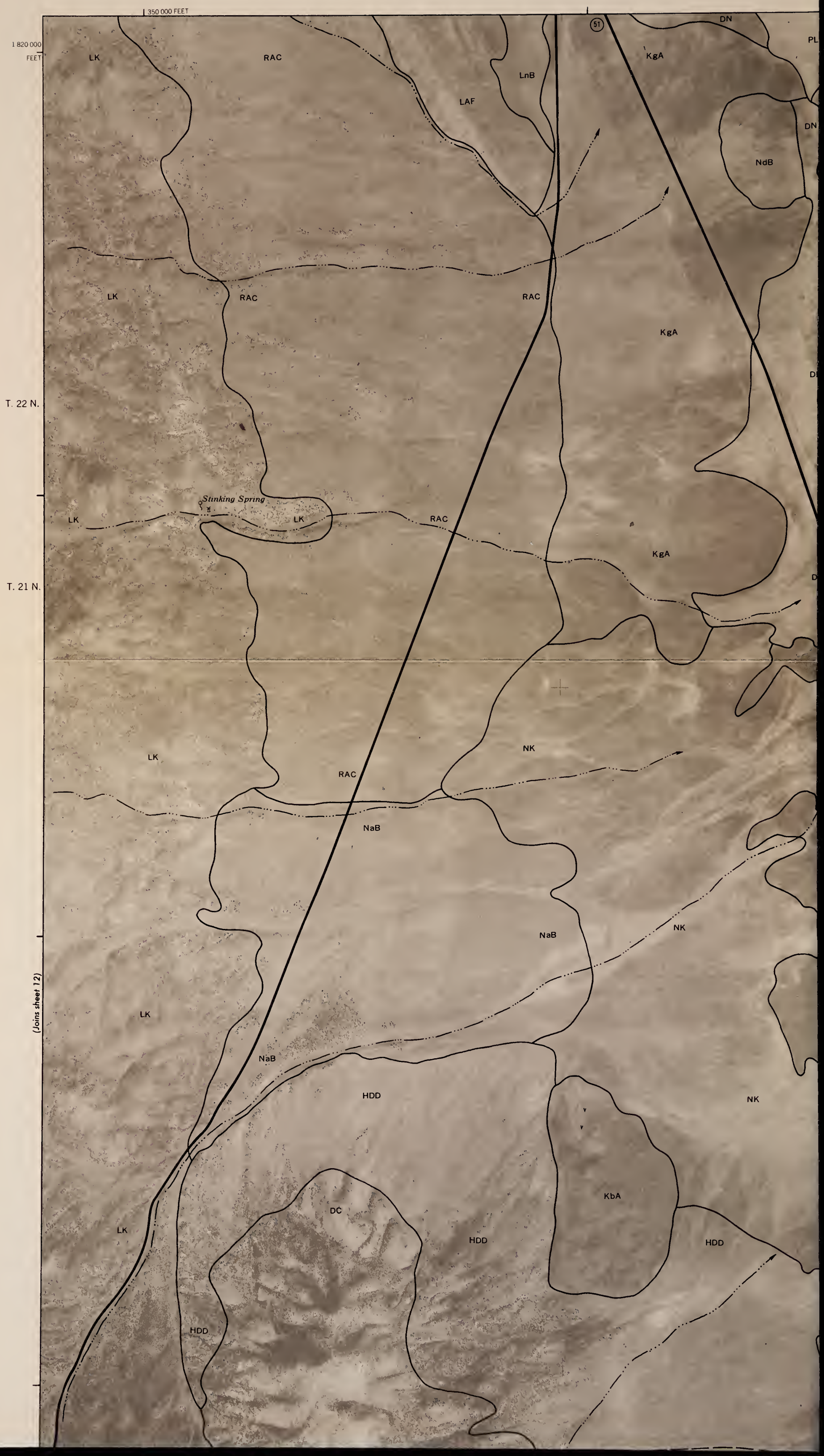
SHEET NO. 13
DIAMOND VALLEY AREA, PART OF EUREKA, ELKO AND WHITE PINE COUNTIES, NEVADA
(WHISTLER MTN. NE QUADRANGLE)

This soil survey was compiled in 1978 by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies

1 ¾ ½ ¼ 0 1 2 Miles
5000 4000 3000 2000 1000 0 5000 10000 Feet
Scale 1:24000

Orthophotobase compiled from 1975 and 1976 aerial photography by the U S Department of The Interior, Geological Survey
Planimetric detail obtained from 7½ minute series maps
10,000-foot grid based on state coordinate system

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE



SHEET NO. 13

DIAMOND VALLEY AREA, PART OF EUREKA, ELKO AND WHITE PINE COUNTIES, NEVADA

(WHISTLER MTN. NE QUADRANGLE)

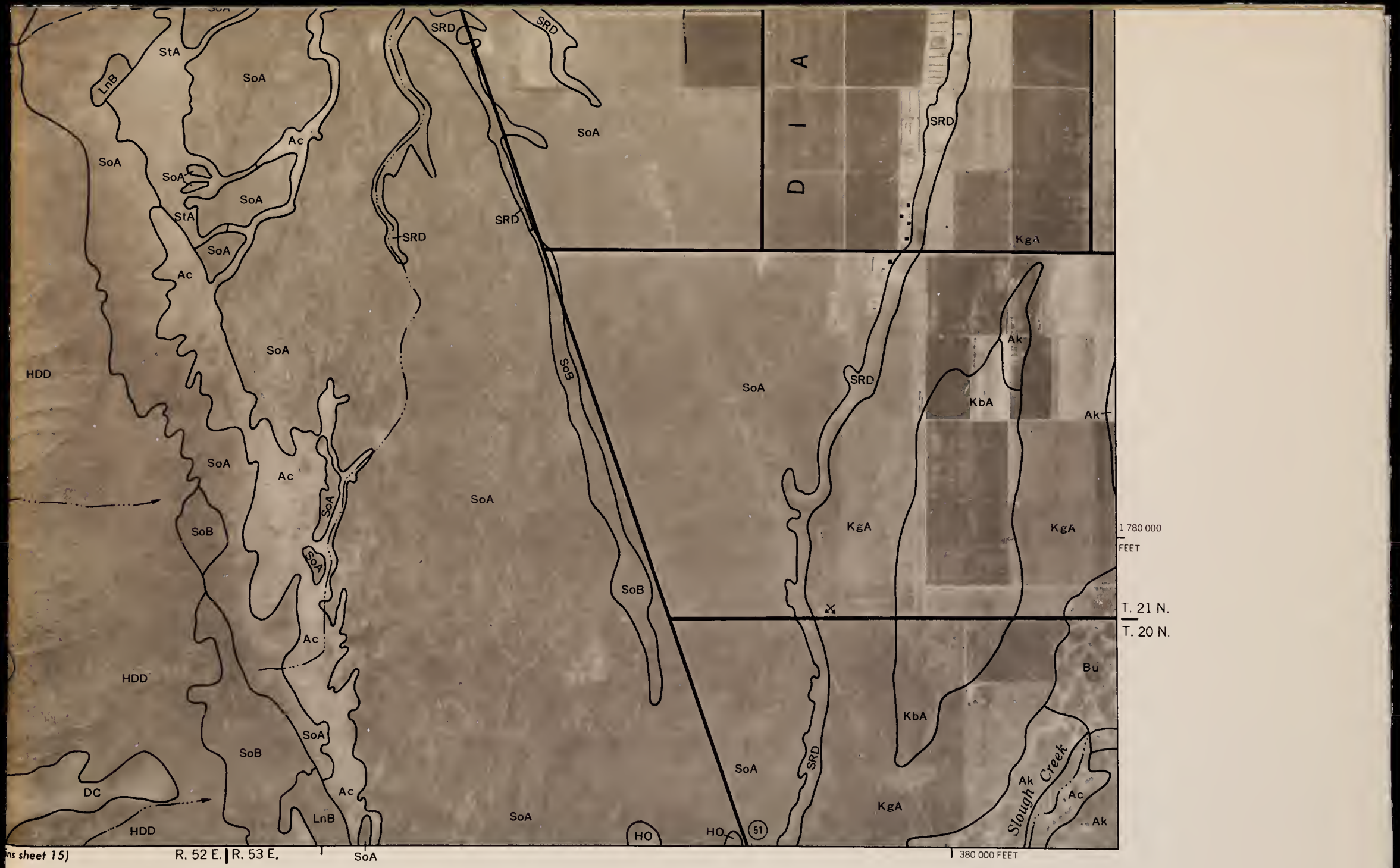
This soil survey was compiled in 1978 by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies

