SOIL SURVEY OF

Big Smoky Valley Area, Nevada

Part of Nye County

United States Department of Agriculture
Soil Conservation Service
In cooperation with
United States Department of the Interior
Bureau of Land Management and
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 1966-71. Soil names and descriptions were approved in 1972. Unless otherwise indicated, statement in the publication refer to conditions in the county in 1972. This survey was made cooperatively by the Soil Conservation Service, the Department of the Interior, Bureau of Land Management, and the University of Nevada Agricultural Experiment Station. It is part of the technical assistance furnished to the Tonopah 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 lands for farming, industry, and recreation.

Locating Soils

All the soils of the Big Smoky Valley Area are shown on the detailed map at the back of this survey. 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 dryland and irrigated capability classification, range site, and wildlife suitability group in which each soil has been placed. It also shows the page where each soil is described and the interpretive group in which each 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 placed over the soil map and colored to show soils that have the same limitation or suitability. For example, soils that have a slight limitation for a given use can be colored green, those with a moderate limitation can be colored yellow, and those with a severe limitation can be colored red.

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

Games managers, sportsmen, and others can find information about soils and wildlife in the section "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."

Engineers and builders can find, under "Engineering," 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 Big Smoky Valley Area may 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."

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Issued February 1980

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Summary of Tables

SOIL SURVEY OF BIG SMOKY VALLEY AREA, NEVADA

PART OF NYE COUNTY

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

THE BIG SMOKY VALLEY AREA, PART OF NYE COUNTY (hereafter referred to as Big Smoky Valley Area) is in the central part of Nevada (fig. 1). It is an area of 887 square miles, or 567,680 acres. Tonopah, the major town, is in the southeastern part of the Area. Other smaller communities are Round Mountain, near the center of the Area, and Manhattan, which is near Round Mountain but outside the survey area.

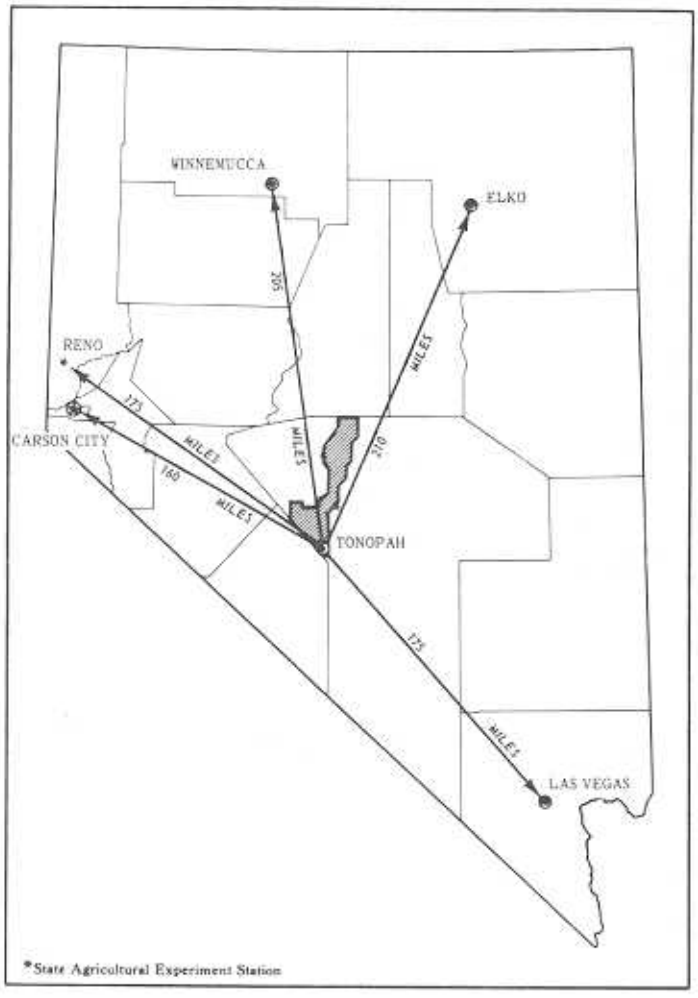

Figure 1.—Location of the Big Smoky Valley Area (part of Nye County) in Nevada.

The Area is generally an elongated valley oriented in a north-south direction. It extends from the Lander-Nye County line on the north to Tonopah on the south, and lies between the Toiyabe Mountains to the west and the Toquima Mountains to the east. The Toquima Range joins the San Antonio Range, which completes the boundary on the east side. At the southern end of the Toiyabe Range, the survey boundary turns to the west and extends about 18 miles, then turns south and extends to the Nye-Esmeralda County line. This county line is a boundary for the rest of the survey area.

General Nature of the Area

This section is mainly for those who are not familiar with the survey area. The settlement and development, transportation, physiography and geology, water supply, irrigation, agriculture, and climate of the survey area are briefly described.

Settlement and Development

In 1827 Jedediah S. Smith, part owner of the Rocky Mountain Fur Company, crossed the Big Smoky Valley and Toquima Range to the present site of Manhattan. He was the first reported visitor into the Area. In 1846 Captain Fremont's (*5*) [1] expedition went through the southern part of the Area. Mexicans probably mined the San Antonio Mountains in about 1854, and some early trappers from Canada came into the valley well before 1860. The history of this region since 1862 is mainly a history of mining. The first settlement in the Area was in Ophir Canyon, where an ore mill was built in 1866.

[1] Italic numbers in parentheses refer to Literature Cited, p. 137.

After the first discovery of gold in Ophir Canyon, the mining industry was active for only a decade or two, and then it gradually declined until 1900. Then James Butler discovered rich deposits of silver and gold ore at the present site of Tonopah. The town of Manhattan was founded in 1905; Round Mountain was founded in 1906 when high grade ore was discovered nearby.

Presently, mining activity is limited mostly to assessment work and exploration. Some of the mines and mining towns and all of the railroads in the survey area have been abandoned.

Many of the ranches have been in existence a long time. Their history and economics are related to the mining camps. Generally, the first ranches were established where there were springs, mountain streams, and wet meadows. There, farming could be combined with ranching. A number of ranches were well known as stage stations, watering sites, or camping places for freighters and other travelers.

Most of the ranches are on the west side of the north valley where water from canyons of the Toiyabe Range is available and where springs are prominent in the valley. A few farms are on the south side of the Toiyabe Range at Cloverdale Creek and Peavine Creek. Recently farming has been attempted on the fans and valley bottoms, but generally it has been abandoned.

Communities

There are two communities within the survey area, Tonopah and Round Mountain. Manhattan, about eleven miles south of Round Mountain, is about two miles east of the Area. Round Mountain and Manhattan have elementary schools, grocery stores, and service stations. A service station and cafe are near the highway maintenance station on Nevada Highway 8A. The hospital at Tonopah serves the surrounding area.

Tonopah, county seat of Nye County, has a population of about 1,500, and Manhattan has less than 100 people.

Transportation

The nearest railroad shipping point is at Mina, Nevada, 64 miles northwest of Tonopah. This is the terminus of a spur line of the Southern Pacific Railroad. Tonopah is served by a busline which connects Reno and Las Vegas. Regular airline services are not available within the area. There is an airport that has hard-surfaced runways at Tonopah, and there are unpaved airstrips near Round Mountain and at several ranches. Trucking provides transportation for produce and livestock.

U.S. Highway 6 connects Ely, Nevada, and Bishop, California, and passes through Tonopah near the southern survey boundary. U.S. Highway 95 connects Reno and Las Vegas and also passes through Tonopah. U.S. Highway 50, which provides east-west access across central Nevada, is about twenty miles north of the northern boundary of the Area. State Route 8A joins Highways 6 and 50 and crosses the northern part of the Area.

Physiography and Geology

The Big Smoky Valley Area is in the Great Basin section of the Basin and Range province in northwestern Nye County (*5*). The survey area is a typical internally drained valley hemmed in by mountains, low foothills, and broad alluvial fans. It is divided into two valleys by a low alluvial swell west of Manhattan. The survey area is elongated and makes up about 567,680 acres (887 square miles). It extends from the Lander-Nye County line on the north to Tonopah on the south. The north valley lies between the Toquima Range on the east and the Toiyabe Range on the west. It has alluvial fans and a large playa, locally referred to as Lake Toiyabe, at an elevation of 5,600 feet. The south valley extends west from the top of the San Antonio Mountains across the broad alluvial fans and valley floor, locally referred to as the Tonopah Flat, to the low hills and the Esmeralda-Nye County line. The mountains have a maximum elevation of about 8,500 feet; the valley floor is at an elevation of about 4,800 feet. The elevation of the alluvial fans is about 5,600 feet to 6,500 feet in the northern valley and 4,800 to 6,000 feet in the southern valley.

Eruptive formations are exposed over extensive areas of the San Antonio Mountains and the ranges bordering Big Smoky Valley (*3*). They are basalt, rhyolite, and minor amounts of rock of intermediate composition with associated tuffs and breccias. Such formations lie at or near the surface in the southern part of the Toiyabe Range and in large parts of the Toquima and San Antonio Ranges. These rocks are a series of extensive sheets and connected dikes and necks formed during the Tertiary period. Tuff crops out extensively in nearly all parts of the uplands in the southern part of the Area.

Tertiary sedimentary deposits of the Esmeralda Formation, quartz-latite of the Toiyabe Formation in the higher parts of the Toiyabe Range, slate (in part schistose) of the Palmetto Formation, dark limestone containing chert and interbeded quartz, and several bodies of granitic rocks are in the Area and in the surrounding mountains (*4*).

The survey area is drained into two basins that are intermittently flooded. The underground water as well as the surface water flow toward these basins. The basin in the Tonopah Flat area is south and west of the southern part of the survey area. The basin in the northern part is the large playa. The abundance of hydrophytic plants indicates a high water table in these areas. The basins have playas that are salty and have low water infiltration and are generally devoid of vegetation.

Except for the area near the San Antonio ranch and the large playa in the northern part of the survey area, the soils of the Big Smoky Valley Area are well drained to excessively drained. Near the large playa the soils are somewhat poorly drained to poorly drained.

Water Supply

The water source for irrigation, stock water, and general use comes from small streams fed by snow

and rain, or from ground water. There are about 50 streams in the survey area. All but Moore, Baker, Willow, Jefferson, and Shoshone Creeks, which rise in the Toquima Range, rise in the Toiyabe Mountains. The largest streams are Twin Rivers and Peavine Creeks. Except for Peavine, Cottonwood, and Cloverale Creeks, all of the streams discharge into the northern part of the Area. By June, the volume of flow has decreased greatly. Some concrete-lined ditches carry the water from the mouths of the canyons to the fields below. Small seeps and springs are generally in the northern part of the Area. Because power lines are being extended and transportation is becoming easier, pumping of ground water for irrigation and other uses is becoming more common.

Potentially usable streams in Big Smoky Valley have a combined average annual flow of about 35,000 acre-feet. About 20,000 acre-feet of flow occurs during the average growing season. The maximum flow generally is at or near the canyon mouths.

The northern part of the Area receives more precipitation at a given altitude than the Tonopah flat area. Inflow to the valley fill reservoir is mostly recharge from precipitation. Outflow from the northern part of the valley is evapotranspiration from areas of phreatophytic plants. Nearly half of the estimated outflow from the Tonopah flat area is evapotranspiration, and the rest is probably ground water outflow.

The estimated total average annual inflow and outflow are 65,000 acre-feet in the northern part of the valley and 14,000 acre-feet in the Tonopah flat. The estimated perennial yield of the valley fill reservoirs is 65,000 acre-feet in the northern part and 6,000 acre-feet in the Tonopah flat.

Pumping lifts in the Tonopah Flat area range from about 50 feet at the highway rest stop on U.S. 95, 12 miles west of Tonopah and outside of the survey area, to about 150 feet at Bridgewell about 8 miles south of the San Antonio ranch. Lifts of usable water in the northern part of the Area range from 17 feet near the highway maintenance station to 150 feet east of Wall Canyon.

The well yields range from 30 gal/min at the highway rest stop on U.S. 95 to 2,500 gal/min at Tonopah Flat area and 1,800 gal/min west of Round Mountain. One well on the R.O. ranch yields 1,500 gal/min. Springs yield 4 gal/min to 120 gal/min in the northern part of the Area and 10 to 25 gal/min at the San Antonio ranch.

Irrigation

The streams flowing from the mountains (*6*) generally are well suited to use for irrigation. Most alluvial areas yield usable ground water of suitable quality. Shallow wells near the playa would probably yield unsuitable water. The wells that have been dug in the survey area indicate that at least some of the valley can be used for irrigated crops.

Irrigating the salty soils near the playa increases the content of salt. Only the soils on the lower part of the alluvial fans, except the very gravelley soils, should be irrigated. In the northern part of the Area, the Quima and Broyles soils are most suitable for irrigation. In the southern part of the survey area, Koyen and Domez soils are most suitable. Unless irrigation areas are enlarged by developing additional water supplies, no serious drainage problem is anticipated.

Agriculture

Raising beef cattle is the most important farm enterprise. A few of the ranches are used for recreation, hunting, or youth camps. In 1972, there were 17 ranches in the survey area, most of them operated by the owners. There were about 18,000 acres of private land. The average farm size was 1,100 acres, and this included about 120 acres of irrigated land per ranch. A total of about 2,000 acres was irrigated. Native grasses, grass-legume mixtures and alfalfa were the most common crops. Irrigation is needed to supplement precipitation. Water for irrigation comes mostly from streams, but the streams produce very little water after about the middle of June.

Most of the survey area is rangeland administered by the Bureau of Land Management. The soils of the valley plains and alluvial fans support a sparse stand of vegetation that provides only limited livestock grazing. The precipitation is so scanty that revegetation by any known method is prohibitive. The uplands and lower mountains provide moderate amounts of forage for grazing. The steepness of the mountains restricts cattle grazing.

Climate

The Big Smoky Valley is in an area of typical mid-latitude steppe climate. It has hot summers, cool winters, and little precipitation. Sunshine is abundant, and the rate of evaporation is high. Although summer days are hot, the low humidity and cool nights make this climate more comfortable than humid climates. Natural vegetation is very sparse.

Table 1 gives temperature and precipitation data compiled from records of the United States Weather Bureau at Tonopah (*11*). The station was in the town of Tonopah from 1902 until 1954, when it was moved to the Tonopah airport. The airport is 667 feet lower than Tonopah, and it is on the eastern side of the San Antonio Mountains, so the records show a significant increase in the daily temperature range.

The valley is on a plateau between major mountain ranges, and this is the main reason for the semiarid climate. To the west lie the Sierra Nevada, a massive range of mountains that effectively reduces the moisture content of storms moving inland from the Pacific Ocean during the fall, winter, and spring. As moist air flows eastward it is forced to rise over the mountains, and it loses much of its moisture on the western slopes. The air moving down the eastern slopes is warmed by compression, and when it reaches the interior valleys it is relatively dry. As the air continues to move eastward, each successive mountain range further reduces the moisture content. As a result, precipitation in the survey area is light. The main source of moisture during the summer is the northward flow of warm, moist air from the Gulf of Mexico. There is a gradual increase in moisture and in thunderstorm

TABLE 1.—*Temperature and precipitation*

[Data from Tonopah. Length of record, 30 years except where noted]

Month	Temperature			Precipitation				Mean number of days when—		
	Average daily maximum	Average daily minimum	Average daily	Mean	Greatest daily [1]	Snow, sleet		Precipitation is 0.10 inch or more	Temperature is—	
						Mean [2]	Maximum monthly [1]		90° and above	32° and below
	°F	°F	°F	Inches	Inches	Inches	Inches			
January	40.2	20.0	30.1	0.31	0.54	3.3	24.1	1	0	28
February	45.2	24.1	34.7	.37	1.52	2.8	13.0	1	0	24
March	51.8	27.8	39.8	.55	0.76	3.0	21.2	2	0	23
April	61.9	35.5	48.7	.58	0.85	1.3	8.0	2	0	11
May	70.5	43.1	56.8	.47	0.88	.1	4.0	1	(3)	3
June	80.6	50.4	63.3	.24	1.06	0	(4)	1	5	(3)
July	89.3	58.6	73.9	.43	1.23	0	0	1	16	0
August	87.0	56.6	71.8	.33	1.22	0	0	1	10	0
September	79.0	49.7	64.3	.40	1.26	.1	2.0	1	2	(3)
October	66.2	39.6	52.9	.47	0.75	.4	4.0	1	0	5
November	51.5	28.6	38.8	.45	1.03	2.7	37.0	1	0	20
December	43.8	23.3	33.5	.37	0.65	2.1	9.0	1	0	27
Year	64.9	38.1	50.7	4.97	1.52	15.8	37.0	14	33	141

[1] Length of record, 33 years.
[2] Length of record, 25 years.
[3] Less than one-half day.
[4] Trace.

activity as one moves from west to east across the State. As in all semiarid regions, heavy downpours occur occasionally in small areas. These cloudbursts sometimes bring as much rain to a locality in a few hours as would normally fall in several months.

During the transition between the winter frontal systems and the summer thunderstorms, there is a marked increase in the formation of high-altitude low pressure systems, low aloft. This happens most frequently in May and October. The vertical movement of air associated with these systems covers a wide area and results in rather widespread precipitation. Generally, the rate at which precipitation increases as altitude increases is considerably less than in frontal storm systems. Topography influences this type of storm less.

Precipitation tends to be rather uniform throughout the year and averages only 5 inches annually. In winter, precipitation generally falls as snow. The city of Tonopah receives about 23 inches of snow annually, compared to the airport's 7 inches. This snowfall discrepancy is caused by the city's higher elevation and its closeness to the western slopes of the Sierras.

The small amount of precipitation is not enough for the production of crops without irrigation, nor is it enough for seeding range grasses. Because the annual precipitation varies so widely, periods of drought can be severe even if supplemental water from the surrounding mountains is used to meet the needs of crops.

Much of the precipitation comes during winter and early in spring. Occasionally thunderstorms drop large amounts of rain during July, August, and September.

The annual temperature range is quite large. The highest temperature ever recorded was 104° F in July 1960, and the lowest was 15° F in January 1952. Summer temperatures often go above 90° F during the day, and nighttime temperatures dip down into the fifties. The daily temperature range is even larger at the airport, where the weather station was moved in 1954, since cold mountain air drains into the valley at night and lowers the temperature. In winter, daytime temperatures rarely drop below 32° F, but nighttime temperatures usually do. Temperatures below 0° F occur, on the average, once a year.

Although freezing temperatures have been recorded as late as mid-June and as early as mid-September, the growing season in the survey area averages about 144 days, from late May to early October. Table 2 shows the probability of last freezing temperatures in the spring and first freezing temperatures in the fall for the Area (*11*).

How This Survey Was Made

Soil scientists made this survey to learn what kinds of soils are in the Big Smoky Valley Area, where they are located, and how they can be used. They went into the area knowing they likely would find many soils they had already seen and perhaps some 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 comparisions 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 is the category 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, the major horizons of all the soils of one series are similar in thickness, arrangement, and other important characteristics. Each soil series is named for a town or geographic feature or the name is coined. Lathrop and Quima 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, soil series are divided into phases. The name of a soil phase indicates a feature that affects management. For example, Quima coarse sandy loam, 0 to 2 percent slopes, is one of several phases within the Quima 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 field borders, trees, and other details that help in drawing boundaries accurately. The soil maps at the back of this publication were prepared from aerial photographs.

The areas shown on a soil map are called mapping units. On most maps detailed enough to be useful in planning the management of farms and fields, a mapping unit is nearly equivalent to a soil phase. It is not exactly equivalent because it is not practical to show on such a map 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 the Big Smoky Valley Area: soil complexes and soil associations.

A soil complex consists of areas of two or more soils, so intricately mixed or so small in size that they cannot be shown separately on the soil map. Each area of a complex contains some of each of the two or more dominant soils, and the pattern and relative proportions are about the same in all areas. Generally, the name of a soil complex consists of the names of the dominant soils joined by a hyphen. Settlemeyer-Yobe 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 are shown as one unit because the time and effort of mapping 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. Dobel-Bluewing association is an example.

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

While a soil survey is in progress, soil scientists take soil samples needed for laboratory measurements and for engineering tests. Laboratory data from the same kinds of soils 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 kinds of soils.

Soil scientists observe how a soil behaves when used as a growing place for native and cultivated plants and as material for structures, foundations for structures, or covering for structures. They relate this behavior to properties of the soils. For example, they observe that filter fields for onsite disposal of sewage fail on a given kind of soil, and they relate this to the slow permeability of the soil or to a high water table. They see that streets, road pavements, and foundations for houses are cracked on a particular soil and they relate this failure to the high shrink-swell potential of the soil material. Thus they use observation and knowledge of the soil properties and 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 the Big Smoky 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 several minor soils, 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 range or a wildlife area, or in planning enegineering 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.

TABLE 2.—*Probability of last freezing*

LAST IN SPRING

Temperature	Dates for given probability and temperature			
	90 percent	80 percent	70 percent	60 percent
24°F or lower	March 21	March 29	April 4	April 9
28°F or lower	April 3	April 10	April 16	April 21
32°F or lower	April 26	May 4	May 10	May 15

FIRST IN FALL

Temperature	Dates for given probability and temperature			
	10 percent	20 percent	30 percent	40 percent
24°F or lower	October 17	October 23	October 28	November 1
28°F or lower	October 7	October 13	October 18	October 21
32°F or lower	September 22	September 28	October 3	October 7

The soil associations in the Big Smoky Valley Area have been grouped into four general kinds of landscapes for broad interpretative purposes. Each of the broad groups and the soil associations in each group are described in the following paragraphs.

Soils of the Uplands and Mountains

These soils formed in residuum and colluvium derived from basalt, andesite, rhyolite, and volcanic ash. The surface layer is gravelly and cobbly and is medium textured and moderately coarse textured. The soils are well drained, shallow, and moderately deep.

The Old Camp-Pintwater-Rock outcrop association is the only association in this group. It makes up about 14 percent of the survey area.

1. *Old Camp-Pintwater-Rock outcrop association*

Moderately steep and steep, shallow soils on uplands and mountains

This association is on uplands and mountains. It is mostly in the southern part of the survey area along the San Antonio Mountains and in the southern end of the Toiyabe Range. It also includes the low hills in the southwestern part of the Area and a small area along the Toquima range. Elevation ranges from 5,500 to 8,000 feet. Mean annual precipitation is 5 to 12 inches. Mean annual air temperature is 40° to 47° F, and the length of the frost-free season is 80 to 120 days.

This association makes up about 14 percent of the survey area. It is about 23 percent Old Camp soils, 19 percent Pintwater soils, 17 percent Rock outcrop, and 7 percent Gabbs soils. The remaining 34 percent is Basket, Kyler, Maggie, McCann, Mina, Nevoyer, Osobb, Penelas, Silverbow, Timblin, and Vinini soils.

Old Camp soils are well drained and steep. They are on low mountains and uplands. Slopes are 30 to 50 percent. Typically, the surface layer is light brownish gray to pale brown very gravelly and gravelly very fine sandy loam about 6 inches thick. The subsoil is about 4 inches of pale brown very gravelly loam. Fractured metavolcanic rock is at a depth of 10 inches. Old Camp soils have moderate permeability and very low available water capacity. The hazard of erosion is moderate. Rooting depth is 10 to 20 inches. These soils have a plant cover of black sagebrush, Sandberg bluegrass, Indian ricegrass, spiny hopsage, and needleandthread.

Pintwater soils are well drained. They are on uplands. Slopes are 15 to 50 percent. Typically, the surface layer is light brownish gray and light gray very cobbly and very gravelly fine sandy loam about 3 inches thick. The subsoil is about 14 inches of very pale brown very gravelly and very cobbly fine sandy loam. Rhyolitic bedrock is at a depth of 17 inches. The first few inches are creviced in places. Pintwater soils have moderately rapid permeability and very low available water capacity. The hazard of erosion is moderate. Rooting depth is 10 to 20 inches. These soils have a plant cover of black sagebrush, ephedra, Indian ricegrass, squirreltail, galleta, and bud sagebrush.

Rock outcrop consists of nearly level to extremely steep bare rocks and cliffs and areas that have a soil mantle that is less than 10 inches deep to bedrock. Rock outcrop is on uplands and low mountains.

Gabbs soils are well drained. They are on the lower parts of uplands and on foothills. Typically, the surface layer is grayish brown very cobbly very fine sandy loam about 3 inches thick. The subsoil is about 5 inches of light brownish gray gravelly fine sandy loam. The next layer is light brownish gray very gravelly fine sandy loam about 12 inches thick. The underlying material is a white, very gravelly silica-lime cemented hardpan. Gabbs soils have moderately rapid permeability and very low available water capacity. The hazard of erosion is slight. Rooting depth is 20 to

temperatures in spring and first in fall

LAST IN SPRING—Continued

Dates for given probability and temperature—Continued				
50 percent	40 percent	30 percent	20 percent	10 percent
April 14 April 26 May 20	April 19 May 1 May 25	April 24 May 6 May 30	April 30 May 12 June 5	May 9 May 20 June 14

FIRST IN FALL—Continued

Dates for given probability and temperature—Continued				
50 percent	60 percent	70 percent	80 percent	90 percent
Nobember 5 October 25 October 11	November 9 October 29 October 15	November 13 November 1 October 19	November 18 November 6 October 24	November 25 November 12 October 30

30 inches. These soils have a plant cover of Bailey greasewood, shadscale, bud sagebrush, ephedra, desert needlegrass, and galleta.

The soils in this association are not suited to irrigated crops or range seeding. They are used mainly for range, wildlife habitat, and recreation.

Soils on Valley Fill, Outwash Plains, and Alluvial Fans

The soils formed in alluvium derived mainly from such volcanic rocks as basalt, rhyolite, tuffs, and latite and admixtures of limestone and shale. The surface layer is gravelly and coarse, moderately coarse, or medium in texture. The soils are well drained to excessively drained.

The four associations in this group are the Dobel-Bluewing-Lyda association, the Mazuma-Quima-Broyles association, the Wardenot-Laxal association, and the Vigus-Unsel-Ardivey association. These associations make up about 49 percent of the survey area.

2. *Dobel-Bluewing-Lyda association*

Gently sloping and moderately sloping soils on alluvial fans, aprons, and terraces

This association is on alluvial fans, aprons, and terraces throughout the survey area and is adjacent to the uplands and above the valley floor. Elevation ranges from 5,000 to 6,500 feet. Mean annual precipitation is 4 to 6 inches. Mean annual air temperature is 43° to 51° F, and the length of the frost-free season is 100 to 130 days.

This association makes up about 31 percent of the survey area. It is about 26 percent Dobel soils, 20 percent Bluewing and Lyda soils, and 11 percent Belted soils. The remaining 43 percent is Lathrop, Laxal, Orphant, Roic, Spanel, Tybo, and Wardenot soils and Badland.

Dobel soils are well drained. They are on the alluvial fans and aprons that have many dry stream channels 2 to 10 feet deep. Slopes range from 2 to 8 percent. Typically, the surface layer is light brownish gray very gravelly fine sandy loam or loam about 4 inches thick. The subsoil is about 4 inches of brown gravelly clay loam. Below that is a pale brown, strongly cemented hardpan that is stratified with gravelly soil material. Dobel soils have slow permeability and very low available water capacity. The hazard of erosion is slight. These soils have a plant cover of Bailey greasewood, shadscale, bud sagebrush, ephedra, galleta, and Indian ricegrass.

Bluewing soils are excessively drained. They are on the alluvial fans, terraces, and aprons in intermittent drainageways. Slopes range from 2 to 8 percent. Typically, the surface layer is light brownish gray very stony loamy sand about 3 inches thick. The subsoil is about 5 inches of pale brown very gravelly loamy sand. The substratum is light gray cobbly and very gravelly sand that extends to a depth of 60 inches or more. Bluewing soils have very rapid permeability and low available water capacity. The hazard of erosion is slight. These soils have a plant cover of Bailey greasewood, shadscale, bud sagebrush, fourwing saltbush, and Indian ricegrass.

Lyda soils are well drained. They are on the higher dissected terraces and fans. Slopes range from 2 to 8 percent. Typically, the surface layer is light brownish gray or very pale brown very gravelly fine sandy loam about 4 inches thick. The subsoil is about 8 inches of light yellowish brown cobbly heavy clay loam over very gravelly sandy loam. Below that is a white, silica-lime cemented hardpan. Lyda soils have slow permeability above the hardpan and very slow permeability through it. They have very low available water capacity. The hazard of erosion is moderate. These soils have a plant cover of Bailey greasewood, shad-

scale, bud sagebrush, winterfat, kochia, galleta, and Indian ricegrass.

Belted soils are well drained. They are gently sloping and moderately sloping on terraces. Slopes range from 2 to 8 percent. Typically, the surface layer is light brownish gray gravelly loamy sand and gravelly sandy loam about 5 inches thick. The subsoil is about 5 inches of light gray loam. It is underlain by a very pale brown, strongly cemented hardpan that is about 10 inches thick. Below this is pale brown sandy loam and very gravelly sand that extends to a depth of 60 inches or more. Belted soils have moderate permeability above the hardpan and slow permeability through it. They have very low available water capacity. The hazard of erosion is slight. These soils have a plant cover of Bailey greasewood, shadscale, bud sagebrush, Anderson wolfberry, Indian ricegrass, and globemallow.

The soils in this association are not suited to irrigated crops or to range seeding. They are used mainly for range and wildlife habitat.

3. *Mazuma-Quima-Broyles association*

Nearly level and gently sloping soils on broad, coalescing, and undulating alluvial fans, aprons, and toe slopes

This association is on alluvial fans and aprons slightly above the valley floor and below the uplands. It is in the northern part of the survey area. Elevation ranges from 5,500 to 6,000 feet. Mean annual precipitation is 4 to 6 inches. Mean annual air temperature is 45° to 50° F, and the length of the frost-free season is 100 to 130 days.

This association makes up about 5 percent of the survey area. It is about 27 percent Mazuma soils, 20 percent Quima soils, and 17 percent Broyles soils. The remaining 36 percent is Monte Cristo and Fivemile soils.

Mazuma soils are well drained. They are on low, broad alluvial fans and aprons. Slopes range from 0 to 4 percent. Typically, the surface layer is light gray fine sandy loam about 3 inches thick. The underlying material is very pale brown and light gray fine sandy loam that extends to a depth of 60 inches or more. Mazuma soils have moderately rapid permeability and moderate to high available water capacity. The hazard of erosion is slight to high. These soils have a plant cover of shadscale, bud sagebrush, Indian ricegrass, and galleta.

Quima soils are well drained. They are on alluvial fans. Slopes are 0 to 4 percent. Typically, these soils are pale brown, light brownish gray, and light gray coarse sandy loam more than 60 inches deep. Quima soils have moderately rapid permeability and moderate available water capacity. The hazard of erosion is slight to moderate. These soils have a plant cover of fourwing saltbrush, Indian ricegrass, bud sagebrush, and winterfat.

Broyles soils are well drained. They are on the lower slopes of alluvial fans and aprons. Slopes range from 0 to 4 percent. Typically, the surface layer is light gray fine sandy loam about 3 inches thick. The subsoil is about 8 inches of pale brown fine sandy loam. The substratum is light gray fine sandy loam and has many hard nodules. It extends to a depth of 60 inches or more. Broyles soils have moderately rapid permeability and moderate available water capacity. The hazard of erosion is slight. The hazard of soil blowing is moderate. These soils have a plant cover of shadscale, bud sagebrush, and littleleaf horsebrush.

Some areas of soils in this association have been cleared and are suited to irrigated crops if irrigation water is available. The soils are not suited to range seeding. They are used mainly for range and wildlife habitat.

4. *Wardenot-Laxal association*

Nearly level to moderately sloping soils on alluvial fans and aprons

This association is on alluvial fans and aprons. It is mostly in the northern and western parts of the survey area, but there are a few small areas in the eastern part. The areas are adjacent to steeper uplands. Elevation ranges from 5,500 to 6,200 feet. Mean annual precipitation is 4 to 6 inches. Mean annual air temperature is 43° to 47° F, and the length of the frost-free season is 100 to 130 days.

This association makes up about 6 percent of the survey area. It is about 42 percent Wardenot soils and about 38 percent Laxal soils. The remaining 20 percent is Bluewing, Deerlodge, and Wrango soils.

Wardenot soils are excessively drained and nearly level to moderately sloping. They are on broad, smooth alluvial fans. Slopes range from 0 to 8 percent. Typically, the surface layer is light brownish gray gravelly fine sandy loam about 5 inches thick. The upper part of the substratum is light brownish gray very gravelly fine sandy loam about 20 inches thick. The lower part is pale brown very gravelly loamy sand that extends to a depth of 60 inches or more. Wardenot soils have rapid permeability and low available water capacity. The hazard of erosion is slight. These soils have a plant cover of shadscale, bud sagebrush, kings desertgrass, Indian ricegrass, and galleta.

Laxal soils are somewhat excessively drained and nearly level to moderately sloping. They are on broad, smooth alluvial fans. Slopes range from 0 to 8 percent. Typically, the surface layer is light gray gravelly loam over very gravelly loam and is about 10 inches thick. The substratum is light brownish gray very gravelly sandy loam that extends to a depth of 60 inches or more. Laxal soils have moderately rapid permeability and low available water capacity. The hazard of erosion is slight to moderate. These soils have a plant cover of shadscape, but sagebruch, kings desertgrass, Indian ricegrass, galleta, and sand dropseed. Bailey greasewood or spiny hopsage dominates in some areas.

The soils in this association are generally not suited to irrigated crops. They are not suited to range seeding. The Laxal soils may be marginally suited to crops if irrigation water is available. The soils of this association are used mainly for range and wildlife habitat.

5. *Vigus-Unsel-Ardivey association*

Nearly level to moderately steep soils on dissected alluvial fans

This association is on high, strongly dissected aluvial fans. It is mostly in the northern part of the

survey area, but there are a few small areas in the southern part. Elevation ranges from 5,000 to 6,500 feet. Mean annual precipitation is 4 to 8 inches. Mean annual air temperature is 45° to 50° F, and the length of the frost-free season is 100 to 130 days.

This association makes up about 7 percent of the survey area. It is about 31 percent Vigus soils, 28 percent Unsel soils, 13 percent Ardivey soils, and 12 percent Bluewing soils. The remaining 16 percent is Caudle, Griffy, and Koyen soils.

Vigus soils are well drained and nearly level to moderately sloping. They are on dissected alluvial fans. Slopes range from 0 to 8 percent. Typically, the surface layer is light gray gravelly loamy sand and fine sandy loam about 7 inches thick. The next layer is about 6 inches of brown sandy clay loam. The underlying material is pale brown and brown to white gravelly loamy sand that overlies sandy loam and that extends to a depth of 44 inches or more. It is weakly cemented in the lower part. Vigus soils have moderately slow permeability and moderate available water capacity. The hazard of erosion is moderate. These soils have a plant cover of shadscale, bud sagebrush, galleta, Indian ricegrass, and Bailey greasewood.

Unsel soils are well drained and gently sloping to moderately sloping. They are on dissected alluvial fans. Slopes range from 2 to 8 percent. Typically, the surface layer is light gray gravelly loam about 4 inches thick. The next layer is about 6 inches of dark yellowish brown and pale brown gravelly clay loam. The underlying material is pale brown to very pale brown gravelly sandy loam over very gravelly sand, and it extends to a depth of 60 inches or more. Unsel soils have moderately rapid permeability and low available water capacity. The hazard of erosion is slight. The vegetation is Bailey greasewood, shadscale, bud sagebrush, galleta, kochia, and Douglas rabbitbrush.

Ardivey soils are well drained and moderately sloping to moderately steep. They are on dissected alluvial fans. Slopes range from 4 to 30 percent. Typically, the surface layer is very pale brown very stony loam about 3 inches thick. The next layer is about 14 inches of pale brown and yellowish brown to very pale brown gravelly clay loam to very gravelly loam. The underlying material is very pale brown very gravelly loamy sand that extends to a depth of 60 inches or more. Ardivey soils have moderately slow permeability and low available water capacity. The hazard of erosion is slight. These soils have a plant cover of Bailey greasewood, shadscale, bud sagebrush, galleta, and Indian ricegrass.

Bluewing soils are excessively drained. They are on alluvial fans, terraces, and aprons in many of the dry washes. Slopes range from 0 to 8 percent. Typically, the surface layer is light brownish gray very stony loamy sand about 3 inches thick. The next layer is about 5 inches of pale brown very gravelly loamy sand. The underlying material is light gray cobbly and very gravelly sand that extends to a depth of 60 inches or more. Bluewing soils have very rapid permeability and low available water capacity. The hazard of erosion is slight. These soils have a plant cover of Bailey greasewood, shadscale, bud sagebrush, fourwing saltbush, Indian ricegrass, and some big sagebrush.

The soils in this association are generally not suited to irrigated crops. They are not suited to range seeding. Vigus soils may be marginally suited to crops if irrigation water is available. The soils of this association are used mainly for range and wildlife habitat.

Soils on Alluvial Fans and Aprons

These soils formed in alluvium derived from such volcanics as basalt, rhyolite, tuffs, and andesite and from limestone and granitic rock in places. The surface layer is generally coarse textured or moderately coarse textured. The soils are excessively drained, somewhat excessively drained, and well drained.

The two associations in this group are the Stumble-Tipperary association and the Yomba-Timper-Koyen association. These associations make up about 20 percent of the survey area.

6. Stumble-Tipperary association

Nearly level to moderately steep soils on lake terraces and alluvial fans

This association is on lake-plain terraces and alluvial fans. It is mostly in the south-central part of the survey area, but there is a small area in the north-central part. Elevation ranges from 5,000 to 6,000 feet. Mean annual precipitation is 4 to 6 inches. Mean annual air temperature 43° to 51° F, and the length of the frost-free season is 100 to 150 days.

This association makes up about 7 percent of the survey area. It is about 75 percent Stumble soils and 20 percent Tipperary soils. The remaining 5 percent is Bluewing, Broe, and Fivemile soils and Dune land.

Stumble soils are somewhat excessively drained and nearly level to moderately sloping. They are on alluvial fans. Slopes range from 0 to 8 percent. Typically, the surface layer is light brownish gray loamy fine sand about 15 inches thick. The underlying material is pale brown loamy fine sand that extends to a depth of 60 inches or more. Stumble soils have rapid permeability and low to moderate available water capacity. The hazard of erosion is slight, and the hazard of soil blowing is high. These soils have a plant cover of fourwing saltbush, littleleaf horsebrush, sand dropseed, and Indian ricegrass.

Tipperary soils are excessively drained and nearly level to moderately steep. They are in stabilized dunes on lake terraces. The dunes are 2 to 10 feet high and have steep, short side slopes. Typically, the surface layer is light brownish gray fine sand about 6 inches thick. The underlying material is light brownish gray fine sand that extends to a depth of 60 inches or more. Tipperary soils have very rapid permeability and low available water capacity. The hazard of erosion is slight, and the hazard of soil blowing is high. These soils have a plant cover of black greasewood, fourwing saltbush, Indian ricegrass, needleandthread, and sand dropseed.

The soils in this association are generally not suited to irrigated crops. They are not suited to range seeding. Stumble soils are marginally suited to crops if

irrigation water is available. The soils of this association are used mainly for range and wildlife habitat.

7. *Yomba-Timper-Koyen association*

Nearly level and gently sloping soils on valley plains, low lake terraces, and low alluvial fans

This association is on valley plains, low lake terraces, and low alluvial fans. It is in the south-central part of the survey area. Elevation ranges from 4,700 to 6,000 feet. Mean annual precipitation is 4 to 6 inches. Mean annual air temperature is 47° to 52° F, and the length of the frost-free season is 100 to 150 days.

This association makes up about 13 percent of the survey area. It is about 27 percent Yomba soils, 25 percent Timper soils, and 21 percent Koyen soils. The remaining 27 percent is Belcher, Domez, Stargo and Youngston soils.

Yomba soils are somewhat excessively drained and nearly level. They are on terraces or deltalike valley fill and valley plains. Slopes range from 0 to 2 percent. Typically, the surface layer is light brownish gray gravelly sand over light gray fine sandy loam, and it is about 4 inches thick. The next layer is about 10 inches of light gray fine sandy loam and loam. The underlying material is weakly cemented light gray gravelly coarse sandy loam over gray very gravelly sand that extends to a depth of 60 inches or more. Yomba soils have moderately rapid permeability and low available water capacity. The hazard of erosion is slight. These soils have a plant cover of Bailey greasewood, shadscale, bud sagebrush, Anderson wolfberry, kochia, and Indian ricegrass.

Timper soils are well drained. They are on valley fill, valley plains, and lake terraces. Slopes range from 0 to 4 percent. Typically, the surface layer is light brownish gray gravelly sandy loam over sandy loam and is about 3 inches thick. The next layer is about 9 inches of very pale brown loam over sandy loam. Below this is a very pale brown, strongly cemented hardpan about 3 inches thick. The underlying material is light gray gravelly sandy loam that extends to a depth of more than 60 inches. Timper soils have moderately rapid permeability above the hardpan, and very low available water capacity. The hazard of erosion is light. These soils have a plant cover of Bailey greasewood, shadscale, Anderson wolfberry, bud sagebrush, kochia, and globemallow.

Koyen soils are well drained. They are on the alluvial fans and aprons. Slopes range from 0 to 4 percent. Typically, the surface layer is light gray gravelly fine sandy loam about 4 inches thick. The next layer is about 10 inches of pale brown fine sandy loam. The underlying material is light gray and very pale brown stratified fine sandy loam and very fine sandy loam to a depth of more than 60 inches. Koyen soils have moderately rapid permeability and high available water capacity. The hazard of erosion is slight to moderate. These soils have a plant cover of Bailey greasewood, shadscale, bud sagebrush, Indian ricegrass, and galleta.

The soils in this association are marginally suited to irrigated crops if irrigation water is available. They are not suited to range seeding. They are used mainly for range and wildlife habitat.

Playas and Soils on Flats and Basins

The soils formed in silty lacustrine sediment derived from mixed rock sources. The surface layer is generally medium textured, moderately fine textured, or fine textured. The soils are somewhat poorly drained to poorly drained.

The two associations in this group are the Playas association and the Umberland-Yobe-Orizaba association. These associations make up about 17 percent of the survey area.

8. *Playas association*

Nearly level playas in undrained basins and on valley floor of ancient Lake Toiyabe

This association is on undrained basins and valley floors. It is in the northern part of the survey area. Elevation is 5,600 feet. Mean annual precipitation is 4 to 6 inches. Mean annual air temperature is 43° to 47° F, and the length of the frost-free season is 100 to 130 days.

This association makes up about 5 percent of the survey area. Small areas of Tipperary soils and small dunes of sand-sized clay aggregate are of minor extent.

Playas are somewhat poorly drained. They are on smooth basins and valley floors without surface outlets. They are strongly saline-alkali affected. Slopes range from 0 to 2 percent. Playas are deep, highly stratified silt, silty clay, and clay. They have very slow permeability and high available water capacity. Runoff is ponded. The hazard of erosion is slight. The Playas are barren.

Playas are not suited to irrigated crops, range, or wildlife habitat.

9. Umberland-Yobe-Orizaba association

Nearly level soils on flood plains and low lake terraces

This association is on flood plains and low lake terraces. It is in the northern end of the survey area. Elevation is 5,600 feet. Mean annual precipitation is 4 to 6 inches. Mean annual air temperature is 43° to 47° F, and the length of the frost-free season is 100 to 130 days.

This association makes up about 12 percent of the survey area. It is about 36 percent Umberland soils, 17 percent Yobe soils, and 14 percent Orizaba soils. The remaining 33 percent is Charnock, Nyserva, Parran, Settlemeyer, Tipperary, and Zaba soils.

Umberland soils are somewhat poorly drained. They are on smooth, low lake terraces. They are strongly saline-alkali affected. Slopes range from 0 to 2 percent. Typically, the surface layer is light gray clay loam about 3 inches thick. The next layer is about 12 inches of light gray silty clay. The underlying material is light gray, mottled silty clay loam that extends to a depth of 60 inches or more. Umberland soils have very slow permeability and high available water capacity. A seasonal water table is 3.5 to 5 feet below the surface. The hazard of erosion is slight. The vege-

tation is saltgrass, black greasewood, wiregrass, alkali cordgrass, alkali sacaton, Great Basin wildrye, and buffaloberry.

Yobe soils are somewhat poorly drained. They are on smooth, low lake terraces. They are strongly saline-alkali affected. Slopes are 0 to 2 percent. Typically, the surface layer is light gray silt loam about 7 inches thick. The next layer is about 17 inches of light gray silt loam. Below that is very pale brown silty clay loam that extends to a depth of 60 inches or more. Yobe soils have moderately slow permeability and high available water capacity. A seasonal high water table is at a depth of 3 to 6 feet. The hazard of erosion is slight. These soils have a plant cover of black greasewood, saltgrass, pickleweed, common reedgrass, and quailbush.

Orizaba soils are somewhat poorly drained and poorly drained and nearly level. They are on lake terraces and flood plains. Slopes are 0 to 2 percent. Typically, the surface layer is light gray loam about 3 inches thick. The next layer is gray silty clay loam about 14 inches thick. Below that is about 6 inches of gray sand. The underlying material is light gray stratified loam and silty clay loam that extends to a depth of 60 inches or more. Orizaba soils have moderately slow permeability and high available water capacity. A seasonal high water table is at a depth of 2.5 to 6 feet. The hazard of erosion is slight. These soils have a plant cover of rubber rabbitbrush, black greasewood, big sagebrush, saltgrass, and Great Basin wildrye. In the wetter areas the plant cover is alkali sacaton and wiregrass.

The soils in this association are not suited to irrigated crops. They are not suited to range seeding. They are used mainly for range and wildlife habitat.

Descriptions of the Soils

This section describes the soil series and mapping units in the Big Smoky Valley Area. Each soil series is described in detail, and then, briefly, each mapping unit in that series is described. 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 familiar 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, do not belong to a soil series; nevertheless they are listed in alphabetic order along with the soil series.

Preceding the name of each mapping unit is the symbol that identifies the mapping unit on the detailed soil map. Listed at the end of the description of each mapping unit are the capability units and range site in which the mapping unit has been placed. The pages on which each capability unit and range site are described as well as the pages on which each wildlife suitability group is described are listed in 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 (*7*).

The soils in the Big Smoky Valley Area were mapped at either high or low intensity. High intensity indicates that the soils were mapped in considerable detail. Low intensity indicates that the soils were mapped in more generalized detail. Mapping units in the low intensity survey are less homogeneous than mapping units in the high intensity survey.

High intensity and low intensity mapping units are distinguished on the maps and in the text by different map symbols. The symbol for a high intensity unit consists of a capital letter and a small letter, and the symbol for a low intensity unit is two or three capital letters.

Ardivey Series

The Ardivey series consists of very deep, well drained soils that formed in very gravelly alluvium derived from volcanic rocks, tuff, shale, and granitic rocks. These soils are moderately sloping to moderately steep. They are on broad, convex alluvial fans dissected by many drainageways 2 to 10 feet deep, and on high fans that are severely dissected and have steep side slopes. Slopes are 4 to 30 percent. The vegetation is Bailey greasewood, shadscale, bud sagebrush, galleta, Indian ricegrass, and squirreltail. Elevation ranges from 5,800 to 6,500 feet. Mean annual precipitation is 4 to 8 inches. Mean annual air temperature is 45° to 50° F, and the length of the frost-free season is 100 to 120 days.

In a representative profile the surface layer is very pale brown very stony loam about 3 inches thick. The next layer is pale brown and yellowish brown gravelly clay loam about 7 inches thick. Below this is very pale brown very gravelly loam and very gravelly loamy sand that contains cobbles and extends to a depth of 60 inches or more.

Ardivey soils have moderately slow permeability. Effective rooting depth is 60 inches. Available water capacity is low. Runoff is medium, and the hazard of erosion is slight.