1 ¾ ½ ¼ 0

5000 4000 3000 2000 1000 0

Scale 1

DIAMOND VALLEY A



1 2 Miles

5000 10000 Feet

24000

Orthophotobase compiled from 1975 and 1976 aerial photography by the U.S. Department of The Interior, Geological Survey. Planimetric detail obtained from 7½ minute series maps. 10,000-foot grid based on state coordinate system.

EA, NEVADA NO. 13

SHEET NO. 13 OF 18

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SHEET NO. 14

DIAMOND VALLEY AREA, PART OF EUREKA, ELKO AND WHITE PINE COUNTIES, NEVADA

(EUREKA NW QUADRANGLE)

This soil survey was compiled in 1978 by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies

Scale 1:24000

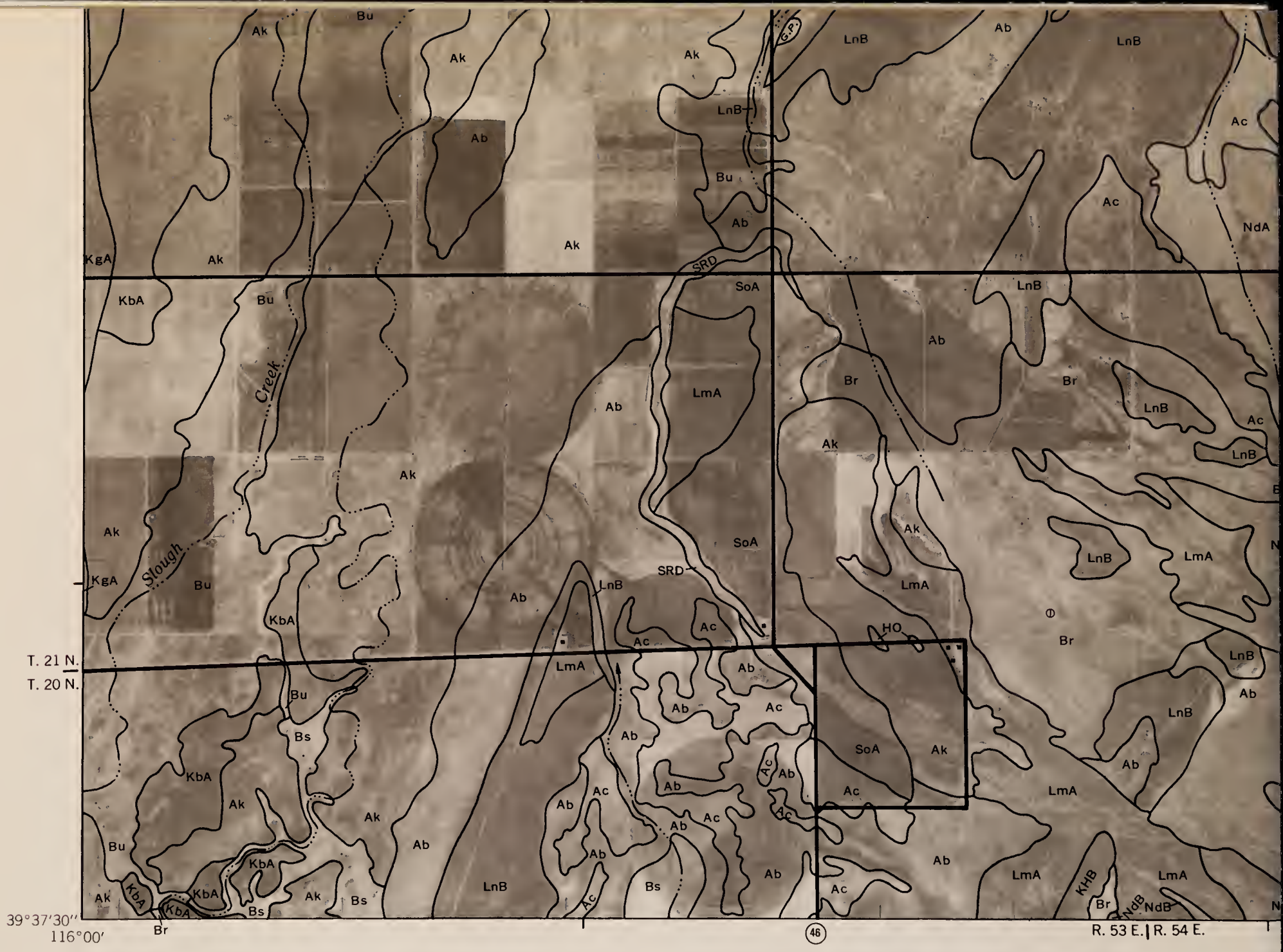
Orthophotobase compiled from 1975 and 1976 aerial photography by the U.S. Department of The Interior, Geological Survey
Planimetric detail obtained from 7½ minute series maps.
10,000-foot grid based on state coordinate system

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SHEET NO. 14

DIAMOND VALLEY AREA, PART OF EUREKA, ELKO AND WHITE PINE COUNTIES, NEVADA

(EUREKA NW QUADRANGLE)



This soil survey was compiled in 1978 by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies

1 ¾ ½ ¼ 0

5 000 4 000 3 000 2 000 1 000 0

Scale 1

DIAMOND VALLEY AR

(Joins sheet 16)

1 2 Miles

5000 10000 Feet

24000

Orthophotobase compiled from 1975 and 1976 aerial photography by the U.S. Department of The Interior, Geological Survey. Planimetric detail obtained from 7½ minute series maps. 10,000-foot grid based on state coordinate system.