Representative profile of Ardivey very stony loam, in an area of Ardivey-Wardenot association, 0.7 mile

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

Soil	Acres	Percent
Ardivey-Wardenot association	9,118	1.61
Badland-Belcher association	1,404	.25
Badland-Pintwater association	1,423	.25
Basket-Mina association	1,094	.19
Belcher gravelly sand, 0 to 4 percent slopes	1,848	.33
Belted gravelly loamy sand, 2 to 8 percent slopes	14,698	2.59
Bluewing very gravelly sand, 0 to 8 percent slopes	8,991	1.58
Bluewing gravelly loamy sand, 0 to 4 percent slopes	4,156	.73
Bluewing very stony loamy sand, 2 to 8 percent slopes	4,220	.74
Bluewing gravelly loam, 0 to 4 percent slopes	4,867	.86
Broe gravelly fine sand, 0 to 4 percent slopes	5,052	.89
Broyles fine sandy loam, 0 to 2 percent slopes	3,605	.64
Broyles fine sandy loam, 2 to 4 percent slopes	1,383	.24
Broyles-Laxal complex	369	.07
Caudle fine sandy loam	1,815	.32
Caudle fine sandy loam, saline-alkali	1,624	.29
Charnock fine sandy loam, strongly saline-alkali	1,853	.33
Charnock clay loam, slightly saline-alkali	905	.16
Charnock complex	1,495	.23
Deerlodge stony loam, very gravelly subsoil variant, 4 to 8 percent slopes	1,016	.18
Dobel-Bluewing association	33,535	5.94
Domez sand	384	.07
Domez fine sandy loam	1,525	.27
Domez-Playas complex	1,243	.22
Dune land	1,436	.25
Fivemile loam	775	.14
Fivemile complex	4,387	.77
Gabbs-Old Camp association	1,269	.22
Griffy loamy sand	1,566	.28
Griffy gravelly loam	786	.14
Jolan gravelly loamy coarse sand	1,902	.34
Koyen sand, 0 to 2 percent slopes	5,168	.91
Koyen fine sandy loam, 2 to 4 percent slopes	13,042	2.30
Koyen gravelly fine sandy loam, 0 to 2 percent slopes	9,095	1.60
Kyler-Rock outcrop complex	707	.12
Lahontan silty clay loam, slightly saline-alkali	2,058	.36
Lahontan clay loam, strongly saline-alkali	1,897	.33
Lathrop gravelly loamy sand, 0 to 4 percent slopes	1,343	.24
Lathrop-Bluewing association	14,271	2.51
Laxal gravelly fine sandy loam, 0 to 2 percent slopes	2,083	.37
Laxal gravelly fine sandy loam, occasionally flooded, 0 to 2 percent slopes	3,063	.54
Laxal gravelly loam, 2 to 4 percent slopes	6,121	1.08
Laxal-Rock outcrop complex	536	.09
Lyda very gravelly fine sandy loam, 2 to 8 percent slopes	11,959	2.11
Maggie-Pintwater association	7,046	1.24
Malpais-Rock outcrop association	3,672	.65
Mazuma fine sandy loam, 0 to 2 percent slopes	3,807	.67
Mazuma fine sandy loam, 0 to 2 percent slopes, severely eroded	1,055	.19
Mazuma fine sandy loam, slightly wet, 0 to 2 percent slopes	3,233	.57
Mazuma very fine sandy loam, 2 to 4 percent slopes	634	.11
Mazuma complex	297	.05
Mine dumps	555	.10
Monte-Cristo-Playas complex	1,735	.31
Noyson sand	2,522	.44
Noyson gravelly sandy loam	310	.06
Nyserva-Tipperary complex	1,679	.30
Old Camp-Mina association	1,565	.28
Old Camp-Osobb association	7,082	1.25
Old Camp-Pintwater association	3,981	.70
Old Camp-Rock outcrop complex	14,039	2.47
Orizaba loam, drained	479	.08
Orizaba loam, slightly saline-alkali	4,328	.76
Orizaba loam, strongly saline-alkali	3,433	.60
Orizaba loam, wet, slightly saline-alkali	817	.14
Orovada very gravelly loamy sand, 0 to 2 percent slopes	482	.08
Orovada fine sandy loam, 0 to 2 percent slopes	2,397	.42
Orovada gravelly fine sandy loam, 2 to 4 percent slopes	1,850	.33
Orphant fine sand	4,597	.81
Orphant-Bluewing association	4,567	.80
Osobb-Gabbs association	7,503	1.32
Parran silty clay loam	7,582	1.34
Penelas association	660	.12
Penelas-Kyler association	1,597	.28
Penelas-Laxal association	880	.16
Penelas-Rock outcrop complex	476	.08
Pintwater-Bluewing association	2,288	.40
Pintwater-Rock outcrop complex	11,007	1.94
Pintwater-Rock outcrop complex, stony	3,817	.67
Playas	14,596	2.57
Playas-Parran complex	2,660	.47
Pumel-Rock outcrop complex	1,206	.21
Quima coarse sandy loam, 0 to 2 percent slopes	4,963	.87
Quima fine sandy loam, 2 to 4 percent slopes	1,982	.35
Roic-Dobel association	6,053	1.07
Settlemeyer loam, drained	299	.05
Settlemeyer silt loam	2,708	.48
Settlemeyer-Yobe complex	736	.13
Silverbow-Rock outcrop complex	2,699	.48
Slickens	245	.04
Spanel gravelly loamy sand	5,338	.94
Stargo gravelly loamy sand	1,016	.18
Stargo coarse sandy loam	4,193	.74
Stumble loamy fine sand, 0 to 8 percent slopes	31,054	5.47
Stumble fine sandy loam, 0 to 2 percent slopes	694	.12
Sundown fine sand	2,117	.37
Timblin-McCann association	4,765	.84
Timper sand, 0 to 2 percent slopes	1,624	.29
Timper gravelly sandy loam, 0 to 4 percent slopes	13,651	2.40
Timper-Playas complex	1,860	.33
Tipperary fine sand, 4 to 30 percent slopes	2,221	.39
Tipperary-Fivemile complex	2,007	.35
Tipperary-Playas complex	6,976	1.23
Tomel-Laxal association	6,702	1.18
Tybo loamy fine sand, 2 to 4 percent slopes	1,774	.31
Tybo-Bluewing association	1,302	.23
Tybo-Stumble association	4,780	.84
Umberland clay loam	12,556	2.21
Umberland-Parran complex	2,578	.45
Umberland-Playas complex	4,108	.72
Unsel-Bluewing complex	24,138	4.25
Vigus gravelly loamy sand, 2 to 8 percent slopes	2,916	.51
Vigus-Koyen association	23,141	4.08
Vinini-Mina association	2,023	.36
Vinini-Nevoyer association	1,713	.30
Wardenot gravelly fine sandy loam, 0 to 8 percent slopes	14,822	2.61
Wrango gravelly fine sandy loam, 0 to 4 percent slopes	913	.16
Wrango stony fine sandy loam, 2 to 8 percent slopes	2,254	.40
Yobe silt loam	7,180	1.26
Yobe-Tipperary complex	1,409	.25
Yobe-Umberland complex	2,590	.46
Yomba gravelly sand	10,789	1.90
Yomba gravelly fine sandy loam	1,233	.22
Yomba-Playas complex	6,922	1.22
Youngston loamy sand	1,225	.22
Youngston fine sandy loam	468	.08
Youngston silt loam	5,245	.92
Zaba-Nyserva association	5,945	1.05
Water areas (less than 40 acres)	232	.04
Total	567,680	100.00

west of State Route 8A and 0.5 mile north of Park Canyon Road, about 2,100 feet north and 1,585 feet west of the southeast corner sec. 13, T. 13 N., R. 42 E.:

A1—0 to 3 inches; very pale brown (10YR 7/3) very stony loam, dark grayish brown (10YR 4/2) moist; moderate very coarse, subangular blocky structure; slightly hard, very friable, sticky, slightly plastic; few very fine roots; many very fine vesicular and tubular pores; 5 percent stones, 50 percent gravel, 10 percent cobbles; moderately alkaline; abrupt smooth boundary.

B21t—3 to 6 inches; pale brown (10YR 6/3) gravelly clay loam, dark yellowish brown (10YR 4/4) moist; weak very thin platy structure; soft, very friable, sticky, plastic; many very fine and few fine roots; many very fine tubular pores; few thin clay films on ped faces and in pores; 30 percent gravel, 5 percent cobbles; thin lime and silica coatings on the underside of some pebbles and cobbles; moderately alkaline; abrupt smooth boundary.

B22t—6 to 10 inches; yellowish brown (10YR 5/4) gravelly clay loam, dark yellowish brown (10YR 4/4) moist; compound weak medium prismatic and moderate medium subangular blocky structure; hard, very friable, sticky, plastic; many very fine and few fine roots; many very fine tubular pores; 40 percent gravel, 5 percent cobbles; common thin clay films on ped faces and in pores; thin lime and silica coatings on the underside of some pebbles; neutral; clear smooth boundary.

IIB3tsica—10 to 17 inches; very pale brown (10YR 6/3) very gravelly loam, brown (10YR 4/3) moist; massive; hard, very friable, slightly sticky, slightly plastic; many very fine and few fine roots; many very fine tubular pores; few thin clay films coating and bridging sand grains; 50 percent gravel, 20 percent cobbles; lime and silica coatings on most pebbles and cobbles; moderately alkaline; clear smooth boundary.

IICsica—17 to 60 inches; very pale brown (10YR 7/3) very gravelly loamy sand, brown (10YR 4/3) moist; massive; slightly hard, very friable, nonsticky, nonplastic; many very fine and few fine roots; 60 percent gravel, 25 percent cobbles, 2 percent stones; weak discontinuous lime and silica coatings on pebbles and cobbles; violently effervescent; strongly alkaline.

Thickness of the solum ranges from 10 to 20 inches. The B horizon averages 45 to 60 percent coarse fragments. It is 30 to 60 percent gravel and 5 to 25 percent cobbles and stones. The B horizon is sandy clay loam, loam, and clay loam. It has weak or moderate, medium, prismatic or subangular blocky structure or thin or very thin, platy structure. The C horizon is 50 to 70 percent gravel, 10 to 30 percent cobbles, and 2 to 10 percent stones. Silica cementation in the C horizon ranges from coatings and pendants on the underside of pebbles to weakly cemented lenticular layers. The consistence of this horizon is no more than firm when moist.

AR—Ardivey-Wardenot association. This association of nearly level to moderately steep soils is in large, irregularly shaped areas on broad, convex, dissected alluvial fans and inset alluvial fans that have many channels 2 to 10 feet deep. Ardivey very stony loam, 4 to 30 percent slopes, makes up about 75 percent of this association; Wardenot gravelly fine sandy loam, 0 to 8 percent slopes, makes up 15 percent; and Bluewing stony loamy coarse sand, 0 to 8 percent slopes, makes up 5 percent. Included in mapping, and making up about 5 percent of the acreage, are other Ardivey soils and some very gravelly alluvium along the sides of the drainageways.

The Ardivey soil has the profile described as representative of the series. The Wardenot soil has a profile similar to that described as representative of the series. The Ardivey soil is on the higher, slightly older fans and is slightly raised. The Wardenot soil is on the more recent, smaller inset fans and toeslopes and is slightly lower. The Bluewing soil has a profile similar to the one described as representative of its series, but the surface layer is stony loamy coarse sand. It is mainly in the drainageways that have been cut into the fans.

Runoff on the Ardivey and Wardenot soils is medium, and on the Bluewing soil, is very slow. The hazard of erosion is slight.

This association is not suited to irrigated crops. It is used mainly for range and wildlife habitat. Capability subclass VIIs dryland; Ardivey soil in range site NV 28–2 and NV 29–2, Desert Loamy Sal; Wardenot soil in range site NV 28–1 and NV 29–1, Desert Loamy; Bluewing soil in range site NV 28–2 and NV 29–2, Desert Loamy Sal.

Badland

This land type consists of moderately sloping to very steep soil material less than 5 inches thick over rhyolitic bedrock that crops out in many places, or over lake-laid sediments of clayey soil material weathered from gypsic rock. It is in areas of rough, complex topography. The soil material is generally gravelly, very gravelly, or stony, and ranges from coarse to fine. It is highly stratified in places. It is severely eroded and produces large amounts of sediment; much of the erosion is caused by high-intensity summer thunderstorms. Some local faulting has caused an intricate pattern of narrow ravines that have very steep sides, sharp crests, and pinnacles.

This land type is essentially barren. Runoff is very rapid, and the hazard of erosion is severe.

This land type is of very limited use. In places it has some value for wildlife habitat, recreation, and esthetic purposes.

BA—Badland-Belcher association. This association is in large, irregularly shaped areas on alluvial fans and terraces. Badland makes up about 40 percent of the association; Belcher gravelly sand, 0 to 4 percent slopes, makes up about 20 percent; and Belted gravelly loamy sand, 2 to 8 percent slopes, makes up about 20 percent. The remaining 20 percent is included Bluewing and Roic soils and some outcrops of tuffaceous rock.

The Badland is severely eroded scarps with many narrow ravines, sharp crests, and pinnacles. The Belcher and Belted soils have the profiles described as representative of their respective series. The nearly level and gently sloping Belcher soil is on smooth valley fill plains, terraces, and alluvial fans. The gently sloping and moderately sloping Belted soil is on lacustrine terraces and alluvial fans.

Runoff is slow to medium. The hazard of erosion is slight.

This association is not suited to irrigated crops. It is used mainly for range and wildlife habitat. Badland in capability subclass VIIIe dryland, not placed in a

range site; Belcher soil in capability subclass VIIs dryland, range site NV 29–16, Desert Sand; Belted soil in capability subclass VIIs dryland, range site NV 28–2 and NV 29–2, Desert Loamy Sal.

BB—Badland-Pintwater association. This association is in large, irregularly shaped areas on alluvial fans, foothills, and uplands. Badland makes up about 60 percent of the association, and Pintwater very cobbly fine sandy loam, 15 to 50 percent slopes, makes up 25 percent. The remaining 15 percent is included Roic soils and some rhyolitic and tuffaceous outcrops.

The Badland is severely eroded scarps with many narrow ravines, sharp crests, and pinnacles. The Pintwater soil has the profile described as representative of its series. It is a moderately steep and steep soil on alluvial fans, foothills, and uplands.

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

This association is not suited to irrigated crops. It is used mainly for range and wildlife habitat. Badland is essentially barren but has limited use for wildlife habitat. Badland in capability subclass VIIIe dryland, not placed in a range site; Pintwater soil in capability subclass VIIs dryland, range site NV 29–14, Desert Stony Hill.

Basket Series

The Basket series consists of very deep, well drained soils that formed in colluvium derived from basalt, rhyolite, and tuffaceous rock. These soils are moderately steep and steep. They are on mountain slopes. Slopes range from 15 to 50 percent. The vegetation is black sagebrush, Sandberg bluegrass, galleta, Indian ricegrass, and scattered juniper. Elevation ranges from 6,500 to 7,500 feet. Mean annual precipitation is 10 to 14 inches. Mean annual air temperature is 40° to 45° F, and the length of the frost-free season is 80 to 100 days.

In a representative profile the surface layer is grayish brown very stony fine sandy loam about 2 inches thick. The next layer is about 22 inches of brown stony, very cobbly, and gravelly clay loam. Below this is pale brown very gravelly loam extending to a depth of 60 inches or more.

Basket soils have moderately slow permeability. Effective rooting depth is about 60 inches. The available water capacity is low. Runoff is rapid, and the hazard of erosion is moderate.

Representative profile of Basket very stony fine sandy loam in an area of Basket-Mina association, about 0.75 mile from the San Antonio mine, 0.25 mile south and 0.3 mile west of the northeast corner sec. 3, T. 5 N., R. 42 E.:

A1—0 to 2 inches; grayish brown (10YR 5/2) very stony fine sandy loam, very dark grayish brown (10YR 3/2) moist; massive; soft, very friable, nonsticky, nonplastic; few very fine and fine roots; many very fine tubular pores; about 60 percent stones, cobbles, and gravel; neutral; abrupt smooth boundary.

B1—2 to 4 inches; brown (10YR 5/3) stony clay loam, brown (10YR 4/3) moist; massive; slightly hard, friable, sticky, plastic; many very fine roots; few very fine tubular pores; about 25 percent stones and cobbles and 30 percent gravel; neutral; abrupt smooth boundary.

B21t—4 to 11 inches; brown (7.5YR 5/4) gravelly clay loam, dark brown (7.5YR 4/4) moist; compound weak medium and fine prismatic and medium subangular blocky structure; hard, friable, very sticky, very plastic; many very fine and few fine roots; common very fine and fine tubular pores; many thin clay films in pores and common thin clay films on ped faces; about 25 percent gravel and 20 percent stones and cobbles; mildly alkaline; abrupt wavy boundary.

B22t—11 to 17 inches; yellowish brown (10YR 5/4) gravelly clay loam, dark yellowish brown (10YR 4/4) moist; weak medium prismatic structure; hard, friable, sticky, plastic; common very fine and many fine roots; many very fine and few fine tubular pores; few thin clay films in pores and on ped faces; about 55 percent gravel and stones; mildly alkaline; abrupt wavy boundary.

B3ca—17 to 24 inches; pale brown (10YR 6/3) very cobbly clay loam, dark brown (10YR 4/3) moist; massive; slightly hard, sticky, plastic; common very fine roots; common very fine and common fine tubular pores; about 70 percent cobbles, stones and gravel; strongly effervescent; strongly alkaline; abrupt smooth boundary.

Cca—24 to 60 inches; pale brown (10YR 6/3) very gravelly loam, brown (10YR 4/3) moist; massive; slightly hard, very friable, slightly sticky, slightly plastic; many very fine roots; common very fine and few fine tubular pores; common medium distinct white (10YR 8/1) lime in soft masses; about 70 percent gravel and stones; strongly effervescent; strongly alkaline.

Thickness of the solum ranges from 18 to 36 inches. Depth to Cca horizon ranges from 24 to 26 inches. The upper part of the solum is noncalcareous. Reaction is neutral in the upper part of the solum and increases to mildly alkaline as depth increases. The A1 horizon is more than 20 percent gravel, 20 percent cobbles, and 5 percent stones. It has weak or moderate, thin or medium platy structure or is massive. Consistence is soft or slightly hard. The B2t horizon has structure ranging from weak to moderate, fine to medium prismatic, or medium subangular blocky. It is clay or clay loam. The lower part of the solum and the C horizon are calcareous and strongly alkaline.

BC—Basket-Mina association. This association of moderately steep and steep soils is in large, irregularly shaped areas on uplands and mountain slopes. Basket very stony fine sandy loam, 15 to 50 percent slopes, makes up about 50 percent of the association, and Mina extremely stony fine sandy loam, 30 to 50 percent slopes, makes up about 30 percent. The remaining 20 percent is Old Camp soils and small areas of Rock outcrop.

These soils have the profiles described as representative of their respective series. The moderately steep and steep Basket soil is on north facing mountain slopes. The Mina soil is on the uplands and mountain slopes, mainly those facing northwest.

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

This association is not suited to irrigated crops. It is used mainly for range and wildlife habitat. Capability subclass VIIs dryland; Basket soil in range site NV 28–7 and NV 29–7, Upland Juniper Slope; Mina soil in range site NV 29–10, Semidesert Loamy Slope.

Belcher Series

The Belcher series consists of well drained soils that are shallow to a silica cemented hardpan. These soils formed in alluvium derived from stratified, semiconsolidated, lake-laid tuff and ash. They are on smooth.

nearly level and gently sloping lake terraces and alluvial fans. Slopes range from 0 to 4 percent. The vegetation is dalea, shadscale, black greasewood, littleleaf horsebrush, and Indian ricegrass. Elevation ranges from 4,800 to 5,500 feet. Mean annual precipitation is 4 to 6 inches. Mean annual air temperature if 47° to 52° F, and the length of the frost-free season is 130 to 150 days.

In a representative profile the surface layer is light brownish gray gravelly sand about 1 inch thick. The next layer is about 6 inches of light gray fine sandy loam. Below this is a light gray silica cemented hardpan about 8 inches thick. Below the hardpan is semiconsolidated lake-laid tuff stratified with loose sand that extends to a depth of about 60 inches or more.

Belcher soils have moderately rapid permeability above the hardpan and slow permeability through it. Effective rooting depth is 5 to 18 inches. Available water capacity is very low. Runoff is slow, and the hazard of erosion is slight.

Representative profile of Belcher gravelly sand, 0 to 4 percent slopes, 600 feet west of State Route 89, west of road to sand dunes about 15 miles northwest of Tonopah, 2,100 feet east and 4,200 feet north of southwest corner sec. 9, T. 4 N., R. 41 E.:

A1—0 to 1 inch; light brownish gray (10YR 6/2) gravelly sand, dark grayish brown (10YR 4/2) moist; single grained; loose; many very fine and fine interstitial pores; 25 percent gravel; violently effervescent; moderately alkaline; abrupt smooth boundary.

C1—1 to 7 inches; light gray (10YR 7/2) fine sandy loam, brown (10YR 4/3) moist; weak thin and very thin platy structure; slightly hard, very friable, nonsticky, slightly plastic; common very fine and fine roots; many very fine and fine vesicular and common fine tubular pores; violently effervescent; very strongly alkaline; abrupt wavy boundary.

C2sicam—7 to 15 inches; light gray (10YR 7/2) and white (10YR 8/1) hardpan that has many very thin continuous very pale brown (10YR 8/3 and 7/4) strongly cemented silica laminae, light gray moist; strong medium very platy structure; extremely hard, extremely firm, nonsticky, nonplastic; many very fine roots matted on silica laminae; many very fine interstitial pores; violently effervescent; very strongly alkaline; diffuse smooth boundary.

C3—15 to 60 inches; semiconsolidated lake-laid tuff interbedded with thin lenses of loose sand; very hard and very firm but can be dug with tile spade.

Depth to the hardpan ranges from 5 to 18 inches. The depth to lake-laid tuff ranges from 10 to 30 inches. Reaction ranges from moderately alkaline in the A horizon to very strongly alkaline in the C horizon. The C1 horizon is dominantly fine sandy loam but includes strata of loamy fine sand, sand, and very fine sandy loam. The hardpan is very hard to extremely hard and very firm or extremely firm. In places, it is interbedded with thin layers of loose sand.

BEB—Belcher gravelly sand, 0 to 4 percent slopes. This nearly level and gently sloping soil is in medium sized, irregularly shaped areas on lake terraces and alluvial fans. This soil has the profile described as representative of the series. Included in mapping, and making up about 10 percent of the acreage, are small playa areas, some small areas of exposed lake-laid sediments, and some steeper areas on the side slopes of terraces.

Runoff is slow, and the hazard of erosion is slight. This soil is not suited to irrigated crops. It is used mainly for grazing and wildlife habitat. Capability subclass VIIs dryland; range site NV 29–16, Desert Sand.

Belted Series

The Belted series consists of well drained soils that are shallow to a strongly cemented hardpan. They formed in alluvium and lacustrine deposits derived from mixed rocks, mostly from volcanics. These soils are gently sloping to moderately sloping. They are on broad, smooth alluvial fans and low lake terraces. Slopes range from 2 to 8 percent. The vegetation consists of Bailey greasewood, shadscale, bud sagebrush, Anderson wolfberry, Indian ricegrass, and globemallow. Elevation ranges from 5,200 to 6,000 feet. Mean annual precipitation is 4 to 6 inches. Mean annual air temperature is 47° to 51° F, and the length of the frost-free season is 130 to 150 days.

In a representative profile the surface layer is light brownish gray gravelly loamy sand over light gray gravelly sandy loam about 5 inches thick. The next layer is about 5 inches of light gray loam. Below this is a very pale brown, strongly cemented hardpan about 10 inches thick. Below the hardpan is pale brown sandy loam over light gray very gravelly sand that extends to a depth of 60 inches or more.

Belted soils have moderate permeability above the hardpan and slow permeability through it. Effective rooting depth is about 10 inches. Available water capacity is very low. Runoff is medium, and the hazard of erosion is slight.

Representative profile of Belted gravelly loamy sand, 2 to 8 percent slopes, about 8 miles northwest of Tonopah, 2,100 feet west and 1,580 feet north of the southeast corner sec. 1, T. 3 N., R. 41 E.:

A11—0 to 2 inches; light brownish gray (10YR 6/2) gravelly loamy sand, dark grayish brown (10YR 4/2) moist; massive; loose; many very fine interstitial pores; 25 percent gravel; strongly effervescent; strongly alkaline; abrupt smooth boundary.

A12—2 to 5 inches; light gray (10YR 7/2) gravelly sandy loam, dark grayish brown (10YR 4/2) moist; massive; slightly hard, very friable, nonsticky, slightly plastic; common very fine roots; many very fine and fine interstitial pores; violently effervescent; strongly alkaline; clear wavy boundary.

B2t—5 to 10 inches; light gray (10YR 7/2) loam, brown (10YR 5/3) moist; weak medium platy and moderate fine and medium subangular blocky structure; hard, friable, slightly sticky, slightly plastic; few very fine and fine roots; many very fine tubular pores; common thin clay films in pores and few thin clay films on ped faces; strongly effervescent; strongly alkaline; abrupt wavy boundary.

Csicam—10 to 20 inches; very pale brown (10YR 7/3) strongly cemented hardpan, pale brown (10YR 6/3) moist, common coarse distinct yellowish brown (10YR 5/6) silica laminae coat underside of plates and are less than 1 millimeter thick; moderate medium platy structure; extremely hard, extremely firm; common very fine root mats on plate tops; many very fine interstitial pores in interior of plates; violently effervescent, noncalcareous where silica coats the underside of plates; very strongly alkaline; clear smooth boundary.

C2sica—20 to 31 inches; pale brown (10YR 6/3) sandy loam, brown (10YR 5/3) moist; massive; slightly hard, friable, nonsticky, nonplastic; common very fine tubular pores; violently effervescent; very strongly alkaline; clear wavy boundary.

C3ca—31 to 60 inches; light gray (10YR 7/2) very gravelly sand, brown (10YR 4/3) moist; massive; soft, very friable, nonsticky, nonplastic; many very fine interstitial pores; violently effervescent; very strongly alkaline.

Thickness of the solum and depth to the hardpan range from 6 to 17 inches. The A horizon has weak or moderate, platy structure or is massive. The B2t horizon is sandy clay loam, heavy sandy loam, or loam. The hardpan is very hard or extremely hard when dry and firm to extremely firm when moist. The laminae of the hardpan are not continuous, and only in a few places are more than 0.5 inch thick.

BHC—Belted gravelly loamy sand, 2 to 8 percent slopes. This gently sloping to moderately sloping soil is in large, irregularly shaped areas on broad alluvial fans and terraces. This soil has the profile described as representative of the series. Included in mapping, and making up about 10 percent of the acreage, are Bluewing and Koyen soils.

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

This soil is not suited to irrigated crops. It is used mainly for range and wildlife habitat. Capability subclass VIIs dryland; range site NV 28–2 and NV 29–2, Desert Loamy Sal.

Bluewing Series

The Bluewing series consists of very deep, excessively drained soils that formed in very gravelly alluvium derived from mixed rocks, including rhyolite, basalt, tuff, and granite. These soils are nearly level to moderately sloping. They are on alluvial fans and aprons. Slopes range from 0 to 8 percent. The vegetation is Bailey greasewood, shadscale, bud sagebrush, fourwing saltbush, galleta, and Indian ricegrass. Elevation ranges from 5,000 to 6,200 feet. Mean annual precipitation is 4 to 6 inches. Mean annual air temperature is 48° to 50° F, and the length of the frost-free season is 100 to 130 days.

In a representative profile the surface layer is light brownish gray very stony loamy sand about 3 inches thick. The next layer is about 5 inches of pale brown very gravelly loamy sand. Below this is light gray very gravelly sand and cobbly sand that extends to a depth of 60 inches or more.

Bluewing soils have very rapid permeability. Effective rooting depth is about 60 inches. Available water capacity is low. Runoff is very slow to medium, and the hazard of erosion is slight.

Representative profile of Bluewing very stony loamy sand, 2 to 8 percent slopes, about 2 miles north of the abandoned Liberty Mine and about 500 feet west of an ungraded road parallel to the San Antonio Mountains; about 800 feet south and 1,300 feet west of the northeast corner sec. 6, T. 5 N., R. 42 E.:

A1—0 to 3 inches; light brownish gray (10YR 6/2) very stony loamy sand, dark grayish brown (10YR 4/2) moist; massive; soft, very friable, nonsticky and nonplastic; few very fine roots; many very fine vesicular pores; neutral; clear smooth boundary.

C1—3 to 8 inches; pale brown (10YR 6/3) very gravelly loamy sand, brown (10YR 4/3) moist; massive; soft, very friable, nonsticky, nonplastic; many very fine roots; many very fine interstitial pores; mildly alkaline; gradual smooth boundary.

C2ca—8 to 19 inches, light gray (10YR 7/2) very gravelly sand, grayish brown (10YR 5/2) moist; massive; soft, very friable, nonsticky, nonplastic; few very fine roots; few very fine and medium tubular pores; strongly effervescent on underside of coarse fragments; mildly alkaline; gradual wavy boundary.

C3—19 to 60 inches; light gray (10YR 7/2) cobbly sand, grayish brown (10YR 5/2) moist; massive; soft, very friable, nonsticky, nonplastic; few very fine and medium tubular pores; neutral.

In places as much as 1 percent of the surface is covered with stones. The soil is calcareous in the A1 horizon or upper part of the C horizon in places but is calcareous in some part of the profile in all places. Reaction ranges from neutral in the A and C horizons to strongly alkaline in the Cca horizon. Texture between a depth of 10 and 40 inches is dominantly loamy coarse sand or sand modified by gravel, cobbles, or stones, and there are strata of sand or loamy sand in places. The content of gravel in the C2 horizon ranges from 50 to 80 percent. The pebbles are mostly rounded or subrounded, and most range in size from ¾ inch to 1¼-inches. The content of cobbles and stones ranges to 25 percent.

BLC—Bluewing very gravelly sand, 0 to 8 percent slopes. This nearly level to moderately sloping soil is in small, irregularly shaped areas on small alluvial fans that merge onto the lowlands or flood plans. The fans are generally smooth but have been cut by dry washes that are 1 to 3 feet deep. This soil has a profile similar to the one described as representative of the series, but it does not have stones on the surface, and the pebbles in the soil are generally less than ⅜ inch in diameter. Included in mapping, and making up about 5 percent of the acreage, are other Bluewing soils that have a stony surface.

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

This soil is not suited to irrigated crops. It is used mainly for range and wildlife habitat. Capability subclass VIIs dryland; range site NV 28–2 and NV 29–2, Desert Loamy Sal.

BMB—Bluewing gravelly loamy sand, 0 to 4 percent slopes. This nearly level to gently sloping soil is in broad, irregularly shaped areas on alluvial fans that are slightly undulating and that have small, dry washes 1 to 4 feet deep. This soil has a profile similar to the one described as representative of the series, but the surface layer is gravelly loamy sand that has neither stones on the surface nor a high percentage of gravel in the soil. Included in mapping, and making up about 15 percent of the acreage, are other Bluewing soils that have a stony surface.

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

This soil is not suited to irrigated crops. It is used mainly for range and wildlife habitat. Capability subclass VIIs dryland; range site NV 28–1 and NV 29–1, Desert Loamy.

BNC—Bluewing very stony loamy sand, 2 to 8 percent slopes. This gently sloping and moderately sloping soil is in broad, irregularly shaped areas on undulating alluvial fans that have channels 2 to 10 feet deep. This soil has the profile described as representative of the series. Included in mapping, and making up about 10 percent of the acreage, are Ardivey, Jolan, Koyen, and other Bluewing soils.

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

This soil is not suited to irrigated crops. It is used mainly for range and wildlife habitat. Capability subclass VIIs dryland; range site NV 28–2 and NV 29–2, Desert Loamy Sal.

BOB—Bluewing gravelly loam, 0 to 4 percent slopes. This nearly level and gently sloping soil is in irregularly shaped areas on smooth alluvial fans and terraces. This soil has a profile similar to the one described as representative of the series, but it has a gravel pavement on the surface, and the surface layer is gravelly loam. Included in mapping, and making up about 5 percent of the acreage, are other Bluewing soils and Zaba soils.

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

This soil is not suited to irrigated crops. It is used mainly for range and wildlife habitat. Capability subclass VIIs dryland; range site NV 28–2 and NV 29–2, Desert Loamy Sal.

Broe Series

The Broe series consists of very deep, well drained soils that formed in sandy alluvium derived mainly from volcanic rocks. These soils are nearly level to gently sloping. They are on terraces and alluvial fans. Slopes range from 0 to 4 percent. The vegetation consists of galleta, shadscale, Bailey greasewood, bud sagebrush, rabbitbrush, and winterfat. Elevation ranges from 5,000 to 6,000 feet. Mean annual precipitation is 4 to 6 inches. Mean annual air temperature is 47° to 50° F, and the length of the frost-free season is 100 to 130 days.

In a representative profile the surface layer is light brownish gray gravelly fine sand about 2 inches thick. The next layer is very pale brown and pale brown fine sandy loam that has many white lime seams in the lower part. It is about 22 inches thick. Below this is 9 inches of pale brown loamy sand that has many white nodules. This is underlain by pale brown loamy fine sand that has a few white lime segregations and that extends to a depth of 60 inches or more.

Broe soils have moderately rapid permeability. Effective rooting depth is about 60 inches. Available water capacity is moderate. Runoff is very slow, and the hazard of erosion is slight.

Representative profile of Broe gravelly fine sand, 0 to 4 percent slopes, about 2 miles southeast of the San Antonio Ranch, about 0.4 mile west and 0.4 mile south of the north quarter corner sec. 5, T. 6 N., R. 42 E.:

A1—0 to 2 inches; light brownish gray (10YR 6/2) gravelly fine sand, dark grayish brown (10YR 4/2) moist; single grained; loose; few medium and coarse roots; many very fine interstitial pores; 25 percent gravel; mildly alkaline; abrupt smooth boundary.

B21—2 to 5 inches; very pale brown (10YR 7/3) fine sandy loam, brown (10YR 4/3) moist; massive; slightly hard, very friable, nonsticky, nonplastic; common very fine roots; many very fine vesicular pores; moderately alkaline; abrupt smooth boundary.

B22—5 to 15 inches; pale brown (10YR 6/3) fine sandy loam, brown (10YR 4/3) moist; massive; slightly hard, very friable, nonsticky, slightly plastic; many very fine and few fine roots; many very fine tubular pores; many fine white (10YR 8/1) lime filaments; strongly effervescent; strongly alkaline; abrupt wavy boundary.

C1sica—15 to 24 inches; pale brown (10YR 6/3) fine sandy loam, brown (10YR 4/3) moist; massive; slightly hard, friable, nonsticky, nonplastic; common very fine and fine roots; common very fine tubular pores; many hard and firm durinodes; many fine and medium white (10YR 8/1) lime seams; violently effervescent; very strongly alkaline; clear wavy boundary.

IIC2sica—24 to 33 inches; pale brown (10YR 6/4) loamy sand, brown (10YR 4/3) moist; massive; slightly hard, friable, nonsticky, nonplastic; common very fine roots; common very fine tubular pores; many ¾ to 1-inch durinodes with white (10YR 8/1) lime coats; strongly and violently effervescent; very strongly alkaline; abrupt wavy boundary.

IIC3—33 to 60 inches; pale brown (10YR 6/3) loamy fine sand, brown (10YR 4/3) moist; massive; very friable, nonsticky, nonplastic; many micro interstitial pores; noncalcareous except for few white (10YR 8/1) lime segregations; strongly alkaline.

Thickness of the solum ranges from 12 to 20 inches. Depth to hard nodules ranges from 13 to 24 inches. Reaction in the solum ranges from mildly alkaline in the upper part to strongly alkaline in the lower part. Effervescence is none or slight in the upper part of the solum, but ranges to violent in the rest of the soil. The B2 horizon is generally fine sandy loam but includes sandy loam and contains as much as 25 percent gravel or cobbles. It is massive or has weak coarse or very coarse prismatic structure. The C horizon has coarse strata of loamy fine sand, loamy sand, or fine sand. The weighted texture between depths of 10 and 40 inches is loamy fine sand or loamy sand.

BPB—Broe gravelly fine sand, 0 to 4 percent slopes. This nearly level to gently sloping soil is in small, irregularly shaped areas on smooth terraces and alluvial fans. This soil has the profile described as representative of the series. Included in mapping, and making up about 10 percent of the acreage, are Stumble and Bluewing soils.

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

This soil is suited to irrigated crops if irrigation water is made available. It is used mainly for range and wildlife habitat. Capability unit IIIs–22 irrigated, capability subclass VIIs dryland; range site NV 28–2 and NV 29–2, Desert Loamy Sal.

Broyles Series

The Broyles series consists of very deep, well drained soils that formed in moderately coarse textured alluvium derived from mixed rocks, including volcanics and granitic rocks. These soils are nearly level to gently sloping. They are on broad, smooth alluvial fans and aprons. Slopes range from 0 to 4 percent. The vegetation consists of shadscale, bud sagebrush, littleleaf horsebrush, and Indian ricegrass. Elevation ranges from 5,600 to 6,000 feet. Mean annual precipitation is 4 to 6 inches. Mean annual air temperature is 45° to 47° F, and the length of the frost-free season is 100 to 130 days.

In a representative profile the surface layer is light gray fine sandy loam about 3 inches thick. The next layer is about 8 inches of pale brown fine sandy loam. Below this is white and light gray fine sandy loam that has hard nodules and that extends to a depth of

36 inches. This is underlain by very pale brown stratified loamy sand, coarse sandy loam, and fine sandy loam to a depth of 60 inches or more.

Broyles soils have moderately rapid permeability. Effective rooting depth is about 60 inches. Available water capacity is moderate. Runoff is slow to medium, and the hazard of erosion is slight. The hazard of soil blowing is moderate.

Representative profile of Broyles fine sandy loam, 0 to 2 percent slopes, about 1 mile west of junction of State Routes 8A and 70, 1,500 feet west and 500 feet south of the northeast corner sec. 15, T. 10 N., R. 43 E.:

A1—0 to 3 inches; light gray (10YR 7/2) fine sandy loam, brown (10YR 4/3) moist; massive; soft, very friable, nonsticky, nonplastic; few very fine roots; many very fine interstitial pores; effervescent; moderately alkaline; abrupt smooth boundary.

B2—3 to 11 inches; pale brown (10YR 6/3) fine sandy loam, brown (10YR 5/3) moist; weak very coarse prismatic structure; soft, very friable, nonsticky, nonplastic; many very fine and few fine roots; common very fine and fine tubular pores; noncalcareous in the upper part, effervescent in lower part; moderately alkaline; clear smooth boundary.

C1sica—11 to 24 inches; white (10YR 8/2) fine sandy loam, pale brown (10YR 6/3) moist; massive; soft, very friable, nonsticky, nonplastic; few ½- by ¾-inch durinodes; many very fine and common fine roots; few very fine tubular pores; violently effervescent; strongly alkaline; clear smooth boundary.

C2sica—24 to 36 inches; light gray (10YR 7/2) fine sandy loam, brown (10YR 5/3) moist; massive; soft, very friable, nonsticky, nonplastic; about 20 to 40 percent hard and firm durinodes; common very fine and fine roots; common very fine tubular pores; violently effervescent; strongly alkaline; clear smooth boundary.

C3ca—36 to 60 inches; very pale brown (10YR 7/3) stratified loamy sand, coarse sandy loam, and fine sandy loam, brown (10YR 5/3) moist; massive; soft, very friable, nonsticky, nonplastic; common very fine, fine, and medium roots; common very fine tubular pores; effervescent; strongly alkaline.

The thickness of the solum and depth to the durinodes range from 10 to 20 inches. The surface of the A horizon varies from noncalcareous to calcareous. The texture of the B and C horizons includes fine sandy loam, coarse sandy loam, loamy sand, and very fine sandy loam, and the gravel content is as much as 30 percent in places. The C3 horizon ranges from violently effervescent to noneffervescent.

BrA—Broyles fine sandy loam, 0 to 2 percent slopes. This nearly level soil is in small, irregularly shaped areas on broad alluvial fans. It has the profile described as representative of the series. Included in mapping, and making up about 10 percent of the acreage, are other Broyles soils, and a soil that is somewhat similar but that has a hardpan below a depth of 36 inches.

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

This soil is suited to irrigated crops if irrigation water is made available. It is used mainly for range and wildlife habitat. Capability unit IIc–1 irrigated, capability subclass VIIc dryland; range site NV 28–1 and NV 29–1, Desert Loamy.

BrB—Broyles fine sandy loam, 2 to 4 percent slopes. This gently sloping soil is in small, irregularly shaped areas on broad, smooth alluvial fans. It has a profile similar to the one described as representative of the series, but the surface layer is slightly thicker. Included in mapping, and making up about 5 percent of the acreage, are Bluewing soils.

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

This soil is suited to irrigated crops if irrigation water is made available. It is used mainly for range and wildlife habitat. Capability unit IIe–20 irrigated, capability subclass VIIc dryland; range site NV 28–1 and NV 29–1, Desert Loamy.

Bt—Broyles-Laxal complex. This complex of nearly level soils is in very small, irregularly shaped areas on alluvial fans and aprons that have been dissected by small, narrow flood channels. Broyles fine sandy loam, 0 to 2 percent slopes, makes up about 70 percent of the complex, and Laxal gravelly fine sandy loam, 0 to 2 percent slopes, makes up about 25 percent. Included in mapping, and making up about 5 percent of the acreage, are other Broyles soils.

The Broyles soil has a profile similar to the one described as representative of the series. It is on the alluvial fans and aprons. The Laxal soil has a profile similar to the one described as representative of the series, but the surface layer is gravelly fine sandy loam about 6 inches thick. This soil is in dissected areas on alluvial fans where small, narrow flood channels have formed.

Runoff on the Broyles soil is slow, and on the Laxal soil it is medium. The hazard of erosion is slight.

This complex has severe limitations used for irrigated crops but can be used if irrigation water is made available. It is used mainly for range and wildlife habitat. Capability unit IIIs–45 irrigated, capability subclass VIIs dryland; range site NV 28–1 and NV 29–1, Desert Loamy.

Caudle Series

The Caudle series consists of very deep, well drained soils that formed in alluvium derived from mixed rocks. These soils are nearly level. They are on alluvial fans and lacustrine terraces that are smooth to slightly undulating. Slopes range from 0 to 2 percent. The vegetation consists of black greasewood, big sagebrush, shadscale, ephedra, and alkali sacaton. Elevation ranges from 5,600 to 5,800 feet. Mean annual precipitation is 4 to 6 inches. Mean annual air temperature is 45° to 50° F, and the length of the frost-free season is 100 to 130 days.

In a representative profile the surface layer is light brownish gray fine sandy loam about 2 inches thick. Below this is 12 inches of light gray clay loam, and 25 inches of light gray silt loam. This is underlain by very pale brown clay loam to a depth of 60 inches or more.

Caudle soils have moderately slow permeability. Effective rooting depth is about 60 inches. Available water capacity is high. Runoff is medium to rapid, and the hazard of erosion is slight to moderate.

Representative profile of Caudle fine sandy loam, 1.4 miles south of Moores Creek Road and 2.6 miles east of State Route 8A, about 500 feet west and 500 feet

south of the northeast corner sec. 21, T. 11 N., R. 43 E.:

A11—0 to 2 inches; light brownish gray (10YR 6/2) fine sandy loam, dark brown (10YR 3/3) moist; massive; soft, very friable, nonsticky, nonplastic; common very fine roots; many very fine vesicular pores; moderately alkaline; abrupt wavy boundary.

A12—2 to 3 inches; light gray (10YR 7/2) clay loam, brown (10YR 4/3) moist; strong thin platy structure; slightly hard, very friable, sticky, plastic; many very fine roots; many very fine vesicular pores; strongly effervescent; very strongly alkaline; abrupt wavy boundary.

B2t—3 to 8 inches; light gray (10YR 7/2) clay loam with pale brown (10YR 6/3) coats, brown (10YR 5/3) moist; compound moderate coarse prismatic and very fine subangular blocky structure; slightly hard, very friable, sticky, plastic; many very fine roots; many very fine tubular pores; slightly effervescent; strongly alkaline; clear wavy boundary.

B3tsica—8 to 14 inches; light gray (10YR 7/2) clay loam, brown (10YR 5/3) moist; moderate thin platy structure; slightly hard, very friable, slightly sticky, slightly plastic; many very fine and few fine roots; many very fine tubular pores; about 20 percent durinodes; strongly effervescent; strongly alkaline; abrupt wavy boundary.

C1ca—14 to 24 inches; light gray (10YR 7/2) silt loam, brown (10YR 5/3) moist; massive; slightly hard, very friable, sticky and plastic; many very fine roots; few very fine tubular and vesicular pores; 2-inch thick white (10YR 8/1) ash layer; violently effervescent; strongly alkaline; abrupt irregular boundary.

C2ca—24 to 39 inches; light gray (10YR 7/2) silt loam, brown (10YR 4/3) moist; few fine distinct dark olive (5Y 3/3) mottles, moist; massive; hard, friable, slightly sticky, slightly plastic; common very fine and fine roots; many very fine and fine tubular pores; violently effervescent; moderately alkaline; clear wavy boundary.

C3—39 to 60 inches; very pale brown (10YR 7/3) clay loam, brown (10YR 4/3) moist; few fine distinct dark olive (5Y 3/3) mottles, moist; massive; hard, very friable, sticky, plastic; common very fine and fine roots; many very fine and few fine tubular pores; moderately alkaline.

Thickness of the solum ranges from 12 to 20 inches. Texture range includes loam, silt loam, and clay loam. There are generally ash deposits in most places. The A horizon is generally calcareous except for the upper 1 to 3 inches. The B2t horizon is clay loam and loam. The lower part of the B2t horizon and the upper part of the C1 horizon are 20 to 30 percent durinodes ⅜ to ¾ inch in diameter. Effervescence of the B horizon ranges from slight to strong and is less than in the C horizon below.

Cf—Caudle fine sandy loam. This nearly level soil is in medium sized, irregularly shaped areas on undulating alluvial fans and lacustrine terraces. The surface has coppice mounds of fine sand 15 to 18 inches high. This soil has the profile described as representative of the series. Included in mapping, and making up about 10 percent of the acreage, are eroded Caudle soils and small, severely eroded areas on toeslopes.

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

This soil is suited to irrigated crops if irrigation water is made available. It is used mainly for range and wildlife habitat. Capability Unit IIc–1 irrigated, capability subclass VIIc dryland; range site NV 29–6, Loamy Bottom.

Cg—Caudle fine sandy loam, saline-alkali. This nearly level soil is in small, irregularly shaped areas on slightly undulating alluvial fans adjacent to the flood plains. This soil has a profile similar to the one described as representative of the series, but about 20 percent of this unit is strongly saline-alkali affected and is on barren, eroded side slopes of drainageways. Included in mapping, and making up about 20 percent of the acreage, are Monte Cristo soil, Caudle loam in the saline-alkali affected areas, and a soil that is similar to the Caudle soils but that has a sandy substratum at a depth of about 24 inches.

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

This soil has severe limitations to use for irrigated crops. The complex pattern of nonsaline and strongly saline-alkali soils make reclamation very difficult. This soil is used mainly for range and wildlife habitat. Capability subclass VIIw dryland; range site NV 28–3 and NV 29–3, Sodic Flat.

Charnock Series

The Charnock series consists of very deep, somewhat poorly drained, saline-alkali affected soils that formed in loamy alluvium and lacustrine sediments. These soils are nearly level. They are on low lake terraces in basins and on smooth flood plains that have some undulations and some coppice sand dunes as much as 20 inches high. Slopes range from 0 to 2 percent. The vegetation consists of black greasewood, rubber rabbitbrush, saltgrass, alkali sacaton, and Great Basin wildrye. Elevation is about 5,600 feet. Mean annual precipitation is 4 to 6 inches. Mean annual air temperature is 45° to 50° F, and the length of the frost-free season is about 115 days.