EA, NEVADA NO. 14

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SHEET NO. 15
DIAMOND VALLEY AREA, PART OF EUREKA, ELKO
AND WHITE PINE COUNTIES, NEVADA
(WHISTLER MTN. SE QUADRANGLE)

This soil survey was compiled in 1978 by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies

1 ¾ ½ ¼ 0 1 2 Miles
5000 4000 3000 2000 1000 0 5000 10000 Feet
Scale 1:24000

Orthophotobase compiled from 1975 and 1976 aerial photography by the U.S. Department of The Interior, Geological Survey
Planimetric detail obtained from 7½ minute series maps
10,000-foot grid based on state coordinate system.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SHEET NO. 15

DIAMOND VALLEY AREA, PART OF EUREKA, ELKO AND WHITE PINE COUNTIES, NEVADA

(WHISTLER MTN. SE QUADRANGLE)

(Joins sheet 13)

R. 52 E. | R. 53 E.

116°00′

39°37′30″

T. 20 N.

T. 19 N.

(Joins sheet 16)

39°30′
116°07′30″

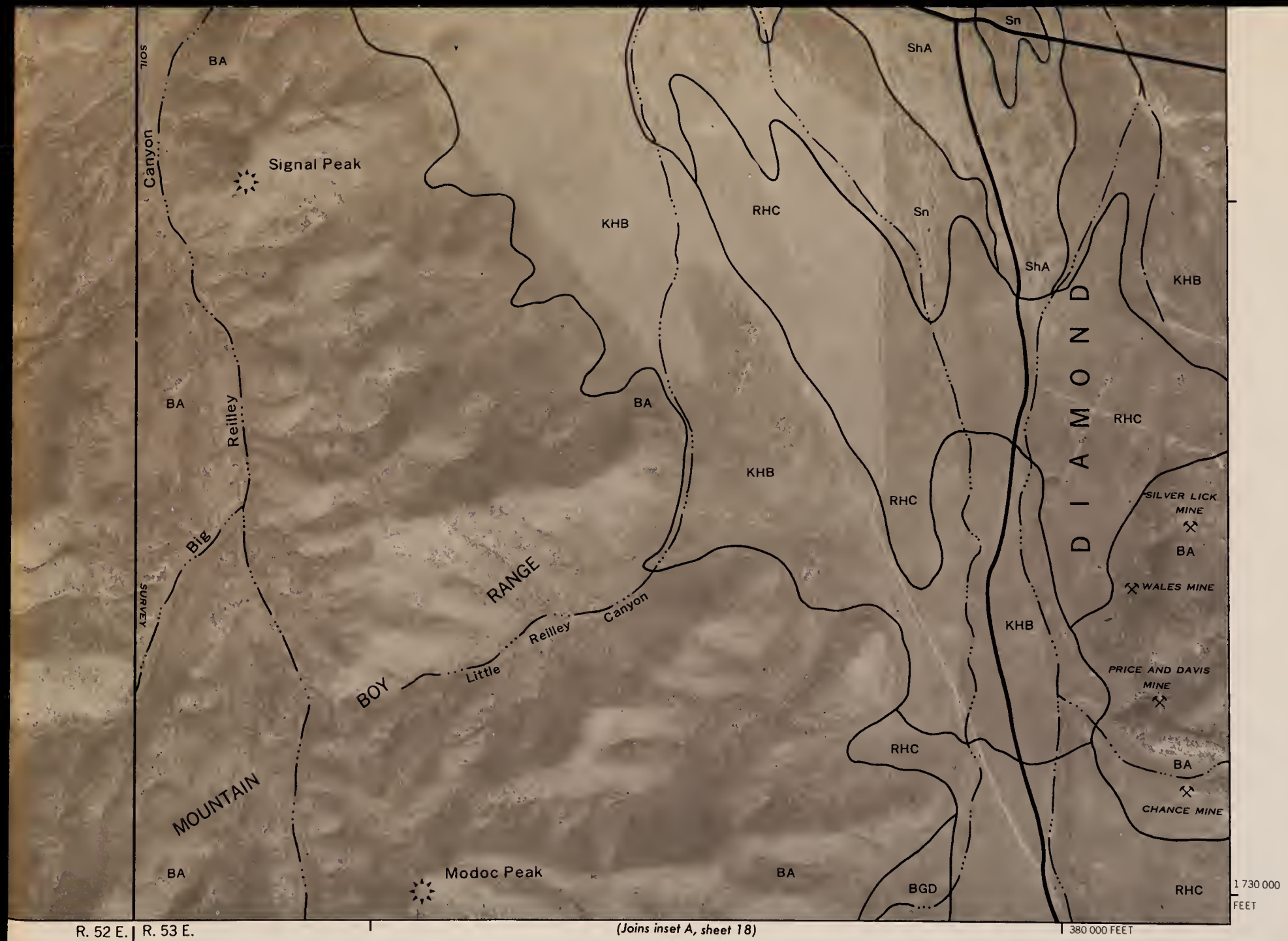
This soil survey was compiled in 1978 by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies

1 ¾ ½ ¼ 0

5000 4000 3000 2000 1000 0

Scale 1

DIAMOND VALLEY A



Orthophotobase compiled from 1975 and 1976 aerial photography by the U.S. Department of The Interior, Geological Survey.
Planimetric detail obtained from 7½ minute series maps.
10,000-foot grid based on state coordinate system.