In a representative profile the surface layer is light gray fine sandy loam and loam about 11 inches thick. Below this is light gray loam to a depth of 60 inches.

Charnock soils have moderately slow permeability. Effective rooting depth is about 60 inches. Available water capacity is high. Depth to the water table ranges from 36 to 54 inches, and the soils are generally moist below a depth of 20 inches. Runoff is very slow, and the hazard of erosion is slight.

Representative profile of Charnock fine sandy loam, strongly saline-alkali, about 4 miles northeast of Big Smoky Valley highway maintenance station, about 2,100 feet north and 500 feet west of the southeast corner sec. 9, T. 11 N., R. 43 E.:

A11—0 to 5 inches; light gray (10YR 7/2) fine sandy loam, brown (10YR 4/3) moist; strong very thick platy structure; slightly hard, very friable, slightly sticky, slightly plastic; few fine and medium roots; many very fine vesicular pores; violently effervescent; very strongly alkaline; clear smooth boundary.

A12—5 to 11 inches; light gray (10YR 7/1) loam, brown (10YR 4/3) moist; strong thin platy structure; slightly hard, very friable, slightly sticky, slightly plastic; many very fine and fine and few medium roots; common very fine and fine tubular pores; violently effervescent; very strongly alkaline; clear smooth boundary.

C1—11 to 19 inches; light gray (10YR 7/1) loam, pale brown (10YR 6/3) moist; massive; soft, very friable, slightly sticky, slightly plastic; common very fine and medium roots; few very fine and fine tubular pores; violently effervescent; very strongly alkaline; abrupt smooth boundary.

C2sica—19 to 27 inches; light gray (10YR 7/1) loam, very pale brown (10YR 7/3) moist; many faint brown (10YR 3/3) mottles moist; strong thin and medium platy structure; slightly hard, firm, sticky, plastic; few fine roots; few very fine tubular pores; 50 percent of horizon is discontinuously weakly silica-cemented with hard and firm plates, 1 to 10 millimeters thick; strongly effervescent; strongly alkaline; clear smooth boundary.

C3ca—27 to 60 inches; light gray (10YR 7/1) loam, brown (10YR 5/3) moist; massive; slightly hard, very friable, nonsticky, nonplastic; few fine roots; violently effervescent; strongly alkaline.

Depth to the Csica horizon ranges from 10 to 32 inches. The A horizon is either slightly saline-alkali affected or strongly saline-alkali affected. The C horizon is sandy loam, fine sandy loam, loam, silt loam, clay loam, and sandy clay loam. The silica cementation in the Csica horizon is discontinuous and generally platy, but nodules about ⅜-inch diameter are in some places. Plates are 1 to 10 mm thick. Consistence of this horizon is firm or very firm.

Ch—Charnock fine sandy loam, strongly saline-alkali. This nearly level soil is in large, irregularly shaped areas on smooth flood plains and low lake terraces. It has a profile similar to the one described as representative of the series, but it is strongly saline-alkali affected. Included in mapping, and making up about 10 percent of the acreage, are Charnock soils and some small playas.

Runoff is very slow, and the hazard of erosion is slight. A seasonal high water table is at a depth of 2.5 to 4.5 feet.

This soil is not suited to irrigated crops. It is used mainly for range and wildlife habitat. Capability subclass VIIw dryland; range site NV 28–13, Saline Meadow.

Ck—Charnock clay loam, slightly saline-alkali. This nearly level soil is on flood plains and low terraces. It has a profile similar to the one described as representative of the series, but it has a clay loam surface layer. Included in mapping, and making up about 10 percent of the acreage, are areas of similar soils that are strongly saline-alkali affected and some small playas.

Runoff is very slow, and the hazard of erosion is slight. A seasonal high water table is at a depth of 4.0 to 5.0 feet.

This soil is not suited to irrigated crops. It is used mainly for range and wildlife habitat. Capability subclass VIw dryland; range site NV 28–4, Saline Bottom.

Cm—Charnock complex. This complex of nearly level soils is in small, irregularly shaped areas on undulating, low lake terraces and basins. Charnock fine sandy loam, strongly saline-alkali, makes up about 60 percent of the complex, and Charnock clay loam, slightly saline-alkali, makes up 35 percent. Included in mapping, and making up about 5 percent of the acreage, are areas of other nonsaline-alkali Charnock soils and some small playas.

Charnock fine sandy loam, strongly saline-alkali, has a profile similar to the one described as representative of the series, but it is strongly saline-alkali affected. It is on the tops of the undulations. Charnock clay loam, slightly saline-alkali, has a profile similar to the one described as representative of the series, but the surface layer is clay loam. It is on the flatter areas and between the undulations.

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

This complex has severe limitations for irrigated crops. It is used mainly for range and wildlife habitat. Capability subclass VIIw dryland; Charnock fine sandy loam, strongly saline-alkali, in range site NV 28–13, Saline Meadow; Charnock clay loam, slightly saline-alkali, in range site NV 28–4, Saline Bottom.

Deerlodge Variant

The Deerlodge variant consists of well drained soils that are moderately deep to a strongly cemented hardpan. These soils formed in very gravelly alluvium derived from mixed shale and volcanics. These soils are moderately sloping. They are on convex alluvial fans that have been dissected. Slopes range from 4 to 8 percent. The vegetation consists of black sagebrush, bud sagebrush, shadscale, galleta, and squirreltail. Elevation ranges from 5,800 to 6,000 feet. Mean annual precipitation is 6 to 8 inches. Mean annual air temperature is 45° to 47° F, and the length of the frost-free season is 80 to 100 days.

In a representative profile the surface layer is light brownish gray stony loam over light brownish gray gravelly loam. It is about 3 inches thick. The next layer is grayish brown gravelly clay in the upper 3 inches and brown very gravelly clay loam in the lower 18 inches. This is underlain by a white, strongly cemented very gravelly hardpan that extends to a depth of 60 inches or more.

Deerlodge soils have moderately slow permeability to the hardpan and very slow permeability through it. Effective rooting depth is about 24 inches. Available water capacity is very low. Runoff is medium, and the hazard of erosion is slight.

Representative profile of Deerlodge stony loam, very gravelly subsoil variant, 4 to 8 percent slopes, between Pablo and Wall Canyons, 0.3 mile west and 0.1 mile south of the northeast corner sec. 12, T. 10 N., R. 42 E.:

A11—0 to 1 inch; light brownish gray (10YR 6/2) stony loam, dark grayish brown (10YR 4/2) moist; single grained; loose, many very fine interstitial pores; moderately alkaline; abrupt smooth boundary.

A12—1 to 3 inches; light brownish gray (10YR 6/2) gravelly loam, dark brown (10YR 3/3) moist; massive; slightly hard, very friable, slightly sticky, slightly plastic; many very fine and fine vesicular pores; mildly alkaline; abrupt smooth boundary.

B21t—3 to 6 inches; grayish brown (10YR 5/2) gravelly clay, brown (10YR 4/3) moist; weak medium subangular blocky structure parting to strong very fine granular; soft, very friable, sticky, plastic; many very fine and few fine and medium roots; many very fine tubular pores; many thin clay films coating ped faces and pores; 30 percent gravel; mildly alkaline; clear smooth boundary.

B22t—6 to 16 inches; brown (10YR 5/3) very gravelly clay loam, brown (10YR 4/3) moist; massive; slightly hard, very friable, very sticky, very plastic; many very fine and few fine roots; many very fine tubu-

lar pores; many thin clay films coating ped faces and pores; 60 percent gravel; mildly alkaline; clear smooth boundary.

B3tca—16 to 24 inches; brown (10YR 5/3) very gravelly clay loam, dark brown (10YR 3/3) moist; massive; slightly hard, very friable, sticky, plastic; common very fine roots; common very fine tubular pores; 60 percent gravel; few thin clay films coating sand grains; violently effervescent; moderately alkaline; clear smooth boundary.

Csicam—24 to 60 inches; white (10YR 8/1) strongly cemented, very gravelly duripan that has a grayish brown (10YR 5/2) discontinuous laminae cap.

As much as 50 percent of the surface is covered with gravel in places. The thickness of the solum and depth to the hardpan range from 21 to 32 inches. The A horizon is 3 to 4 inches thick. It ranges from noncalcareous to strongly effervescent. It has 2 to 10 percent stones on the surface. The B2t horizon ranges from sandy clay loam to clay, but average texture is clay loam. It is 50 to 60 percent gravel and cobbles in the lower part. The B3tca horizon is at a depth of 11 to 26 inches.

DEC—Deerlodge stony loam, very gravelly subsoil variant, 4 to 8 percent slopes. This moderately sloping soil is in small, irregularly shaped areas on convex, dissected alluvial fans. Included in mapping, and making up about 10 percent of the acreage, are Bluewing soils in the dry washes.

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

This soil is not suited to irrigated crops. It is used mainly for range and wildlife habitat. Capability subclass VIIs dryland; range site NV 29–12, Semidesert Shallow Loamy.

Dobel Series

The Dobel series consists of well drained soils that are shallow to a strongly cemented hardpan. These soils formed in mixed gravelly alluvium derived from volcanic rocks. They are gently sloping to moderately sloping and are on smooth, dissected alluvial fans that have many dry washes from 2 to 10 feet deep. Slopes range from 2 to 8 percent. The vegetation consists of Bailey greasewood, shadscale, bud sagebrush, ephedra, galleta, and Indian ricegrass. Elevation ranges from 5,500 to 6,000 feet. Mean annual precipitation is 4 to 6 inches. Mean annual air temperature is 45° to 50° F, and the length of the frost-free season is 100 to 130 days.

In a representative profile the surface layer is light brownish gray very gravelly sandy loam over light gray loam about 4 inches thick. The next layer is about 4 inches of brown gravelly sandy clay loam. Below this is a pale brown, strongly cemented hardpan about 4 inches thick. Below the hardpan is light gray very gravelly sandy loam about 26 inches thick, and then a light gray indurated hardpan about 2 inches thick over light brownish gray very gravelly sandy loam extends to a depth of 60 inches or more.

The Dobel soils have slow permeability. Effective rooting depth is about 8 inches. Available water capacity is very low. Runoff is rapid, and the hazard of erosion is slight.

Representative profile of Dobel very gravelly sandy loam, in an area of Dobel-Bluewing association, about 5 miles north of Tonopah, about 500 feet east and 1,300 feet north of the southwest corner sec. 3, T. 4 N., R. 42 E.:

A1—0 to 1 inch; light brownish gray (10YR 6/2) very gravelly sandy loam, dark grayish brown (10YR 4/2) moist; massive; slightly hard, very friable, nonsticky, nonplastic; few very fine roots; many very fine and fine vesicular pores; violently effervescent; very strongly alkaline; abrupt smooth boundary.

A2—1 to 4 inches; light gray (10YR 7/2) loam, brown (10YR 5/3) moist; moderate very coarse subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; few very fine roots; many very fine tubular pores; violently effervescent; very strongly alkaline; abrupt smooth boundary.

B&A—4 to 4½ inches; brown (10YR 5/3) gravelly clay loam, brown (10YR 4/3) moist; few light gray (10YR 7/2) clean sand grains on ped faces; strong very fine and fine subangular blocky structure; slightly hard, very friable, sticky, plastic; common very fine and few fine tubular pores; common thin clay films on ped faces; 25 percent gravel; strongly effervescent; very strongly alkaline; abrupt smooth boundary.

B2t—4½ to 8 inches; brown (7.5YR 5/4) gravelly sandy clay loam, dark brown (10YR 4/4) moist; moderate medium prismatic structure; hard, very friable, sticky, plastic; many very fine and fine roots; many very fine and few fine pores; few thin clay loams on ped faces and common thin clay films in pores and coating sand grains; 25 percent gravel; noneffervescent matrix but strongly effervescent on coarse fragments, in matrix underneath coarse fragments, and in small areas on ped faces; strongly alkaline; clear smooth boundary.

C1sicam—8 to 12 inches; pale brown (10YR 6/3) strongly cemented duripan, grayish brown (10YR 5/2) moist; white (10YR 8/2) discontinuous indurated silica laminae in pores and cementing sand grains, very pale brown (10YR 7/3) moist; massive; very hard, extremely firm, brittle; common very fine and few fine roots; few very fine tubular pores; violently effervescent; strongly alkaline; clear smooth boundary.

C2ca—12 to 38 inches; light gray (10YR 7/2) very gravelly sandy loam, light brownish gray (10YR 6/2) moist; massive; soft, very friable, nonsticky, nonplastic; few very fine and fine roots; common very fine tubular pores; about 60 percent gravel that has lime pendants on underside; violently effervescent; strongly alkaline, abrupt smooth boundary.

C3sicam—38 to 40 inches; light gray (10YR 7/2) indurated duripan, pale brown (10YR 6/3) moist, very pale brown (10YR 7/3) laminae cap; strong very thick platy structure; extremely hard, extremely firm; common very fine root mats between plates; violently effervescent; very strongly alkaline; abrupt smooth boundary.

C4ca—40 to 60 inches; light brownish gray (10YR 6/2) very gravelly sandy loam, grayish brown (10YR 5/2) moist; massive; soft, very friable, nonsticky, nonplastic; common very fine roots; few very fine tubular pores; about 60 percent gravel; violently effervescent; strongly alkaline.

Thickness of the solum and depth to the duripan range from 6 to 13 inches. The soil is calcareous throughout except in the B2t horizon, which has a noneffervescent matrix. The pH values in the soil decrease as depth increases. They range from 9.6 in the A1 horizon to 8.6 in the lower part of the C horizon. The B2t horizon has moderate to strong, very fine to medium, prismatic structure. It is dominantly sandy clay loam but includes clay loam and loam. This horizon has as much as 30 percent gravel. The Cca horizon contains from 40 to 75 percent gravel and cobbles. Texture ranges include sandy loam, loamy sand, and sand.

DN—Dobel-Bluewing association. This association of nearly level to moderately sloping soils is in very large, irregularly shaped areas on smooth, dissected alluvial fans that have many dry washes 2 to 10 feet deep, and on small inset alluvial fans. Dobel very gravelly sandy loam, 2 to 8 percent slopes, makes up about 70 percent of the complex, and Bluewing stony loamy coarse sand, 0 to 8 percent slopes, makes up about 15 percent. Included in mapping, and making up about 15 percent of the acreage, are Tybo soils, other Dobel soils, and some Bluewing soils that are subject to occasional flooding.

The Dobel soil has the profile described as representative of the Dobel series. It is on the broad, smooth alluvial fans. The Bluewing soil has a profile similar to the one described as representative of the Bluewing series, but the surface layer is stony loamy coarse sand. This soil is on the small, inset fans and in the dry washes.

Runoff on the Dobel soil is rapid and on the Bluewing soil is very slow. The hazard of erosion is slight.

This association is not suited to irrigated crops. It is used mainly for range and wildlife habitat. Capability subclass VIIs dryland; range site NV 28–2 and NV 29–2, Desert Loamy Sal.

Domez Series

The Domez series consists of very deep, well drained soils that formed in stratified loamy alluvium derived mainly from volcanic rock. These soils are nearly level. They are on broad, smooth valley fill plains and alluvial fans. Slopes range from 0 to 2 percent. The vegetation consists of Bailey greasewood, Anderson wolfberry, shadscale, kochia, and Indian ricegrass. Elevation ranges from 4,800 to 5,500 feet. Mean annual precipitation is 4 to 6 inches. Mean annual air temperature is 47° to 51° F, and the length of the frost-free season is 130 to 150 days.

In a representative profile the surface layer is light gray fine sandy loam about 6 inches thick. Below this is 4 inches of light gray very fine sandy loam, 13 inches of very pale brown loam, and 17 inches of very pale brown very fine sandy loam. This is underlain by very pale brown silt loam extending to a depth of 60 inches or more.

Domez soils have moderate permeability. Effective rooting depth is about 60 inches. Available water capacity is high. Runoff is slow to medium, and the hazard of erosion is slight.

Representative profile of Domez fine sandy loam, about 23 miles northwest of Tonopah, east of a hill that juts up from the valley floor and 100 feet west of State Route 89, 3,100 feet north and 1,000 feet west of the southeast corner sec. 26, T. 7 N., R. 41 E.:

A1—0 to 2 inches; light gray (10YR 7/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; massive; soft, very friable, nonsticky, nonplastic; few very fine roots; many very fine and common fine vesicular pores; violently effervescent; strongly alkaline; clear smooth boundary.

C1—2 to 6 inches; light gray (10YR 7/2) fine sandy loam, discontinuous lenses of gravelly fine sandy loam ½ inch thick, dark grayish brown (10YR 4/2) moist; massive; slightly hard, very friable, nonsticky, nonplastic; few very fine roots; many very fine and fine tubular pores; violently effervescent; strongly alkaline; clear smooth boundary.

C2—6 to 10 inches; light gray (10YR 7/2) very fine sandy loam, brown (10YR 4/3) moist; common medium and large distinct white (10YR 8/2) lime coats on plate surfaces, few fine distinct yellow (10YR 7/6) silica coats on pebbles; moderate thin, medium and thick platy structure; hard, friable, slightly sticky, slightly plastic; few very fine roots; common very fine vesicular pores; violently effervescent; strongly alkaline; clear smooth boundary.

C3si—10 to 16 inches; very pale brown (10YR 7/3) loam, brown (10YR 4/3) moist; common medium and large distinct white (10YR 8/2) lime coating on durinodes and ped faces; moderate medium subangular blocky structure; hard, friable, slightly sticky, slightly plastic; common very fine roots; common very fine vesicular pores; common thin silica bridgings on sand grains; about 50 percent hard and brittle, cylindrical durinodes; slightly effervescent; moderately alkaline; clear smooth boundary.

C4si—16 to 23 inches; very pale brown (10YR 7/3) loam, brown (10YR 4/3) moist; massive; slightly hard, very friable, slightly sticky, slightly plastic; common very fine roots; common very fine tubular pores; about 60 percent hard and brittle, cylindrical durinodes; effervescent; moderately alkaline; gradual smooth boundary.

C5—23 to 40 inches; very pale brown (10YR 7/3) very fine sandy loam, brown (10YR 4/3) moist; massive; slightly hard, friable, slightly sticky, slightly plastic; few very fine roots; common very fine tubular pores; effervescent; moderately alkaline; clear smooth boundary.

IIC6—40 to 60 inches; very pale brown (10YR 7/3) silt loam, brown (10YR 4/3) moist; massive; slightly hard, very friable, slightly sticky, slightly plastic; many very fine tubular pores; violently effervescent; moderately alkaline.

Depth to the Csi horizon ranges from 6 to 20 inches. The soil is slightly effervescent to violently effervescent, but in places there are horizons that are noneffervescent. The pH value ranges from 9.0 to 8.2. It is usually the highest at or near the surface and decreases as depth increases. Texture between depths of 10 and 40 inches is stratified fine sandy loam, very fine sandy loam, loam, or clay loam. There are strata of loamy sand to sandy loam in places, and some strata are as much as 15 percent gravel in places. The A1 horizon has weak, thin or medium, platy structure or it is massive. The C horizon is either massive or has weak, very coarse, prismatic structure; weak or moderate, thin to thick, platy or fine structure; or medium, subangular blocky structure. The volume of the durinodes in the C horizon ranges from 40 to 70 percent.

Do—Domez sand. This nearly level soil is in very small, narrow band-shaped areas on smooth valley fill plains and alluvial fans. It has a profile similar to the one described as representative of the series, but the surface layer is sand about 8 inches thick, and the soil is slightly saline-alkali affected. Included in mapping, and making up about 10 percent of the acreage, are Broyles, Orovada, and Bluewing soils.

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

This soil is suited to irrigated crops if irrigation water is made available. It is used mainly for grazing and wildlife habitat. Capability unit IIs–4 irrigated, capability subclass VIIs dryland; range site NV 28–2 and NV 29–2, Desert Loamy Sal.

Dr—Domez fine sandy loam. This nearly level soil is in small, irregularly shaped areas on broad, smooth valley fill plains and alluvial fans. It has the profile

described as representative of the series. Included in mapping, and making up about 10 percent of the acreage, are Yomba soils and other Domez soils.

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

This soil is suited to irrigated crops if irrigation water is made available. It is used mainly for grazing and wildlife habitat. Capability unit IIc–1 irrigated, capability subclass VIIc dryland; range site NV 28–2 and NV 29–2, Desert Loamy Sal.

Ds—Domez-Playas complex. This complex of nearly level soils and Playas is in small, irregularly shaped areas on broad, smooth valley-fill plains. Domez fine sandy loam makes up about 70 percent of the complex, and Playas make up about 20 percent. Included in mapping, and making up about 10 percent of the acreage, are Yomba soils.

The Domez soil has a profile similar to the one described as representative of the series. It is in slightly raised areas that surround the small depressional areas of Playas. Playas are the same as described under "Playas" in this section.

Runoff on the Domez soils is slow, and on the Playas it is very slow or ponded. The hazard of erosion is slight.

This complex is not suited to irrigated crops. It is used mainly for range and wildlife habitat. Capability subclass VIIc dryland; Domez soil in range site NV 28–2 and NV 29–2, Desert Loamy Sal; Playas not placed in a range site.

Dune Land

DU—Dune Land. This land type consists of unstabilized accumulations of loose sand deposited on the valley floor by wind. The Dunes are active and continually shifting hills. They are 10 to 100 feet high and have steep side slopes, sharp ridges, and crests. They are essentially barren except for small areas around the bases.

This land type has no value for cultivation or range. It may be of some value for recreation and esthetic purposes. Capability subclass VIIIs dryland; not placed in a range site.

Fivemile Series

The Fivemile series consists of very deep, well drained soils that formed in silty and clayey alluvial sediments derived from mixed rocks. These soils are nearly level. They are on smooth flood plains and low stream terraces. Slopes range from 0 to 2 percent. The vegetation consists of black greasewood, big sagebrush, shadscale, fourwing saltbush, and bud sagebrush. Elevation is about 5,600 feet. Mean annual precipitation is 4 to 6 inches. Mean annual air temperature is 47° to 51° F, and the length of the frost-free season is 100 to 130 days.

In a representative profile the surface layer is light gray silty clay loam about 4 inches thick. The next layer is light gray stratified silt loam and silty clay loam about 22 inches thick. It is underlain by 4 inches of gray silt loam over light gray silty clay loam that extends to a depth of 60 inches or more.

The Fivemile soils have moderately slow permeability. Effective rooting depth is about 60 inches. Available water capacity is high. Runoff is slow, and the hazard of erosion is slight.

Representative profile of Fivemile silty clay loam in an area of Fivemile complex, 1.6 mile west of the junction of State Routes 8A and 70, 500 feet east and 1,000 feet south of the northwest corner sec. 15, T. 10 N., R. 43 E.:

A1—0 to 4 inches; light gray (10YR 7/1) silty clay loam, dark grayish brown (10YR 4/2) moist; massive; slightly hard, very friable, sticky, plastic; few very fine roots; many very fine, common fine, and few medium tubular pores; strongly effervescent; strongly alkaline; abrupt smooth boundary.

C1—4 to 26 inches; light gray (10YR 7/2) stratified silt loam and silty clay loam, brown (10YR 4/3) moist; massive; slightly hard, very friable, slightly sticky and sticky, slightly plastic and plastic; many very fine, fine, and medium roots; many very fine vesicular pores; strongly effervescent; moderately alkaline; abrupt smooth boundary.

A1B—26 to 30 inches; gray (10YR 6/1) silt loam, brown (10YR 4/3) moist; massive; slightly hard, very friable, slightly sticky, slightly plastic; common very fine and fine roots; common very fine tubular pores; violently effervescent; strongly alkaline; clear smooth boundary.

C2—30 to 60 inches; light gray (10YR 7/2) silty clay loam, brown (10YR 4/3) moist; massive; slightly hard, very friable, sticky, plastic; common very fine and fine roots; common very fine and common medium tubular pores; violently effervescent; strongly alkaline.