EA, NEVADA NO. 15

SHEET NO. 15 OF 18

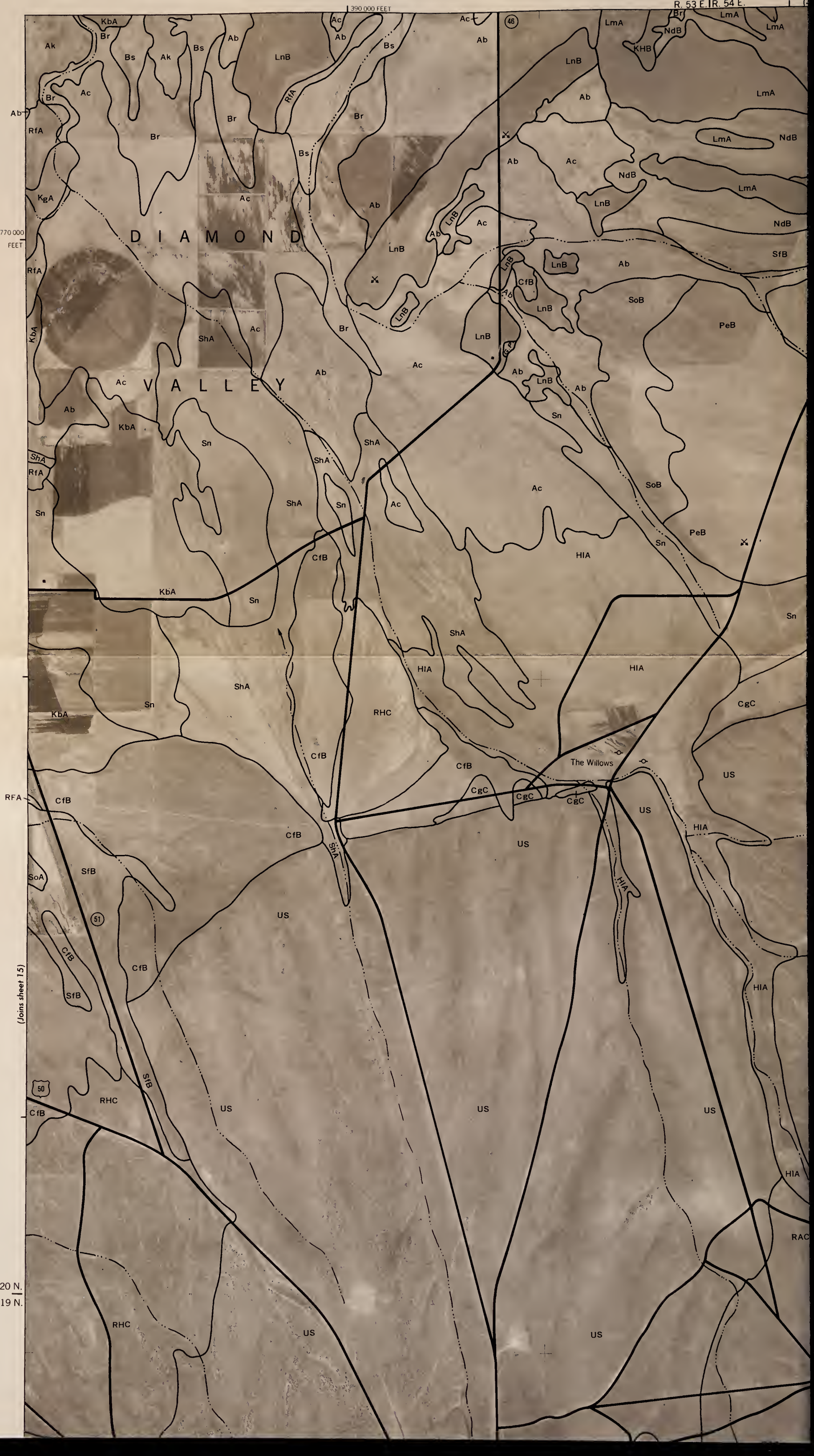
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SHEET NO. 16
DIAMOND VALLEY AREA, PART OF EUREKA, ELKO AND WHITE PINE COUNTIES, NEVADA
(EUREKA SW QUADRANGLE)

This soil survey was compiled in 1978 by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies

Orthophotobase compiled from 1975 and 1976 aerial photography by the U.S. Department of The Interior, Geological Survey
Planimetric detail obtained from 7½ minute series maps
10,000-foot grid based on state coordinate system

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE



SHEET NO. 16

DIAMOND VALLEY AREA, PART OF EUREKA, ELKO AND WHITE PINE COUNTIES, NEVADA

(EUREKA SW QUADRANGLE)

This soil survey was compiled in 1978 by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies

ichmond Mountain

(Joins sheet 18)

1 2 Miles

5000 10000 Feet

24000

Orthophotobase compiled from 1975 and 1976 aerial photography by the U.S. Department of The Interior, Geological Survey. Planimetric detail obtained from 7½ minute series maps. 10,000-foot grid based on state coordinate system.

EA, NEVADA NO. 16

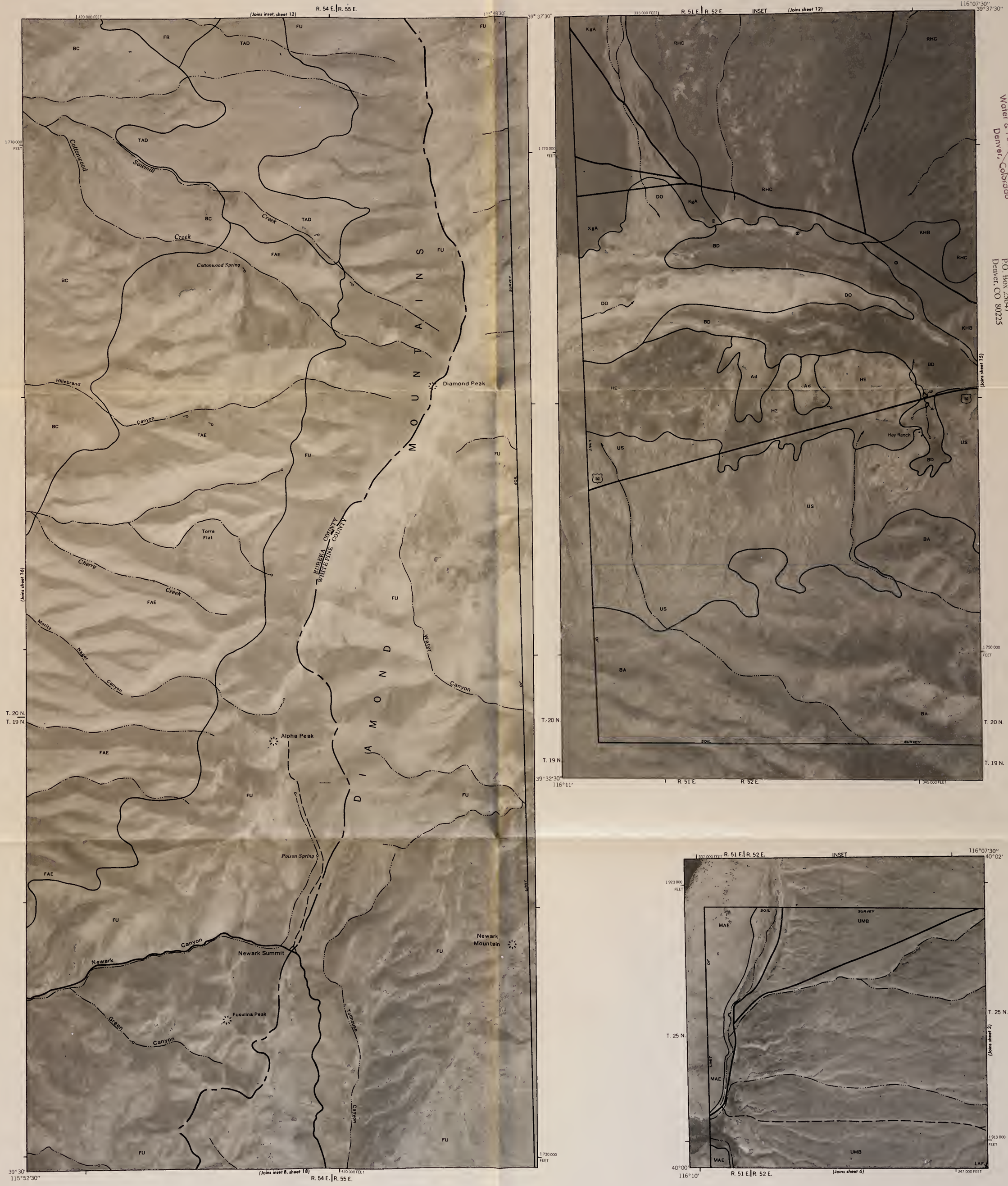
SHEET NO. 16 OF 18

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SHEET NO. 17

DIAMOND VALLEY AREA, PART OF EUREKA, ELKO AND WHITE PINE COUNTIES, NEVADA

(EUREKA SE, MINERAL HILL SW, AND WHISTLER MTN. SW QUADRANGLES)