The A1 horizon commonly is massive but has strong, thin or medium platy structure in some places. Hummocks of fine sand and silt as much as 20 inches high are on the surface in places. The soil between depths of 10 and 40 inches is stratified silty clay loam and silt loam and is generally massive. The buried A1 horizon has thin, weak or medium platy structure in places. The depth to the buried A1 horizon varies widely, and this horizon is absent in some places.

Fa—Fivemile loam. This nearly level soil is in small, narrow areas on flood plains and low lake terraces slightly higher than the flood plain. It has a profile similar to the one described as representative of the series, but the surface layer is loam and the underlying material is silt loam. Included in mapping, and making up about 10 percent of the acreage, are similar soils that have hummocks 1 to 3 feet high.

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

This soil is suited to irrigated crops if irrigation water is made available. It is used mainly for range and wildlife habitat. Capability unit IIc–1 irrigated, capability unit VIIc dryland; range site NV 29–6, Loamy Bottom.

Fb—Fivemile complex. This complex is nearly level soils is in small, irregularly shaped areas on smooth flood plains that are flooded occasionally. Fivemile silty clay loam makes up about 65 percent of the complex, and Fivemile loamy fine sand makes up about 25 percent. Included in mapping, and making up about 10 percent of the acreage, is a similar soil that is somewhat poorly drained.

Fivemile silty clay loam has the profile described as representative of the series. It is between the sandy hummocks and it has a smooth surface. Fivemile loamy fine sand has a profile similar to the one

described as representative of the series, but the surface layer is loamy fine sand and small dunes 4 to 20 inches high are on the surface. It is slightly saline-alkali affected.

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

This complex is suited to irrigated crops if irrigation water is made available. It is subject to occasional flooding. It is used mainly for range and wildlife habitat. Capability unit IIw–91 irrigated, capability subclass VIIw dryland; range site NV 29–6, Loamy Bottom.

Gabbs Series

The Gabbs series consists of well drained soils that are moderately deep to a hardpan. These soils formed in colluvium derived from basalt, rhyolite, loess, and ash material. They are moderately steep and steep and are on mountain slopes. Slopes range from 15 to 50 percent. The vegetation consists of Bailey greasewood, shadscale, bud sagebrush, ephedra, desert needlegrass, spiny horsebrush, and galleta. Elevation ranges from 6,000 to 7,000 feet. Mean annual precipitation is 6 to 8 inches. Mean annual air temperature is 45° to 47° F, and the length of the frost-free season is 100 to 115 days.

In a representative profile the surface layer is grayish brown extremely cobbly very fine sandy loam over gravelly very fine sandy loam about 3 inches thick. The next layer is light brownish gray gravelly fine sandy loam about 5 inches thick. Below this is about 12 inches of light brownish gray very gravelly fine sandy loam. It is underlain by a white, extremely hard hardpan that extends to a depth of 32 inches or more.

Gabbs soils have moderately rapid permeability to the hardpan and very slow permeability through it. Effective rooting depth is about 20 inches. Available water capacity is very low. Runoff is medium, and the hazard of erosion is slight.

Representative profile of Gabbs extremely cobbly very fine sandy loam, in an area of Gabbs-Old Camp association, about 0.5 mile west of the top of Red Mountain, 2,100 feet south and 2,100 feet west of the southeast corner sec. 3, T. 3 N., R. 42 E.:

A11—0 to 1 inch; grayish brown (10YR 5/2) extremely cobbly very fine sandy loam, very dark grayish brown (10YR 3/2) moist; massive; soft, very friable, nonsticky, nonplastic; few very fine roots; many very fine tubular pores; about 25 percent cobbles, 5 percent stones, and 15 percent gravel; few ¼-inch thick hardpan fragments; mildly alkaline; abrupt smooth boundary.

A12—1 to 3 inches; light brownish gray (10YR 6/2) gravelly very fine sandy loam, brown (10YR 4/3) moist; strong thin platy structure; soft, very friable, nonsticky, slightly plastic; common fine roots; many very fine and fine vesicular pores; about 25 percent gravel and a few ¼-inch thick pan fragments; mildly alkaline; clear smooth boundary.

B2—3 to 8 inches; light brownish gray (10YR 6/2) gravelly fine sandy loam, dark grayish brown (10YR 4/2) moist; weak medium subangular blocky structure; slightly hard, very friable, nonsticky, slightly plastic; many very fine roots; many very fine tubular pores; about 30 percent gravel including a few ¼-inch thick pan fragments; mildly alkaline; clear smooth boundary.

C1ca—8 to 20 inches; light brownish gray (10YR 6/2) very gravelly fine sandy loam, dark grayish brown (10YR 4/2) moist; massive; slightly hard, very friable, slightly sticky, slightly plastic; few fine and medium roots; many very fine tubular pores; about 50 percent gravel including a few ¼- to 1-inch pan fragments; violently effervescent; moderately alkaline; abrupt wavy boundary.

C2sicam—20 to 32 inches; white (10YR 8/1) duripan, very pale brown (10YR 7/3) moist; many light gray (10YR 7/2) and very pale brown (10YR 7/3) lime mottles and dark brown (10YR 3/3) and brown (10YR 4/3) organic root stains on pan; massive; extremely hard, extremely firm; roots matted on pan.

Thickness of the solum ranges from 6 to 15 inches, and depth to the hardpan ranges from 20 to 30 inches. The soil above the hardpan is noncalcareous except for pan fragments, which are strongly effervescent or violently effervescent, and reaction ranges from pH 7.4 to 8.4. Texture above the hardpan ranges from fine sandy loam to loam and is modified by 35 to 60 percent rock fragments. The gravel content is 25 to 30 percent, and the cobble content is 10 to 60 percent. The A1 horizon is massive or has weak, thick platy to strong, thin platy structure. The B2 horizon is massive or has weak, fine or medium, subangular blocky structure. Reaction in the hardpan ranges from pH 8.0 to 8.6. The hardpan is massive or has thick platy structure.

GA—Gabbs-Old Camp association. This association of moderately steep and steep soils is in small, irregularly shaped areas on hills and mountain slopes. Slopes range from 15 to 50 percent. Gabbs extremely cobbly very fine sandy loam, 15 to 50 percent slopes, makes up about 40 percent of the complex; Old Camp very gravelly fine sandy loam, 30 to 50 percent slopes, makes up about 30 percent; and Rock outcrop makes up about 20 percent. Included in mapping, and making up about 10 percent of the acreage, are Nevoyer soils. The Gabbs soil in this association has the profile described as representative of the series. The Old Camp soil has a profile similar to the one described as representative of the series.

The Gabbs soil is on south- and west-facing slopes and is moderately deep to a hardpan. It has moderately rapid permeability to the hardpan. Effective rooting depth is about 25 inches. Runoff is medium, and available water capacity is very low. The hazard of erosion is slight.

The Old Camp soil is on north-facing slopes and is shallow to bedrock. It has moderate permeability above the bedrock. Effective rooting depth is about 15 inches. Runoff is rapid, and available water capacity is very low. The hazard of erosion is moderate.

Rock outcrop is throughout the association on narrow ridgetops that have steep side slopes.

This association is not suited to irrigated crops. It is used mainly for range and wildlife habitat. Gabbs soil in capability subclass VIIs dryland, range site NV 29–14, Desert Stony Hill; Old Camp soil in capability subclass VIIs dryland, range site NV 29–12, Semidesert Shallow Loamy; Rock outcrop in capability subclass VIIIs dryland, not placed in a range site.

Griffy Series

The Griffy series consists of very deep, well drained soils that formed in loamy alluvium derived from mixed rocks including volcanics and granitics. These soils are on nearly level, smooth alluvial fans and

aprons. Slopes are 0 to 2 percent. The vegetation consists of shadscale, bud sagebrush, Indian ricegrass, and galleta. Elevation ranges from 5,500 to 5,800 feet. Mean annual precipitation is 4 to 6 inches. Mean annual air temperature is 43° to 47° F, and the length of the forest-free season is 100 to 130 days.

In a representative profile the surface layer is light gray loamy sand over fine sandy loam about 4 inches thick. The next layer is about 8 inches of pale brown sandy clay loam. Below this is light gray gravelly fine sandy loam over very pale brown fine sandy loam that extends to a depth of 60 inches or more.

Griffy soils have moderate permeability. Effective rooting depth is about 60 inches. Available water capacity is high. Runoff is medium, and the hazard of erosion is slight.

Representative profile of Griffy loamy sand, 0.2 mile west of State Route 8A and west of Bald Mountain Canyon, 1,800 feet south and 50 feet east of the northwest corner sec. 28, T. 9 N., R. 43 E.:

A11—0 to 2 inches; light gray (10YR 7/2) loamy sand, brown (10YR 4/3) moist; single grained; many very fine interstitial pores; mildly alkaline; abrupt smooth boundary.

A12—2 to 4 inches; light gray (10YR 7/1) fine sandy loam, brown (10YR 4/3) moist; weak very thin platy structure; slightly hard, very friable, nonsticky, nonplastic; common very fine, fine and medium roots; many very fine vesicular pores; moderately alkaline; abrupt smooth boundary.

B2t—4 to 12 inches; pale brown (10YR 6/3) sandy clay loam, brown (10YR 4/3) moist; weak very coarse prismatic structure; slightly hard, very friable, sticky, plastic; common very fine and fine roots; few very fine tubular and vesicular pores; few thin clay films coating pores, bridging sand grains, and on ped faces; moderately alkaline; abrupt smooth boundary.

C1ca—12 to 15 inches; light gray (10YR 7/2) gravelly fine sandy loam, brown (10YR 4/3) moist; massive; slightly hard, very friable, nonsticky, nonplastic; many very fine and few fine roots; many very fine interstitial pores; 5 percent hard and firm durinodes; 5 percent stones and cobbles; violently effervescent; strongly alkaline; abrupt smooth boundary.

C2ca—15 to 60 inches; very pale brown (10YR 7/3) fine sandy loam, brown (10YR 4/3) moist; massive; soft, very friable, nonsticky, nonplastic; few very fine and medium roots; many very fine tubular pores; about 5 percent gravel and cobbles that are lime coated on underside; violently effervescent; strongly alkaline.

The solum is 12 to 21 inches thick. It is generally noncalcareous, but in some places the A horizon is calcareous. The gravel content of the B2t horizon ranges from 5 to 25 percent, and in the C horizon it ranges from 5 to 30 percent. The B2t horizon is clay loam or sandy clay loam, and the C horizon is sandy loam or fine sandy loam. Hard nodules range to as much as 20 percent in the C horizon. Thin silica coatings are on the underside of pebbles in this horizon.

Gr—Griffy loamy sand. This nearly level soil is in small, irregularly shaped areas on broad alluvial aprons near the toes of alluvial fans. This soil has the profile described as representative of the series. Included in mapping, and making up about 10 percent of the acreage, are Bluewing and Lathrop soils, and other soils similar to Griffy soils.

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

This soil is suited to irrigated crops if irrigation water is made available. It is used mainly for range and wildlife habitat. Capability unit IIs–43 irrigated, capability subclass VIIc dryland; range site NV 28–1 and NV 29–1, Desert Loamy.

Gs—Griffy gravelly loam. This nearly level soil is in very small, irregularly shaped areas on broad, smooth alluvial fans and aprons near the toes of alluvial fans. It has a profile similar to the one described as representative of the series, but the surface layer is gravelly loam. Included in mapping, and making up about 10 percent of the acreage, are other Griffy soils.

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

This soil is suited to irrigated crops if irrigation water is made available. It is used mainly for range and wildlife habitat. Capability unit IIc–1 irrigated, capability subclass VIIc dryland; range site NV 28–1 and NV 29–1, Desert Loamy.

Jolan Series

The Jolan series consists of well drained soils that are moderately deep to a hardpan. These soils formed in moderately coarse textured alluvium derived from latite, basalt, rhyolite, and tuffaceous rocks. They are nearly level to gently sloping and are on alluvial fans. Slopes range from 0 to 4 percent. The vegetation consists of Bailey greasewood, shadscale, bud sagebrush, Anderson wolfberry, galleta, and Indian ricegrass. Elevation ranges from 5,300 to 5,600 feet. Mean annual precipitation is 4 to 6 inches. Mean annual air temperature is 47° to 50° F, and the length of the frost-free season is 130 to 150 days.

In a representative profile the surface layer is 2 inches of light brownish gray gravelly loamy coarse sand over 8 inches of light gray fine sandy loam. The next layer is 10 inches of pale brown fine sandy loam. It is underlain by a pale brown indurated hardpan extending to a depth of 36 inches or more.

Jolan soils have moderately rapid permeability above the hardpan and very slow permeability through the pan. Effective rooting depth is about 20 inches. Available water capacity is low. Runoff is slow, and the hazard of erosion is slight.

Representative profile of Jolan gravelly loamy coarse sand, about 6 miles southeast of the Cloverdale Ranch, about 1,300 feet west and 1,000 feet south of the northwest corner sec. 5, T. 6 N., R. 40 E.:

A11—0 to 2 inches; light brownish gray (10YR 6/2) gravelly loamy coarse sand, dark grayish brown (10YR 4/2) moist; massive; soft, very friable, nonsticky, nonplastic; many very fine, common medium, and few coarse roots; many micro interstitial pores; strongly alkaline; abrupt smooth boundary.

A12—2 to 6 inches; light gray (10YR 7/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; massive; soft, very friable, nonsticky, nonplastic; common very fine and fine roots; common very fine tubular pores; slightly effervescent; strongly alkaline; abrupt smooth boundary.

A13—6 to 10 inches; light gray (10YR 7/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; massive; slightly hard, very friable, nonsticky, nonplastic; common very fine and few fine roots; many micro, common very fine, and few fine tubular pores; violently effervescent; strongly alkaline; abrupt wavy boundary.

B2—10 to 20 inches; pale brown (10YR 6/3) fine sandy loam, brown (10YR 4/3) moist; massive; slightly hard, very friable, nonsticky, slightly plastic; many very fine and few fine roots; common very fine tubular pores; strongly alkaline; abrupt wavy boundary.

Csicam—20 to 36 inches; pale brown (10YR 6/3) indurated hardpan, brown (10YR 4/3) moist; massive very pale brown (10YR 7/3) and white (10YR 8/1) silica and lime 1 to 15 millimeters thick coating fracture planes; extremely hard, extremely firm; roots matted in fracture planes; very strongly alkaline.

Thickness of the solum and depth to the hardpan range from 20 to 30 inches. The profile except for the B2 horizon is calcareous either in the matrix or as lime filaments. The solum is dominantly fine sandy loam but includes strata of loamy very fine sand, loamy fine sand, and loamy sand. It contains as much as 30 percent gravel. The A1 horizon is normally massive but has weak, thin and medium, platy structure in places. The B horizon has moderate very coarse prismatic structure in some places.

JO—Jolan gravelly loamy coarse sand. This nearly level soil is in small, irregularly shaped areas on broad, smooth alluvial fans. The fans are dissected by a few dry washes that are 3 to 5 feet. Included in mapping, and making up about 5 percent of the acreage, are Bluewing soils.

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

This soil is suited to irrigated crops. Small areas are irrigated and planted to small grain and to alfalfa for hay production. This soil is used mainly for range and wildlife habitat. Capability unit IVs–12 irrigated, capability subclass VIIs dryland; range site NV 28–2 and NV 29–2, Desert Loamy Sal.

Koyen Series

The Koyen series consists of very deep, well drained soils that formed in loamy alluvium derived mainly from volcanic rocks. These soils are nearly level to gently sloping. They are on smooth valley-fill plains and low alluvial fans. Slopes range from 0 to 4 percent. The vegetation consists of Bailey greasewood, shadscale, bud sagebrush, Anderson wolfberry, Indian ricegrass, and galleta. Elevation ranges from 5,000 to 6,000 feet. Mean annual precipitation is 4 to 6 inches. Mean annual air temperature is 45° to 51° F, and the length of the frost-free season is 100 to 150 days.

In a representative profile the surface layer is light gray gravelly fine sandy loam about 4 inches thick. The next layer is pale brown fine sandy loam about 10 inches thick. It is underlain by light gray and very pale brown stratified fine sandy loam and very fine sandy loam that extends to a depth of 60 inches or more.

Koyen soils have moderately rapid permeability. Effective rooting depth is about 60 inches. Available water capacity is high. Runoff is slow to medium, and the hazard of erosion is slight to moderate.

Representative profile of Koyen gravelly fine sandy loam, 0 to 2 percent slopes, about 4 miles southwest of the San Antonio Ranch, about 500 feet west and 1,300 feet south of the northeast corner sec. 6, T. 6 N., R. 41 E.:

A1—0 to 4 inches; light gray (10YR 7/2) gravelly fine sandy loam, brown (10YR 4/3) moist; massive; soft, very friable, nonsticky, nonplastic; few fine roots; common fine tubular and many very fine and fine vesicular pores; noneffervescent; moderately alkaline; abrupt smooth boundary.

B2—4 to 14 inches; pale brown (10YR 6/3) fine sandy loam, brown (10YR 4/3) moist; weak very coarse subangular blocky structure; soft, very friable, very fine tubular pores; moderately alkaline; clear smooth boundary.

C1ca—14 to 37 inches; light gray (10YR 7/2) fine sandy loam, stratified with loamy fine sand, brown (10YR 4/3) moist; massive; soft, very friable, nonplastic, nonsticky; common very fine and fine roots; few very fine tubular pores; effervescent and strongly effervescent; strongly alkaline; clear wavy boundary.

C2ca—37 to 60 inches; very pale brown (10YR 7/3) very fine sandy loam stratified with silt loam, loam, and fine sandy loam, brown (10YR 4/3) moist; massive; soft, very friable, nonsticky, nonplastic; common very fine roots; few very fine pores; violently effervescent to effervescent depending on stratification; strongly alkaline.

Thickness of the solum ranges from 14 to 20 inches. The depth to the Cca horizon ranges from 14 to 24 inches. The solum is noncalcareous except in the lower part in places. Reaction ranges from pH 8.0 to 9.0, and it is generally lowest in the solum. The texture between depths of 10 and 40 inches is dominantly sandy loam or fine sandy loam, but in places includes loamy fine sand or very fine sandy loam. In places this is modified by pebbles that are lime coated on the underside and make up as much as 30 percent of any one horizon. The A horizon has weak, very thin to medium platy structure or is massive. The B horizon has weak, very coarse, subangular blocky structure or is massive. The C horizon is effervescent to violently effervescent depending on the stratification.

KoA—Koyen sand, 0 to 2 percent slopes. This nearly level soil is in medium size, irregularly shaped areas on smooth valley-fill plains. It has a profile similar to the one described as representative of the series, but it has a surface layer of sand 4 to 6 inches thick, and small hummocks of sand have been deposited around the bases of plants. Included in mapping, and making up about 5 percent of the acreage, are Timper soils and other Koyen soils.

Runoff is slow. The hazard of soil blowing is slight.

This soil is suited to irrigated crops if irrigation water is made available. It is used mainly for range and wildlife habitat. Capability unit IIs–4 irrigated, capability subclass VIIc dryland; range site NV 28–2 and NV 29–2, Desert Loamy Sal.

KrB—Koyen fine sandy loam, 2 to 4 percent slopes. This gently sloping soil is in large, irregularly shaped areas on alluvial fans that have been dissected by dry washes 2 to 10 feet deep. This soil has a profile similar to the one described as representative of the series, but the surface layer is nongravelly fine sandy loam, and slopes are 2 to 4 percent. Included in mapping, and making up about 10 percent of the acreage, are Bluewing soils.

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

This soil is suited to irrigated crops if irrigation water is made available. It is used mainly for range and wildlife habitat. Capability unit IIe–20 irrigated, capability subclass VIIc dryland; range site NV 28–2 and NV 29–2, Desert Loamy Sal.

KsA—Koyen gravelly fine sandy loam, 0 to 2 percent slopes. This nearly level soil is in a large, irregularly shaped area on broad, smooth valley-fill plains. It

has the profile described as representative of the series. Included in mapping, and making up about 10 percent of the acreage, are Dobel soils.

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

This soil is suited to irrigated crops if irrigation water is made available. It is used mainly for range and wildlife habitat. Capability unit IIc–1 irrigated, capability subclass VIIc dryland; range site NV 28–2 and NV 29–2, Desert Loamy Sal.

Kyler Series

The Kyler series consists of very shallow, well drained soils that formed in residuum weathered from limestone. These soils are steep. They are on foothills and mountains. Slopes range from 30 to 50 percent. The vegetation consists of black sagebrush, bud sagebrush, galleta, scattered juniper, and cliffrose. Elevation ranges from 6,500 to 7,200 feet. Mean annual precipitation is 10 to 12 inches. Mean annual air temperature is 45° to 47° F, and the length of the frost-free season is 80 to 100 days.

In a representative profile the surface layer is pale brown very gravelly very fine sandy loam about 2 inches thick. The next layer is very pale brown very gravelly very fine sandy loam about 5 inches thick. Gray limestone is at a depth of 7 inches.

Kyler soils have moderate permeability. Effective rooting depth is about 7 inches. Available water capacity is very low. Runoff is rapid, and the hazard of erosion is high.

Representative profile of Kyler very gravelly very fine sandy loam, in an area of Kyler-Rock outcrop complex, on the east slope of Lime Mountain, 1,200 feet west and 1,200 feet north of the southeast corner sec. 13, T. 4 N., R. 42 E.:

A1—0 to 2 inches; pale brown (10YR 6/3) very gravelly very fine sandy loam, brown (10YR 4/3) moist; massive; soft, very friable, nonsticky, nonplastic; common very fine roots; many very fine tubular pores; 50 percent gravel and 10 percent cobbles; violently effervescent; moderately alkaline; abrupt smooth boundary.

C1—2 to 7 inches; very pale brown (10YR 7/3) very gravelly very fine sandy loam, brown (10YR 4/3) moist with white (10YR 8/2) lime pendants on underside of gravel and few thin distinct light yellowish brown (10YR 6/4) silica coatings on the underside of gravel; weak thin platy and fine and medium subangular blocky structure; soft, very friable, slightly sticky, slightly plastic; many very fine and few fine roots; many very fine and fine tubular pores; violently effervescent; strongly alkaline; abrupt slightly wavy boundary.

R—7 inches; gray (N 6/0) limestone.

Depth to bedrock ranges from 6 to 15 inches. The soil is dominantly very fine sandy loam, but strata of fine sandy loam or silt loam are in the profile in some places. Texture is modified by gravel or cobbles, or both, and by stones. Some horizons above the bedrock contain as much as 70 percent rock fragments, but content of rock fragments in the soil averages 35 to 60 percent. These soils are calcareous and range in pH from 8.0 to 9.0, and pH generally increases as depth increases. The A horizon is massive or structure ranges from weak or moderate, thin or medium, platy to weak, fine to coarse, subangular blocky.

KT—Kyler-Rock outcrop complex. This complex of steep soils and outcrops of rock is in very small, irregularly shaped areas on foothills and mountain slopes. Kyler very gravelly very fine sandy loam, 30 to 50 percent slopes, makes up about 50 percent of the complex, and Rock outcrop makes up about 40 percent. Included in mapping, and making up about 10 percent of the acreage, are other soils.

This Kyler soil has the profile described as representative of the series. It is in the areas between the long, narrow ridges of tilted limestone beds and is 6 to 15 inches deep to bedrock. The Rock outcrop is narrow, tilted beds that have vertical sides and sharp peaks. It is essentially barren.

Runoff on the Kyler soil is rapid, and the hazard of erosion is high.

This complex is not suited to irrigated crops. It is used mainly for limited range and wildlife habitat. Capability subclass VIIs dryland; Kyler soil in range site NV 29–12, Semidesert Shallow Loamy; Rock outcrop not placed in a range site.

Lahontan Series

The Lahontan series consists of very deep, somewhat poorly drained saline-alkali affected soils that formed a fine silty alluvium derived mainly from volcanic rocks. These soils are nearly level. They are on smooth valley-fill plains and flood plains. Slopes range from 0 to 2 percent. The vegetation consists of saltgrass, povertyweed, Great Basin wildrye, black greasewood, and big sagebrush. Elevation is about 5,600 feet. Mean annual precipitation is 4 to 6 inches. Mean annual air temperature is 45° to 47° F, and the length of the frost-free season is 100 to 130 days.

In a representative profile the surface layer is light gray silty clay loam about 3 inches thick. Below is light gray and white heavy silty clay loam that extends to a depth of 60 inches or more.

Lahontan soils have slow permeability. Effective rooting depth is about 60 inches. Available water capacity is high. Runoff is very slow or ponded, and the hazard of erosion is slight.

Representative profile of Lahontan silty clay loam slightly saline-alkali about 2½ miles north of Big Smoky Valley highway maintenance station, 2,600 feet west and 2,100 feet north of the southeast corner sec. 16, T. 11 N., R. 43 E.:

A1—0 to 3 inches; light gray (5Y 7/1) silty clay loam, olive (5Y 4/3) moist; massive; slightly hard, very friable, sticky, plastic; common fine and coarse roots; many very fine tubular pores; strongly effervescent; strongly alkaline; clear smooth boundary.

C1—3 to 11 inches; light gray (10YR 7/1) heavy silty clay loam, grayish brown (10YR 5/2) moist; strong, thick platy structure; slightly hard, very friable, sticky, plastic; common very fine, few fine and common medium roots; common very fine and few fine tubular pores; strongly effervescent; very strongly alkaline; clear wavy boundary.

C2—11 to 27 inches; white (10YR 8/2) heavy silty clay loam, light brownish gray (10YR 6/2) moist; massive; slightly hard, very friable, sticky, plastic; many very fine and few fine roots; few very fine and fine, and common very fine tubular pores; violently effervescent; very strongly alkaline; clear wavy boundary.

C3—27 to 60 inches; white (10YR 8/2) heavy silty clay loam, brown (10YR 5/3) moist; many fine brown

(10YR 4/3) mottles; massive; slightly hard, very friable, sticky, plastic; common very fine roots; common very fine and few fine tubular pores; violently effervescent; moderately alkaline.

Lahontan soils are saturated in some horizons above a depth of 40 inches for at least one month during most years. The soil between depths of 10 and 40 inches is dominantly heavy silty clay loam but ranges to clay. There are strata of silt loam and clay loam in places. The soil is calcareous throughout. Few or common, fine to coarse lime nodules are in some horizons. The soil has weak or moderate, medium or coarse, subangular blocky structure or is massive. In places, pores in the upper 1 to 3 inches are vesicular. The A horizon ranges from slightly saline-alkali to strongly saline-alkali. Strong brown or dark brown mottles are in some horizons below a depth of about 20 inches. They range from few to common.

La—Lahontan silty clay loam, slightly saline-alkali. This nearly level soil is in long, narrow areas on smooth flood plains. It has the profile described as representative of the series. Included in mapping, and making up about 10 percent of the acreage, are hummocky soils.

Runoff is very slow or ponded, and the hazard of erosion is slight. A seasonal high water table is at a depth of 4 to 7 feet.

This soil has severe limitations for irrigated crops. It is used mainly for range and wildlife habitat. Capability subclass VIw dryland; range site NV 28–4, Saline Bottom.

Lb—Lahontan clay loam, strongly saline-alkali. This nearly level soil is in small, irregularly shaped areas on smooth flood plains. It has a profile similar to the one described as representative of the series, but it is strongly saline-alkali affected. Included in mapping, and making up about 10 percent of the acreage, are hummocky soils.

Runoff is very slow or ponded, and the hazard of erosion is slight. A seasonal high water table is at a depth of 3.5 to 5 feet.

This soil is not suited to irrigated crops. It is used mainly for range and wildlife habitat. Capability subclass VIIw dryland; range site NV 28–13, Saline Meadow.

Lathrop Series

The Lathrop series consists of very deep, well drained soils that formed in gravelly alluvium derived mainly from granite and rhyolite. These soils are nearly level to gently sloping. They are on broad, smooth alluvial fans that have been dissected and that have many dry washes 2 to 5 feet deep. Slopes range from 0 to 4 percent. The vegetation consists of shadscale, bud sagebrush, winterfat, galleta, Indian ricegrass, and kings desertgrass. Elevation ranges from 5,600 to 6,200 feet. Mean annual precipitation is 4 to 6 inches. Mean annual air temperature is 45° to 50° F, and the length of the frost-free season is 100 to 130 days.

In a representative profile the surface layer is light gray gravelly loam about 3 inches thick. The next layer is brown clay loam about 4 inches thick. Below this is very pale brown gravelly sandy clay loam about 6 inches thick. This is underlain by a layer of light gray gravelly loamy sand about 19 inches thick. Below this is white cobbly sand that extends to a depth of 60 inches or more.

Lathrop soils have moderately slow permeability in the loamy upper part and rapid permeability in the sandy lower part. Effective rooting depth is about 60 inches. Available water capacity is moderate. Runoff is medium, and the hazard of erosion is moderate.

Representative profile of Lathrop gravelly loam, in an area of Lathrop-Bluewing association, about 6 miles southwest of Round Mountain, 1,050 feet east of the west quarter corner sec. 15, T. 9 N., R. 43 E.:

A1—0 to 3 inches; light gray (10YR 7/2) gravelly loam, brown (10YR 4/3) moist; massive; slightly hard, very friable, slightly sticky, slightly plastic; few coarse roots; many very fine and fine and common medium vesicular pores; violently effervescent; strongly alkaline; abrupt wavy boundary.

B2t—3 to 7 inches; brown (10YR 5/3) clay loam, dark yellowish brown (10YR 4/) moist; many white (10YR 8/1) sand grains coating the tops of prisms and the top ½ inch of prism faces, light brownish gray (10YR 6/2) top 1 inch of prism faces and light yellowish brown (10YR 6/4) upper prism interior; moderate medium prismatic structure parting to strong very fine subangular blocky; soft, very friable, sticky, plastic; many very fine, common fine, and few medium roots; common very fine tubular pores; many thin clay films in pores, common thin clay films on ped faces; moderately alkaline; abrupt wavy boundary.

B3tca—7 to 13 inches; very pale brown (10YR 7/3) gravelly sandy clay loam, brown (10YR 5/3) moist; massive; soft, very friable, slightly sticky, slightly plastic; many very fine and few fine and medium roots; common very fine tubular pores; common clay-coated sand grains and few thin clay films in pores; violently effervescent; strongly alkaline; clear smooth boundary.

IIC1sica—13 to 32 inches; light gray (10YR 7/2) gravelly loamy sand, brown (10YR 5/3) moist, few fine prominent black (10YR 2/1) and brownish yellow (10YR 6/6) mottles moist; massive; slightly hard, very friable, nonsticky, nonplastic; few very fine roots; many very fine tubular and interstitial pores; discontinuous weakly cemented laminae that are hard and firm; 45 percent gravel and 30 percent cobbles that have lime coatings on the underside, many are partially weathered granitic fragments; violently effervescent; very strongly alkaline; clear smooth boundary.

IIC2ca—32 to 60 inches; white (10YR 8/2) cobbly sand, light gray (10YR 7/2) moist, few fine prominent black (10YR 2/1) and brownish yellow (10YR 6/6) mottles moist; massive; soft, very friable; few very fine roots; many very fine and fine interstitial pores; 40 percent gravel, 40 percent cobbles, 10 percent stones that have lime coatings on the underside, many are partially weathered granitic fragments; noncalcareous matrix; moderately alkaline.

Thickness of the solum and depth to the Csica horizon range from 8 to 27 inches. The A horizon is generally massive but in places has weak thin and medium platy structure. This horizon commonly is violently effervescent but is slightly effervescent or strongly effervescent in places. Structure of the B2t horizon is compound weak or moderate, medium or coarse, prismatic and moderate or strong, very fine to medium, granular and subangular blocky. This horizon is generally clay loam but includes loam and sandy clay loam that has 20 to 30 percent clay, and contains as much as 30 percent gravel in places. The B3tca horizon is clay loam or fine sandy loam or sandy clay loam and contains 20 to 40 percent gravel. Consistence of the IIC1sica horizons ranges from hard to very hard when dry and from friable to firm when moist. The discontinuous weakly

cemented strata are ½ inch to 2 inches thick. The IIC2ca horizon contains 50 to 90 percent cobbles and stones and many rock fragments that are partially weathered. The C horizon has thin strata of fine sandy loam in places. Where it has friable consistence, it contains 20 to 40 percent durinodes.

LCB—Lathrop gravelly loamy sand, 0 to 4 percent slopes. This nearly level to gently sloping soil is in small, irregularly shaped areas on broad, smooth alluvial fans. It has a profile similar to the one described as representative of the series, but the surface layer is gravelly loamy sand about 4 inches thick. Included in mapping, and making up about 10 percent of the acreage, are Bluewing soils and other Lathrop soils.

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

This soil is not suited to irrigated crops. It is used mainly for range and wildlife habitat. Capability subclass VIIs dryland; range site NV 28–2 and NV 29–2, Desert Loamy Sal.

LF—Lathrop-Bluewing association. This association of nearly level to moderately sloping soils is in large, irregularly shaped areas on broad alluvial fans that have been dissected and that have many dry washes 2 to 5 feet deep. Lathrop gravelly loam, 0 to 4 percent slopes, makes up about 80 percent of the association, and Bluewing stony loamy coarse sand, 0 to 8 percent slopes, makes up about 15 percent. Included in mapping, and making up about 5 percent of the acreage, are Wardenot soils.

This Lathrop soil has the profile described as representative of its series. It is on the broad alluvial fans. The Bluewing soil has a profile similar to the one described as representative of its series, but the surface layer is stony loamy coarse sand and the profile is gravelly sand throughout. This soil is in the dry washes that have cut into the fans.

Runoff is medium on the Lathrop soil and very slow on the Bluewing soil. The hazard of erosion is moderate on the Lathrop soil and slight on the Bluewing soil.

This association is not suited to irrigated crops. It is used mainly for range and wildlife habitat. Capability subclass VIIs dryland; Lathrop soil in range site NV 28–1 and NV 29–1, Desert Loamy; Bluewing soil in range site NV 28–2 and NV 29–2, Desert Loamy Sal.

Laxal Series

The Laxal series consists of very deep, somewhat excessively drained soils that formed in very shaly alluvium derived mainly from interbedded micaceous shale, limestone, and quartzite. These soils are nearly level to moderately sloping. They are on broad, smooth alluvial fans and aprons. Slopes range from 0 to 8 percent. The vegetation consists of shadscale, bud sagebrush, kings desertgrass, Indian ricegrass, galleta, and sand dropseed. In some areas Bailey greasewood or spiny hopsage is present. Elevation ranges from 5,600 to 6,200 feet. Mean annual precipitation is 4 to 6 inches. Mean annual air temperature is 45° to 47° F, and the length of the frost-free season is 100 to 130 days.

In a representative profile the surface layer is light gray gravelly loam about 5 inches thisk. The next layer is light gray very gravelly loam about 5 inches thick. Below this is light brownish gray and gray very gravelly sandy loam that extends to a depth of 60 inches or more.

Laxal soils have moderately rapid permeability. Effective rooting depth is about 60 inches. Available water capacity is low. Runoff is medium, and the hazard of erosion is slight to moderate.

Representative profile of Laxal gravelly loam, 2 to 4 percent slopes, 2 miles southeast of Wall Canyon about 2,600 feet east and 2,600 feet south of the northeast corner sec. 6, T. 9 N., R. 43 E.:

A1—0 to 5 inches; light gray (10YR 7/2) gravelly loam, brown (10YR 4/3) moist; massive; slightly hard, very friable, sticky, plastic; few medium roots; many very fine and fine, and common medium vesicular pores; violently effervescent; strongly alkaline; abrupt smooth boundary.

C1sica—5 to 10 inches; light gray (10YR 7/2) very gravelly loam, brown (10YR 4/3) moist; massive; slightly hard, very friable, slightly sticky, slightly plastic; many very fine and fine roots; common very fine tubular pores; white (10YR 8/2) lime and brownish yellow (10YR 6/8) silica coatings on underside of gravel; 40 percent fine and medium pebbles that are mainly platy in shape; violently effervescent; strongly alkaline; clear smooth boundary.

C2sica—10 to 22 inches; light brownish gray (10YR 6/2) very gravelly sandy loam that has thin strata of clay loam, brown (10YR 4/3) moist; massive; soft, very friable, nonsticky, nonplastic; many very fine roots; many very fine tubular pores; white (10YR 8/2) lime and brownish yellow (10YR 6/8) silica coatings on underside of gravel; 50 percent gravel; discontinuous weak cementing of gravel; violently effervescent; strongly alkaline; clear smooth boundary.

C3sica—22 to 60 inches; gray (10YR 6/1) very gravelly sandy loam, dark grayish brown (10YR 4/2) moist; massive; soft, very friable, nonsticky, nonplastic; few fine roots; many very fine tubular pores; white (10YR 8/2) and light gray (10YR 7/2) lime, and very pale brown (10YR 7/4) silica coatings on underside of gravel; 50 percent gravel; strongly to violently effervescent; strongly alkaline.

The A1 horizon is gravelly or very gravelly loamy sand, fine sandy loam, or loam. It is generally massive, but has weak thin or medium platy structure in places. The soil between depths of 10 and 40 inches is coarsely stratified. It is very gravelly fine sandy loam, sandy loam, or coarse sandy loam that has thin strata of clay loam and sand. It is 35 to 60 percent gravel and 70 to 85 percent sand. A buried B2t horizon of very gravelly clay loam or gravel is below a depth of 30 inches in places.

LmA—Laxal gravelly fine sandy loam, 0 to 2 percent slopes. This nearly level soil is in medium sized, irregularly shaped areas on broad toeslopes of alluvial fans. It has a profile similar to the one described as representative of the series, but the surface layer is gravelly fine sandy loam about 6 inches thick. Included in mapping, and making up about 5 percent of the acreage, are other Laxal soils.

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

This soil has limitations to use for irrigated crops. It is used mainly for range and wildlife habitat. Capability unit IIIs–45 irrigated, capability subclass VIIs

dryland; range site NV 28–1 and NV 29–1, Desert Loamy.

LnA—Laxal gravelly fine sandy loam, occasionally flooded, 0 to 2 percent slopes. This nearly level soil is in small, irregularly shaped areas on broad, smooth toeslopes of alluvial fans that are subject to occasional flooding. This soil has a profile similar to the one described as representative of the series, but the surface layer is gravelly fine sandy loam. Included in mapping, and making up about 10 percent of the acreage, are other Laxal soils.

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

This soil has limitations for irrigated crops. It is used mainly for range and wildlife habitat. Capability unit IIIw–39 irrigated, capability subclass VIIw dryland; range site NV 28–1 and NV 29–1, Desert Loamy.

LRB—Laxal gravelly loam, 2 to 4 percent slopes. This gently sloping soil is in large, irregularly shaped areas on smooth alluvial fans. It has the profile described as representative of the series. Included in mapping, and making up about 10 percent of the acreage, are Bluewing and Deerlodge soils.

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

This soil has limitations to use for crops even if irrigation water is made available. It is used mainly for range and wildlife habitat. Capability unit IIIe–25 irrigated, capability subclass VIIs dryland; range site NV 28–1 and NV 29–1, Desert Loamy.

LS—Laxal-Rock outcrop complex. This complex of gently sloping to moderately sloping soils is in very small, irregularly shaped areas on highly dissected pediments and alluvial fans and aprons. Laxal gravelly loam, 2 to 8 percent slopes, makes up about 70 percent of the complex, and Rock outcrop makes up about 20 percent. Included in mapping, and making up about 10 percent of the acreage, are areas of very gravelly alluvial material that have been exposed in numerous dry washes, and areas of bedrock in some places.

The Laxal soil formed in alluvium that filled older, dissected channels that had been cut into the rock pediments. The refilled channels are in slightly lower positions than the Rock outcrop. They tend to broaden near the lower ends of the pediments and to coalesce to form small local fans and aprons. The Rock outcrop consists of shale, limestone, or quartzite. It is essentially barren.

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

This complex is not suited to irrigated crops. It is used mainly for range and wildlife habitat. Capability subclass VIIs dryland; Laxal soil in range site NV 28–1 and NV 29–1, Desert Loamy; Rock outcrop not placed in a range site.

Lyda Series

The Lyda series consists of well drained soils that are shallow to an indurated hardpan. They formed in alluvium weathered from volcanic rocks. These soils are gently sloping to moderately sloping. They are on the narrow to broad, undulating upper parts of alluvial fans. Slopes range from 2 to 8 percent. The vegetation consists of Bailey greasewood, shadscale, bud sagebrush, winterfat, kochia, galleta, and Indian ricegrass. Elevation ranges from 5,800 to 6,500 feet. Mean annual precipitation is 4 to 6 inches. Mean annual air temperature is 43° to 47° F, and the length of the frost-free season is 100 to 120 days.

In a representative profile the surface layer is light brownish gray and very pale brown very gravelly fine sandy loam and very fine sandy loam about 4 inches thick. The next layer is light yellowish brown cobbly clay loam about 6 inches thick. Below this is pale brown very gravelly sandy loam about 2 inches thick. A white indurated hardpan is at a depth of 12 inches. It extends to a depth of 14 inches or more.

Lyda soils have slow permeability above the hardpan and very slow permeability through it. Effective rooting depth is about 12 inches. Available water capacity is very low. Runoff is rapid, and the hazard of erosion is moderate.

Representative profile of Lyda very gravelly fine sandy loam, 2 to 8 percent slopes, about 5 miles northwest of the San Antonio Ranch, about 0.4 mile south and 0.4 mile east of the northwest corner sec. 30, T. 8 N., R. 40 E.:

A1—0 to 1 inch; light brownish gray (10YR 6/2) very gravelly fine sandy loam, dark grayish brown (10YR 4/2) moist; massive; soft, very friable, nonsticky, nonplastic; many very fine interstitial pores; about 70 percent coarse fragments; violently effervescent; strongly alkaline; abrupt smooth boundary.

A2—1 to 4 inches; very pale brown (10YR 7/3) very fine sandy loam, brown (10YR 4/3) moist; massive; slightly hard, very friable, slightly sticky, slightly plastic; many very fine and fine vesicular pores; violently effervescent; very strongly alkaline; abrupt wavy boundary.

B2t—4 to 10 inches; light yellowish brown (10YR 6/4) cobbly heavy clay loam, dark yellowish brown (10YR 4/4) moist; weak coarse and medium prismatic structure parting to moderate medium subangular blocky; hard, very friable, sticky, very plastic; common very fine, fine, and medium roots; common very fine tubular pores; common thin clay films in pores, many thin films bridging sand grains and few thin films on faces of peds; 50 percent coarse fragments; strongly alkaline; clear wavy boundary.

B3tca—10 to 12 inches; pale brown (10YR 6/3) very gravelly heavy sandy loam, brown (10YR 4/3) moist; weak very fine and fine subangular blocky structure; soft, very friable, slightly sticky, slightly plastic; many very fine and few fine roots; many very fine tubular pores; few thin clay films in pores; about 60 percent coarse fragments; violently effervescent; very strongly alkaline; abrupt wavy boundary.

Csicam—12 to 14 inches; white (10YR 8/2) indurated duripan, pale brown (10YR 6/3) moist; massive; extremely hard, extremely firm; violently effervescent; strongly alkaline.

Thickness of the solum and depth to the hardpan range from 8 to 20 inches. The soils range in pH from 8.6 to 9.4 in the solum. Hardpan fragments throughout the profile are part of the coarse fragment content. The A horizon is massive or has weak or moderate, thick or medium, platy structure. The B horizon contains less than 15 percent

exchangeable sodium. It is 30 to 35 percent clay. Texture of the B2t horizon includes heavy clay loam and light clay. This horizon is 40 to 60 percent coarse fragments, including gravel, cobbles, stones, and hardpan fragments. It has weak or moderate, medium to very coarse prismatic structure that parts easily to weak, moderately fine or medium, subangular blocky or granular structure. The B3tca horizon ranges from sandy clay loam to sandy loam. It is massive or has weak very fine or medium subangular blocky structure. It contains 40 to 60 percent coarse fragments, including stones, cobbles, gravel, and hardpan fragments. The hardpan is massive or has weak, medium to very thick, platy structure.

LTC—Lyda very gravelly fine sandy loam, 2 to 8 percent slopes. This gently sloping to moderately sloping soil is on the large, rounded, narrow to broad, undulating upper parts of alluvial fans. Included in mapping, and making up about 10 percent of the acreage, are Bluewing soils and other Lyda soils.

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

This soil is not suited to irrigated crops. It is used mainly for range and wildlife habitat. Capability subclass VIIs dryland; range site NV 28–2 and NV 29–2, Desert Loamy Sal.

Maggie Series

The Maggie series consists of well drained soils that are shallow to a very gravelly hardpan. These soils formed in alluvium derived from rhyolite and tuffaceous rocks. These soils are gently sloping to moderately sloping. They are on old, high, dissected alluvial fans and pediments. Slopes range from 2 to 8 percent. The vegetation consists of Bailey greasewood, shadscale, bud sagebrush, galleta, and Indian ricegrass. Elevation ranges from 5,500 to 6,000 feet. Mean annual precipitation is 4 to 6 inches. Mean annual air temperature is 45° to 47° F, and the length of the frost-free season is 100 to 120 days.

In a representative profile the surface layer is light gray very gravelly loam about 1 inch thick. The next layer is very pale brown gravelly and very gravelly sandy clay loam about 7 inches thick. Below this is about 6 inches of pale brown very gravelly sandy loam. A light gray very gravelly hardpan is at a depth of about 14 inches. It is about 12 inches thick over extremely hard tuffaceous and rhyolitic rock.

Maggie soils have moderately slow permeability above the hardpan but very slow permeability through it. Effective rooting depth is about 14 inches. Available water capacity is very low. Runoff is rapid, and the hazard of erosion is moderate.

Representative profile of Maggie very gravelly loam, in an area of Maggie-Pintwater association, about 3 miles northwest of the San Antonio Ranch, about 0.6 mile south of the northeast corner sec. 2, T. 7 N., R. 41 E.:

A1—0 to 1 inch; light gray (10YR 7/2) very gravelly loam, brown (10YR 4/3) moist; strong very thick platy structure; slightly hard, very friable, nonsticky, nonplastic; many fine and medium vesicular pores; about 60 percent gravel; strongly effervescent; strongly alkaline; very abrupt smooth boundary.

B1—1 to 3 inches; very pale brown (10YR 7/3) gravelly sandy clay loam, brown (10YR 5/3) moist; strong very thick platy structure; slightly hard, very friable, slightly sticky, slightly plastic; many very fine and few fine vesicular pores; about 20 percent gravel; violently effervescent; strongly alkaline; very abrupt smooth boundary.

B2t—3 to 8 inches; very pale brown (10YR 7/3) and brownish yellow (10YR 6/6) very gravelly sandy clay loam, yellowish brown (10YR 5/4) moist; moderate fine and medium subangular blocky structure; hard, friable, sticky, plastic; few very fine roots; many very fine interstitial pores; common thin clay films on ped faces and in pores; about 50 percent gravel; strongly alkaline; abrupt smooth boundary.

B3tca—8 to 14 inches; pale brown (10YR 6/3) very gravelly sandy loam, brown (10YR 4/3) moist; weak fine and medium subangular blocky structure; slightly hard, very friable, nonsticky, nonplastic; many very fine and few fine and medium roots; many very fine tubular pores; few thin clay films in pores; about 40 percent gravel; strongly effervescent; strongly alkaline; very abrupt smooth boundary.

Csicam—14 to 26 inches; light gray (10YR 7/2) very gravelly interlaminated duripan consisting of several continuous indurated ⅝-inch thick laminae and strongly and weakly silica-lime cemented strata, grayish brown (10YR 5/) moist; extremely hard, extremely firm; common very fine and fine roots matted on laminae; few very fine tubular pores; white (10YR 8/1) lime and many fine distinct brownish yellow (10YR 5/6) silica coatings on gravel; very abrupt wavy boundary.

R—26 inches; extremely hard tuffaceous and rhyolitic rock.