1 ¾ ½ ¼ 0 1 2 Miles
5000 4000 3000 2000 1000 0 5000 10000 Feet
Scale 1:24000

This soil survey was compiled in 1978 by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies

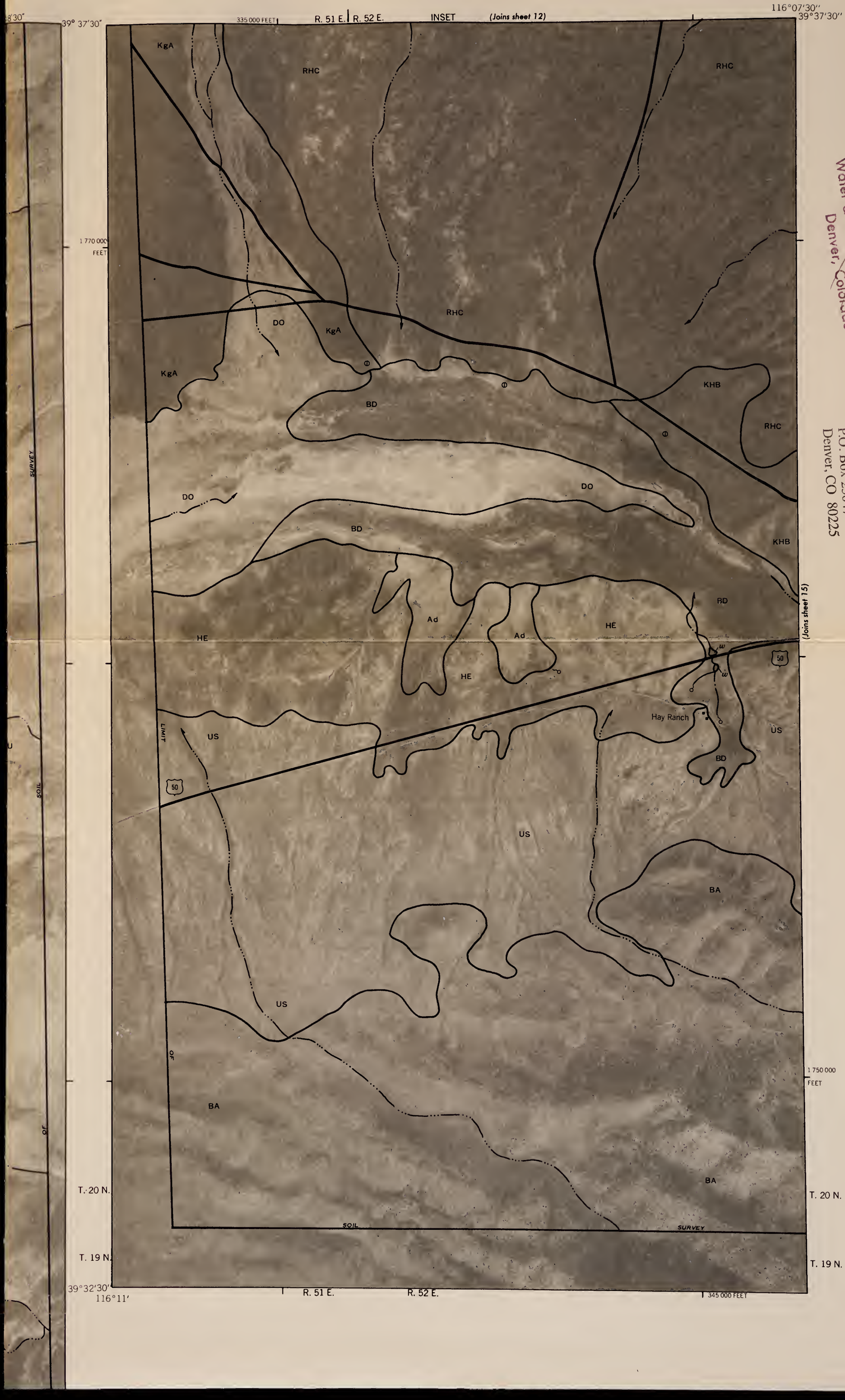
Orthophotobase compiled from 1975 and 1976 aerial photography by the U.S. Department of The Interior, Geological Survey
Planimetric detail obtained from 7½ minute series maps
10,000-foot grid based on state coordinate system

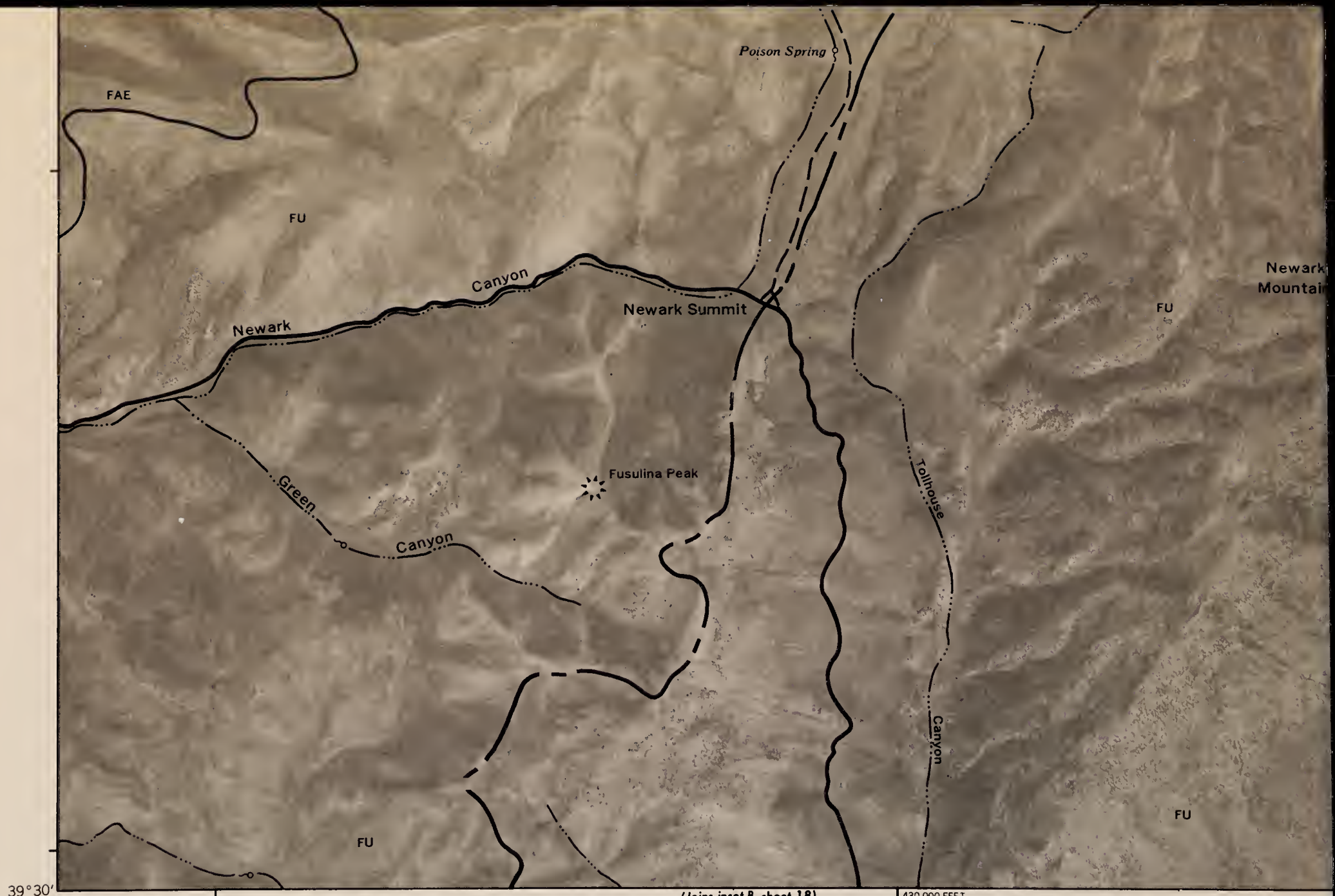
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SHEET NO. 17

DIAMOND VALLEY AREA, PART OF EUREKA, ELKO AND WHITE PINE COUNTIES, NEVADA

(EUREKA SE, MINERAL HILL SW, AND WHISTLER MTN. SW QUADRANGLES)





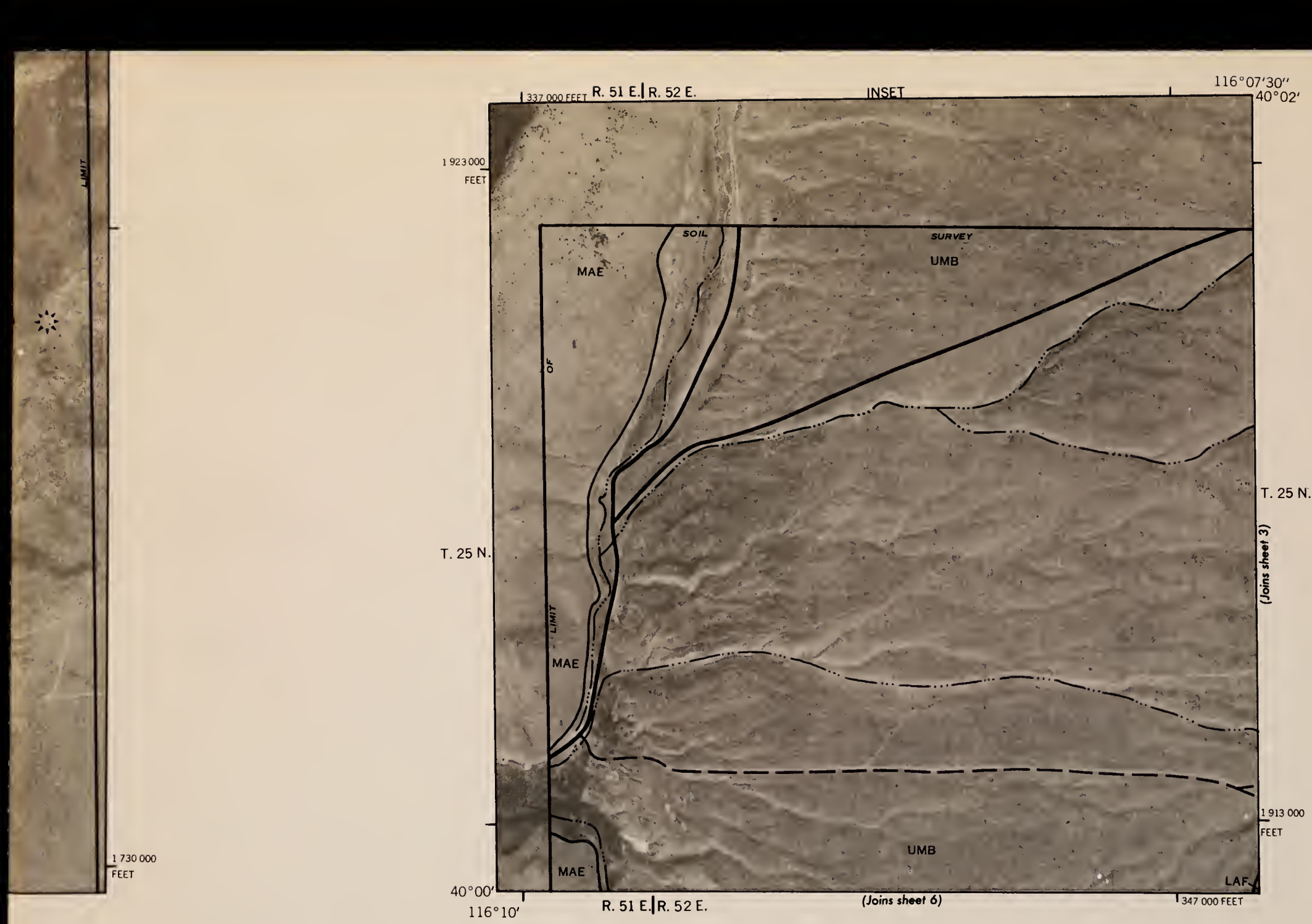
1 ¾ ½ ¼ 0

5000 4000 3000 2000 1000 0

Scale 1:24000

This soil survey was compiled in 1978 by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies

DIAMOND VALLE



1 2 Miles

5000 10000 Feet

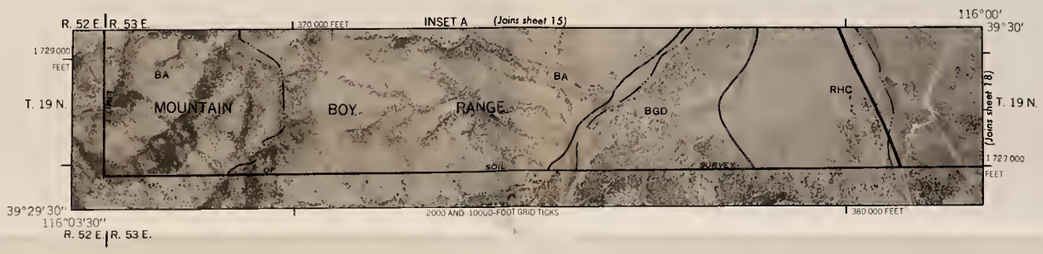
Orthophotobase compiled from 1975 and 1976 aerial photography
by the U.S. Department of The Interior, Geological Survey.
Planimetric detail obtained from 7½ minute series maps.
10,000-foot grid based on state coordinate system.

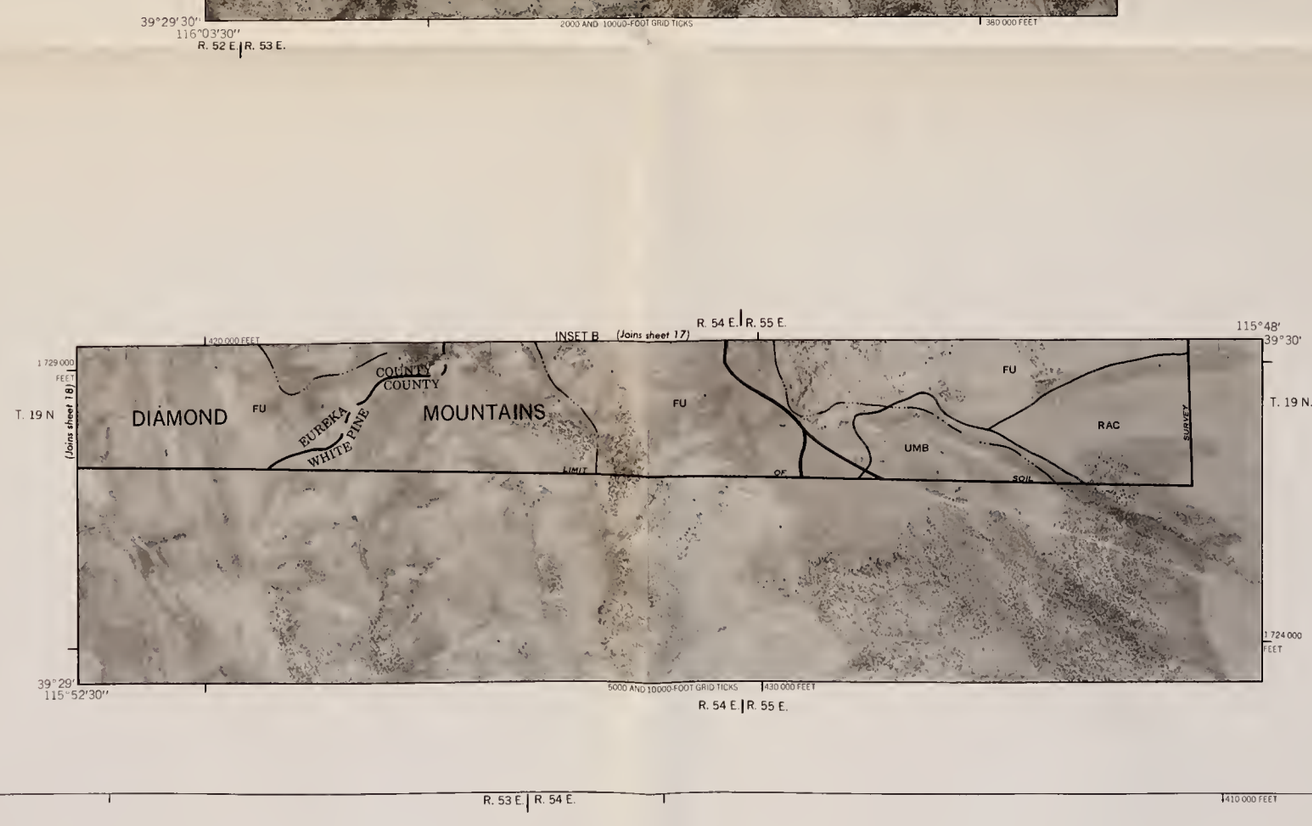
AREA, NEVADA NO. 17

SHEET NO.17 OF 18

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SHEET NO. 18
DIAMOND VALLEY AREA, PART OF EUREKA, ELKO
AND WHITE PINE COUNTIES, NEVADA
(PINTO SUMMIT NW, BELLEVUE PEAK NE, AND PINTO SUMMIT NE QUADRANGLES)



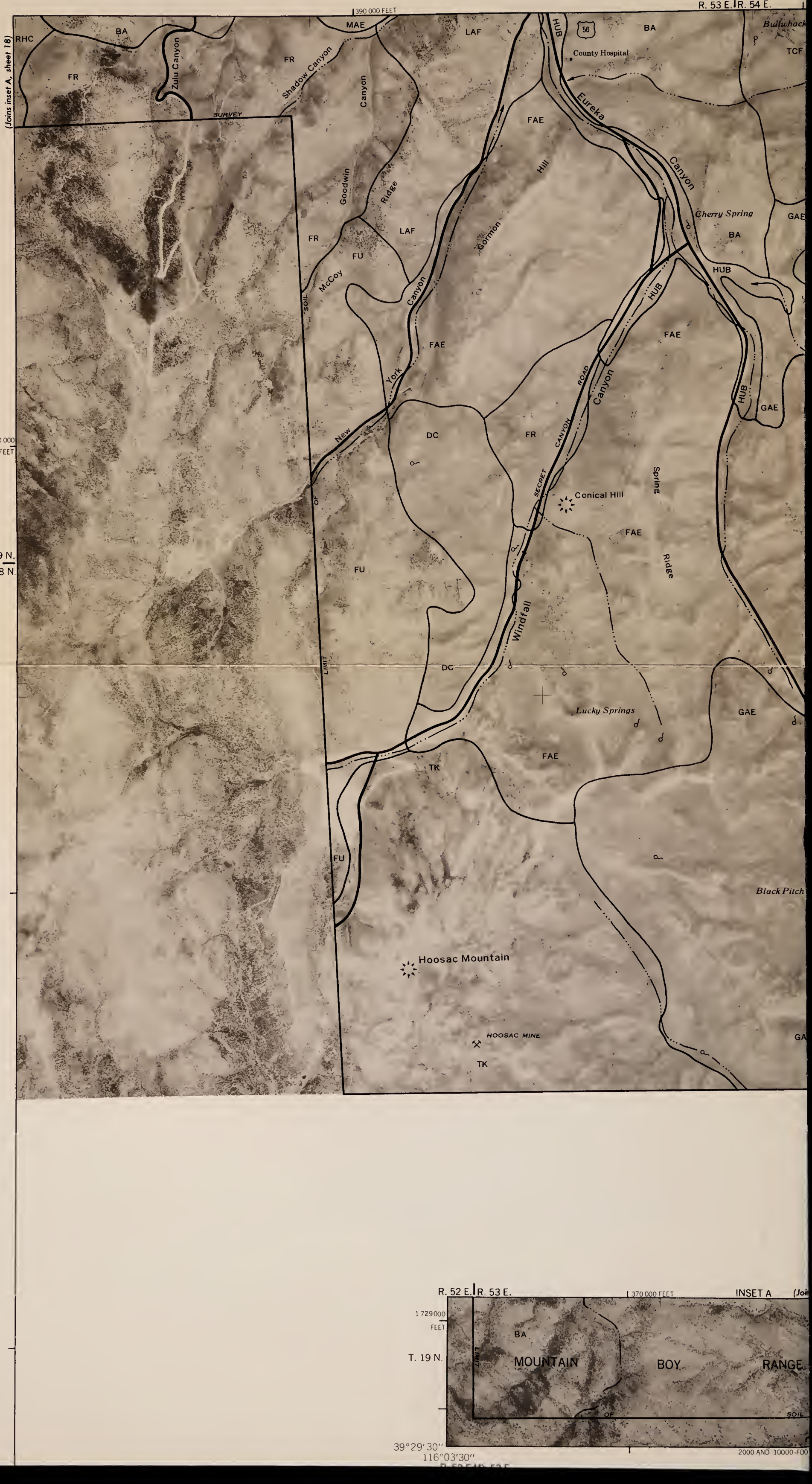


This soil survey was compiled in 1978 by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies

1 ¾ ½ ¼ 0 1 2 Miles
5000 4000 3000 2000 1000 0 5000 10000 Feet
Scale 1:24000

Orthophotobase compiled from 1975 and 1976 aerial photography by the U S Department of The Interior, Geological Survey
Planimetric detail obtained from 7½ minute series maps
10,000-foot grid based on state coordinate system

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE



SHEET NO. 18

DIAMOND VALLEY AREA, PART OF EUREKA, ELKO AND WHITE PINE COUNTIES, NEVADA

(PINTO SUMMIT NW, BELLEVUE PEAK NE, AND PINTO SUMMIT NE QUADRANGLES)

R. 52 E. | R. 53 E.

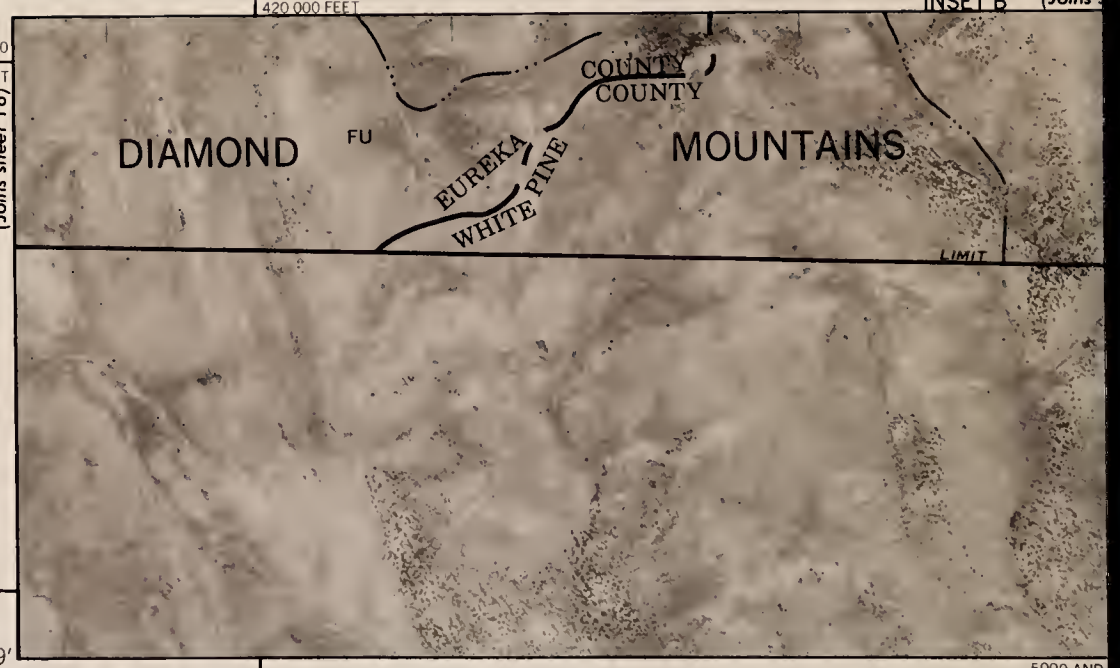
INSET B (Joins

420 000 FEET

1 729 000 FEET

(Joins sheet 18)

T. 19 N.



39°29′
115°52′30″

5000 AND

39°22′30″
116°00′

R. 53 E. | R. 54 E.

This soil survey was compiled in 1978 by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies

1 ¾ ½ ¼ 0

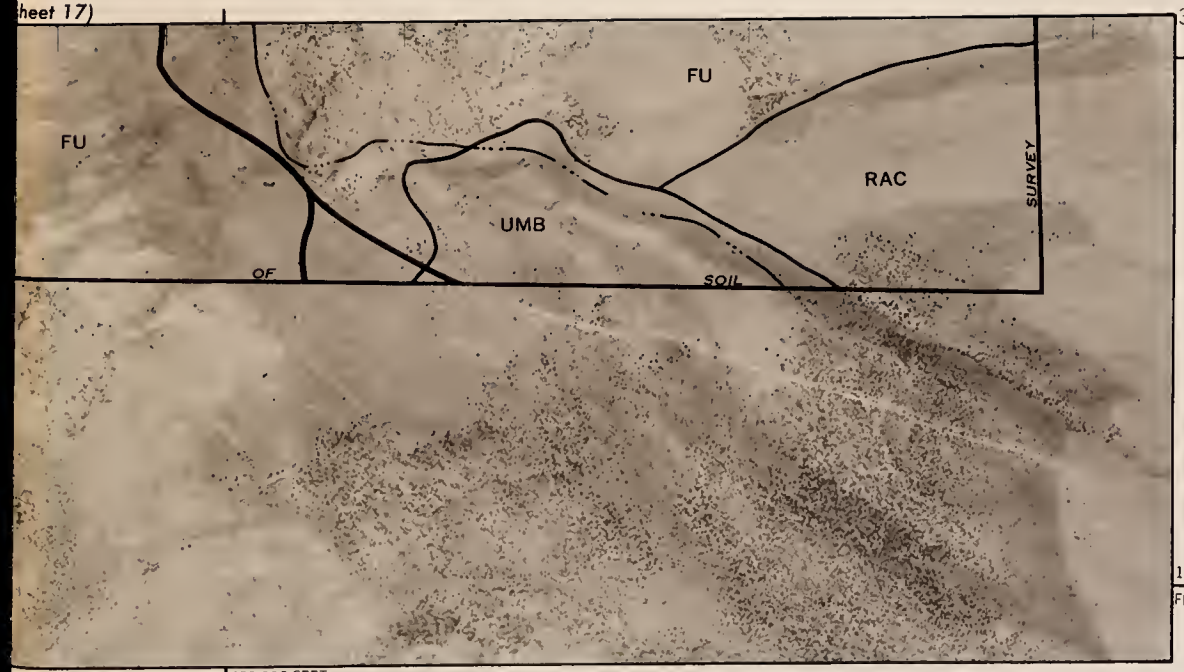
5 000 4 000 3 000 2 000 1 000 0

Scale 1:

DIAMOND VALLEY AR

heet 17)

R. 54 E. | R. 55 E.



115°48′
39°30′

T. 19 N.

1 690 000
FEET

1 724 000
FEET

0000-FOOT GRID TICKS | 430 000 FEET

R. 54 E. | R. 55 E.

410 000 FEET

1 2 Miles

5000 10000 Feet

24000

Orthophotobase compiled from 1975 and 1976 aerial photography
by the U.S. Department of The Interior, Geological Survey.
Planimetric detail obtained from 7½ minute series maps.
10,000-foot grid based on state coordinate system.

EA, NEVADA NO. 18