Thickness of the solum and depth to the hardpan range from 10 to 18 inches. Depth to bedrock ranges from 20 to 36 inches. Rock fragments make up 40 to 60 percent of the solum. The A horizon is massive or has moderate or strong, medium to very thick, platy structure. The B2t horizon is very gravelly heavy fine sandy loam or very gravelly sandy clay loam. This horizon has weak or moderate, fine or medium, subangular blocky structure. It is calcareous in some places. The B3t horizon is gravelly or very gravelly sandy loam or loamy sand. The Csicam horizon is interlaminated with ¼ to ¾-inch thick indurated laminae and strongly or weakly cemented material that is hard or extremely hard and firm or extremely firm.

MA—Maggie-Pintwater association. This association of gently sloping to steep soils is in large, irregularly shaped areas on highly dissected fans, hills, and mountain slopes. Maggie very gravelly loam, 2 to 8 percent slopes, makes up about 50 percent of the association; Pintwater very cobbly fine sandy loam, 15 to 50 percent slopes, makes up about 30 percent; and Bluewing stony loamy coarse sand, 0 to 8 percent slopes, makes up about 10 percent. Included in mapping, and making up about 10 percent of the acreage, are Dobel soils and other Bluewing soils in the washes that are occasionally flooded.

The Maggie soil has the profile described as representative of the series. The Pintwater soil has a profile similar to the one described as representative of the series. The Maggie soil is on the upper ends of the alluvial fans. The Pintwater soil is mainly on the hills and mountain slopes. The Bluewing soil has a profile similar to the one described as representative of the series, but the surface layer is stony loamy coarse sand. It is in the dry washes on the dissected alluvial fans.

Runoff on the Maggie and Pintwater soils is rapid to very rapid, and on the Bluewing soil it is very slow.

The hazard of erosion is moderate on the Maggie and Pintwater soils and slight on the Bluewing soil.

This association is not suited to irrigated crops. It is used mainly for range and wildlife habitat. Capability subclass VIIs dryland; Maggie and Bluewing soils in range site NV 28–2 and NV 29–2, Desert Loamy Sal; Pintwater soil in range site NV 29–14, Desert Stony Hill.

Malpais Series

The Malpais series consists of very deep, well drained soils that formed in stony colluvium derived from rhyolitic rocks. These soils are moderately steep to steep. They are on mountain slopes. Slopes range from 15 to 50 percent. The vegetation consists of Bailey greasewood, shadscale, bud sagebrush, winterfat, spiny hopsage, desert needlegrass, Indian ricegrass, and galleta. Elevation ranges from 6,000 to 7,000 feet. Mean annual precipitation is 6 to 7 inches. Mean annual air temperature is 43° to 45° F, and the length of the frost-free season is 100 to 120 days.

In a representative profile the surface layer is light brownish gray stony fine sandy loam about 3 inches thick. The next layer is about 14 inches of light brownish gray gravelly fine sandy loam. It is underlain by pale brown very stony fine sandy loam that extends to a depth of 60 inches or more.

Malpais soils have moderately rapid permeability. Effective rooting depth is about 60 inches. Available water capacity is low. Runoff is medium, and the hazard of erosion is slight.

Representative profile of Malpais stony fine sandy loam, in an area of Malpais-Rock outcrop association, about 1.5 mile northwest of Frazier's well on a west slope, 1,000 feet west and 500 feet north of the southwest corner sec. 16, T. 4 N., R. 43 E.:

A1—0 to 3 inches; light brownish gray (10YR 6/2) stony fine sandy loam, dark grayish brown (10YR 4/2) moist; moderate thin platy structure; slightly hard, very friable, nonsticky, nonplastic; common very fine roots; few very fine vesicular and common very fine and medium tubular pores; moderately alkaline; abrupt smooth boundary.

B2—3 to 17 inches; light brownish gray (10YR 6/2) gravelly fine sandy loam, dark grayish brown (10YR 4/2) moist; weak medium subangular blocky structure; slightly hard, very friable, nonsticky, nonplastic; many very fine roots; common very fine tubular pores; moderately alkaline; clear smooth boundary.

Cca—17 to 60 inches; pale brown (10YR 6/3) very stony fine sandy loam, brown (10YR 4/3) moist; massive; soft, very friable, nonsticky, nonplastic; common very fine roots; many very fine interstitial pores; violently effervescent; moderately alkaline.

Thickness of the solum ranges from 12 to 20 inches. The solum is generally noncalcareous, but in places the undersides of some stones and pebbles are coated with lime. Stones and gravel make up 50 to 70 percent of the soil. In places the surface is gravelly, cobbly, or stony. The texture between depths of 10 and 40 inches is dominantly fine sandy loam. The A1 horizon is massive or has moderate, thin, platy structure. The B2 horizon is massive or has weak, fine to coarse, subangular blocky structure.

MB—Malpais-Rock outcrop association. This association of moderately steep to steep soils is in medium sized, irregularly shaped areas on rolling hills and mountain slopes. Malpais stony fine sandy loam, 15 to 50 percent slopes, makes up about 70 percent of the association, and Rock outcrop makes up 15 percent. Included in mapping, and making up about 15 percent of the acreage, are Pintwater soils.

The Malpais soil is slightly lower than the Rock outcrop it surrounds. The Rock outcrop consists of rhyolitic and tuffaceous exposures of bedrock. It is small raised islands within the Malpais soil.

Runoff on the Malpais soil is medium, and the hazard of erosion is slight.

This association is not suited to irrigated crops. It is used mainly for range and wildlife habitat. Malpais soil in capability subclass VIIs dryland, range site NV 29–14, Desert Stony Hill; Rock outcrop in capability subclass VIIIs dryland, not placed in a range site.

Mazuma Series

The Mazuma series consists of very deep, well drained soils that formed in loamy alluvium derived from volcanic rocks. These soils are nearly level to gently sloping. They are on broad, smooth, coalescing alluvial fans, toeslopes, and aprons. Slopes are 0 to 4 percent. The vegetation is shadscale, bud sagebrush, Indian ricegrass, and galleta. Elevation ranges from 5,500 to 6,000 feet. Mean annual precipitation is 4 to 6 inches. Mean annual air temperature is 45° to 47° F, and the length of the frost-free season is 100 to 130 days.

In a representative profile the surface layer is light gray fine sandy loam about 3 inches thick. It is underlain by very pale brown and light gray very fine sandy loam that extends to a depth of 60 inches or more.

Mazuma soils have moderately rapid permeability. Effective rooting depth is about 60 inches. Available water capacity is moderate to high. Runoff is slow to medium, and the hazard of erosion is slight to high.

Representative profile of Mazuma fine sandy loam, 0 to 2 percent slopes, about 5 miles west of Round Mountain, about 0.2 mile east and 0.3 mile north of southeast corner sec. 10, T. 10 N., R. 43 E.:

A1—0 to 3 inches; light gray (10YR 7/2) fine sandy loam, brown (10YR 4/3) moist; massive; slightly hard, friable, nonsticky, nonplastic; common very fine roots; many very fine and fine vesicular pores; violently effervescent; strongly alkaline; abrupt smooth boundary.

C1—3 to 10 inches; very pale brown (10YR 7/3) very fine sandy loam, brown (10YR 4/3) moist; massive; slightly hard, very friable, slightly sticky, slightly plastic; common very fine and few fine roots; few very fine and fine tubular pores; violently effervescent; moderately alkaline; clear smooth boundary.

C2—10 to 60 inches; light gray (10YR 7/2) very fine sandy loam, brown (10YR 4/3) moist; massive; soft, very friable; nonsticky, nonplastic; common fine roots; violently effervescent; strongly alkaline.

Strata of fine sandy loam, loam, loamy fine sand, and very fine sandy loam are in all horizons. The soil contains as much as 30 percent gravel in places. The soils are generally calcareous but are noncalcareous in the upper 7 inches in places.

McA—Mazuma fine sandy loam, 0 to 2 percent slopes. This nearly level soil is in medium sized, irreg-

ularly shaped areas on broad, smooth, alluvial fans and toeslopes. This soil has the profile described as representative of the series. Included in mapping, and making up about 5 percent of the acreage, are eroded soils.

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

This soil is suited to irrigated crops if irrigation water is made available. It is used mainly for range and wildlife habitat. Capability unit IIc–1 irrigated, capability subclass VIIc dryland; range site NV 28–1 and NV 29–1, Desert Loamy.

McA3—Mazuma fine sandy loam, 0 to 2 percent slopes, severely eroded. This nearly level soil is in small, irregularly shaped areas on the toeslopes of alluvial fans. It has a profile similar to the one described as representative of the series, but the surface layer has been severely eroded by small gullies and numerous channels that are 3 to 7 feet deep. Included in mapping, and making up about 10 percent of the acreage, are Tipperary soils and other Mazuma soils.

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

This soil is not suited to irrigated crops. It is used mainly for range and wildlife habitat. Capability subclass VIIc dryland; range site NV 28–2 and NV 29–2, Desert Loamy Sal.

MdA—Mazuma fine sandy loam, slightly wet, 0 to 2 percent slopes. This nearly level soil is in medium sized, narrow bands on smooth toeslopes of alluvial fans. It has a profile similar to the one described as representative of the series, but it is somewhat more stratified in places and has a water table at a depth of 5 to 6 feet. Included in mapping, and making up about 10 percent of the acreage, are Wardenot and Wrango soils.

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

This soil is suited to irrigated crops if irrigation water is made available. It is used mainly for range and wildlife habitat. Capability unit IIc–1 irrigated, capability subclass VIIc dryland; range site NV 29–6, Loamy Bottom.

MeB—Mazuma very fine sandy loam, 2 to 4 percent slopes. This gently sloping soil is in very small, irregularly shaped areas on slightly undulating alluvial fans that have been dissected by incised channels 2 to 5 feet deep. This soil has a profile similar to the one described as representative of the series, but the surface layer is very fine sandy loam. Included in mapping, and making up about 10 percent of the acreage, are Bluewing soils and other Mazuma soils.

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

This soil is suited to irrigated crops if irrigation water is made available. It is used mainly for range and wildlife habitat. Capability unit IIe–20 irrigated, capability subclass VIIc dryland; range site NV 29–6, Loamy Bottom.

Mf—Mazuma complex. This complex of nearly level soils is in very small, irregularly shaped areas on hummocky alluvial fans and aprons. Hummocks of sand are about 15 inches high. Mazuma fine sandy loam, 0 to 2 percent slopes, makes up about 50 percent of the complex, and Mazuma loamy fine sand, 0 to 2 percent slopes, makes up 40 percent. Included in mapping, and making up about 10 percent of the acreage, are small, essentially barren playas.

The Mazuma fine sandy loam, 0 to 2 percent slopes, has a profile similar to the one described as representative of the series. It is on the smooth parts of the fans. The Mazuma loamy fine sand has a profile similar to the one described as representative of the series, but the surface layer is loamy fine sand 10 to 20 inches thick. It makes up the hummocks that are superimposed upon the smooth fans.

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

This complex is suited to irrigated crops if irrigation water is made available. It is used mainly for range and wildlife habitat. Capability unit IIs–43 irrigated, capability subclass VIIc dryland; Mazuma fine sandy loam in range site NV 28–1 and NV 29–1, Desert Loamy; Mazuma loamy fine sand in range site NV 29–6, Loamy Bottom.

McCann Series

The McCann series consists of very deep, well drained soils that formed in colluvium derived from basaltic rocks. These soils are moderately steep to steep. They are on mountain slopes. Slopes range from 15 to 50 percent. The vegetation consists of big sagebrush, Indian ricegrass, squirreltail, Thurbur needlegrass, Sandberg bluegrass, and scattered pinyon pine and juniper. Elevation ranges from 6,500 to 8,000 feet. Mean annual precipitation is 10 to 14 inches. Mean annual air temperature is 40° to 43° F, and the length of the frost-free season is 80 to 100 days.

In a representative profile the surface layer is 5 inches of brown extremely stony loam and 4 inches of pale brown very cobbly fine sandy loam. The next layer is pale brown very cobbly loam about 10 inches thick. Below this is pale brown very cobbly fine sandy loam that extends to a depth of 60 inches or more.

McCann soils have moderate permeability. Effective rooting depth is about 60 inches. Available water capacity is low to moderate. Runoff is medium, and the hazard of erosion is moderate.

McCann soils are mapped only in the Timblin-McCann association (TC).

Representative profile of McCann extremely stony loam, an area of Timblin-McCann association, about 18 miles north of Tonopah, about 100 feet east and 0.5 mile south of the northwest corner sec. 6, T. 5 N., R. 43 E.:

A11—0 to 5 inches; brown (10YR 5/3) extremely stony loam, dark brown (10YR 3/3) moist; weak very fine and fine granular structure; soft, very friable, nonsticky, slightly plastic; many very fine roots; common very fine tubular and fine vesicular pores; about 15 percent stones; neutral; clear smooth boundary.

A12—5 to 9 inches; pale brown (10YR 6/3) very cobbly fine sandy loam, dark brown (10YR 3/3) moist; weak fine and medium subangular blocky structure; soft, very friable, slightly sticky, slightly plastic; many very fine, common fine, and few medium roots; common very fine and fine tubular

pores; about 50 percent cobbles, 20 percent gravel; neutral; clear smooth boundary.

B2—9 to 19 inches; pale brown (10YR 6/3) very cobbly loam, brown (10YR 4/3) moist; moderate medium and fine subangular blocky structure; slightly hard, very friable, sticky, slightly plastic; many very fine, common fine, and few medium roots; many very fine tubular pores; about 50 percent cobbles, 20 percent gravel; few thin clay films in pores and bridging sand grains; neutral; clear wavy boundary.

C1—19 to 34 inches; pale brown (10YR 6/3) very cobbly fine sandy loam, brown (10YR 4/3) moist; massive; slightly hard, very friable, slightly sticky, slightly plastic; many very fine roots; many very fine tubular pores; about 50 percent cobbles; neutral; clear wavy boundary.

C2si—34 to 60 inches; pale brown (10YR 6/3) very cobbly fine sandy loam, brown (10YR 4/3) moist; massive; slightly hard, very friable, slightly sticky, slightly plastic; many very fine roots; many very fine tubular pores; 60 percent hard and firm durinodes that have few thin silica films in pores and are weakly cemented in pockets and seams; about 50 percent cobbles; mildly alkaline.

Thickness of the solum ranges from 14 to 25 inches. Texture between depths of 10 and 40 inches is fine sandy loam, very fine sandy loam, or loam modified by 50 to 75 percent cobbles, gravel, and stones. The A1 horizon is massive or structure is weak, very fine or fine, granular or subangular blocky. Consistence when dry is soft or slightly hard. The B horizon is massive or structure is weak or moderate, fine or medium, subangular blocky or weak, coarse, prismatic. The C horizon is soft or slightly hard and very friable to friable. The durinodes are slightly hard or hard and firm or very firm and are below a depth of 18 to 30 inches.

Mina Series

The Mina series consists of very deep, well drained soils that formed in colluvium derived from basaltic rocks. These soils are steep. They are on north- and west-facing colluvial upland slopes. Slopes range from 30 to 50 percent. The vegetation consists of big sagebrush, black sagebrush, winterfat, Indian ricegrass, Sandberg bluegrass, and galleta. Elevation ranges from 6,500 to 7,500 feet. Mean annual precipitation is 8 to 10 inches. Mean annual air temperature is 43° to 47° F, and the length of the frost-free season is 100 to 115 days.

In a representative profile the surface layer is light brownish gray extremely stony and very stony fine sandy loam about 8 inches thick. The next layer is pale brown very stony loam about 16 inches thick. Below this is pale brown very stony fine sandy loam that extends to a depth of 60 inches or more.

Mina soils have moderate permeability. Effective rooting depth is about 60 inches. Available water capacity is low to moderate. Runoff is rapid, and the hazard of erosion is moderate.

Mina soils are mapped only in the Basket-Mina association (BC), the Old Camp-Mina association (OA), and the Vinini-Mina association (VM).

Representative profile of Mina extremely stony fine sandy loam, 30 to 50 percent slopes, about 12 miles north of Tonopah, about 1,320 feet east and 225 feet north of the southwest corner sec. 14, T. 4 N., R. 42 E.:

A11—0 to 2 inches; light brownish gray (10YR 6/2) extremely stony fine sandy loam, dark grayish brown (10YR 4/2) moist; weak thin platy structure; soft, very friable, nonsticky, slightly plastic; many very fine roots; many very fine vesicular and tubular pores; about 12 percent stones, 10 percent cobbles, 10 percent gravel; mildly alkaline; abrupt smooth boundary.

A12—2 to 8 inches; light brownish gray (10YR 6/2) very stony fine sandy loam, dark brown (10YR 3/3) moist; weak fine and medium subangular blocky structure; slightly hard, very friable, nonsticky, slightly plastic; many very fine roots; many very fine tubular pores; about 40 percent stones, cobbles, and gravel; mildly alkaline; clear smooth boundary.

B2—8 to 17 inches; pale brown (10YR 6/3) very stony loam, brown (10YR 4/3) moist; weak coarse subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; many very fine, common fine, and few medium roots; many very fine and few fine tubular pores; about 40 percent stones, cobbles, and gravel; moderately alkaline; clear smooth boundary.

C15i—17 to 24 inches; pale brown (10YR 6/3) very stony loam, dark brown (10YR 3/3) moist; massive; slightly hard, very friable, slightly sticky, slightly plastic; many very fine, common fine, and few fine and medium roots; many very fine and few fine tubular pores; about 40 percent durinodes that are less than 2 centimeters in diameter, hard, firm, brittle; about 40 percent stones, cobbles, and gravel; moderately alkaline; clear smooth boundary.

C2ca—24 to 60 inches; pale brown (10YR 3/3) very stony fine sandy loam, dark brown (10YR 3/3) moist; massive; soft, very friable, nonsticky, slightly plastic; many very fine and few medium roots; many very fine tubular pores; about 40 percent stones, cobbles, and gravel coated with lime and silica on undersides; moderately alkaline.

Thickness of the solum and depth to the Csi horizon range from 14 to 24 inches. Depth to the Cca horizon ranges from 20 to 36 inches. Texture between depths of 10 and 40 inches is dominantly loam or very fine sandy loam but includes fine sandy loam, loam, and light clay loam in some places. Stones, cobbles, and gravel make up 35 to 50 percent of the soil. The A horizon is massive or has very thin to medium platy structure or fine or medium subangular blocky structure. The B2 horizon has weak coarse subangular blocky structure or weak coarse prismatic structure.

Mine Dumps

MG—Mine dumps. This land type consists mostly of manmade areas where mining and milling have taken place. It includes the excavations from open pits and underground workings as well as quarries, placer diggings, stockpiling of ore and waste rock, and the tailings resulting from mining and milling operations.

Areas of this land type are scattered throughout the survey area. The dumps are on nearly all landforms but are mostly on alluvial fans, hills, and mountains. Slopes of the individual dumps vary considerably, ranging from 4 to 50 percent. Elevation ranges from 5,000 to 7,000 feet.

This material is essentially barren. It has no value for farming. It may have some value for recreation and esthetic purposes. Capability subclass VIIIs dryland; not placed in a range site.

Monte Cristo Series

The Monte Cristo series consists of well drained soils that are shallow over a strongly cemented hard-

pan. They formed in alluvium derived mainly from basaltic rocks. These soils are nearly level. They are on flood plains. Slopes range from 0 to 2 percent. The vegetation consists of shadscale, bud sagebrush, kochia, winterfat, and Indian ricegrass. Elevation is about 5,600 feet. Mean annual precipitation is 4 to 6 inches. Mean annual air temperature is 45° to 47° F, and the length of the frost-free season is 100 to 130 days.

In a representative profile the surface layer is light gray loam about 4 inches thick. Below it is 3 inches of pale brown clay loam and 3 inches of pale brown loam. Next is a very pale brown, strongly cemented hardpan about 7 inches thick. Below the hardpan is 15 inches of light brownish gray fine sandy loam over light gray clay loam that extends to a depth of 60 inches or more.

Monte Cristo soils have moderately slow permeability to the hardpan and slow permeability through it. Effective rooting depth is about 10 inches. Available water capacity is very low. Runoff is very slow, and the hazard of erosion is slight.

Representative profile of Monte Cristo loam, in an area of Monte Cristo-Playas complex, about 8 miles southwest of Round Mountain, about 1,500 feet north and 500 feet east of the southwest corner sec. 20, T. 9 N., R. 43 E.:

A1—0 to 4 inches; light gray (10YR 7/2) loam, brown (10YR 5/3) moist; strong thin and medium platy structure; slightly hard, very friable, slightly sticky, slightly plastic; many very fine and fine vesicular pores; violently effervescent; strongly alkaline; abrupt smooth boundary.

B2t—4 to 7 inches; pale brown (10YR 6/3) clay loam, brown (10YR 4/3) moist; weak coarse prismatic structure parting to strong very fine angular blocky and granular; slightly hard, very friable, sticky, plastic; many very fine and few fine roots; many very fine interstitial pores; common thin clay films on ped faces; violently effervescent; moderately alkaline; abrupt wavy boundary.

B3t—7 to 10 inches; pale brown (10YR 6/3) loam, brown (10YR 5/3) moist; strong thick platy structure; slightly hard, very friable, sticky, plastic; many very fine and few fine roots; many thin clay films on ped faces; violently effervescent; strongly alkaline; abrupt wavy boundary.

C1sicam—10 to 17 inches; very pale brown (10YR 7/3) strongly cemented duripan, brown (10YR 5/3) moist; few fine and distinct very dark brown (10YR 3/2) and dark reddish brown (5YR 3/3) moist mottles; strong thick platy structure; very hard, extremely firm; few fine roots; few fine and medium continuous pores between plates; many fine distinct grayish brown (10YR 5/2) moist organic stains; violently effervescent; strongly alkaline; clear wavy boundary.

C2sica—17 to 32 inches; light brownish gray (10YR 6/2) fine sandy loam, brown (10YR 5/3) moist; massive; hard, very firm, nonsticky, nonplastic; few very fine and fine roots; few very fine tubular pores; noncalcareous matrix, violently effervescent in medium and large, irregularly shaped seams, soft masses, and concretions; moderately alkaline; clear wavy boundary.

C3ca—32 to 60 inches; light gray (10YR 7/2) clay loam, pale brown (10YR 6/3) moist; massive; slightly hard, friable, sticky, plastic; noncalcareous matrix, violently effervescent in medium and large, irregularly shaped seams, soft masses, and concretions; moderately alkaline.

Thickness of the solum and depth to the hardpan range from 10 to 18 inches. In places the surface is covered with as much as 6 inches of very gravelly loamy sand or with loamy sand or gravelly sand as much as ¼ inch thick. The A horizon is loam, silt loam, fine sandy loam, or clay loam. It is massive or has strong, medium or thick, platy structure. The B horizon is loam, clay loam, or sandy clay loam. Structure is moderate or strong, coarse prismatic; very fine and fine, angular blocky; or granular. The B3 horizon contains many durinodes in places. The hardpan has weak to strong cementation. Below the hardpan, the texture is fine sandy loam, very fine sandy loam, or clay loam that has as much as 25 percent gravel.

MO—Monte Cristo-Playas complex. This complex of nearly level soils is in small and medium sized, long, narrow bands on smooth, recent flood plains that are subject to occasional flooding. Monte Cristo loam makes up about 70 percent of the complex, and Playas make up 20 percent. Included in mapping, and making up about 10 percent of the acreage, are Broyles soils and other Monte Cristo soils.

The Monte Cristo soil is on the slightly raised parts of the flood plain that surround the Playas. The Playas are small, irregularly shaped areas in slight depressions in areas of the Monte Cristo soil. They are essentially barren.

Runoff is very slow, and the hazard of erosion is slight on the Monte Cristo soil.

This complex is not suited to irrigated crops. It is used mainly for range and wildlife habitat. Capability subclass VIIs dryland; Monte Cristo soil in range site NV 28–1 and NV 29–1, Desert Loamy; Playas not placed in a range site.

Nevoyer Series

The Nevoyer series consists of shallow, well drained soils that formed in colluvium derived from basaltic and rhyolitic rock. These soils are moderately steep and steep. They are on rolling, hilly uplands. Slopes range from 15 to 50 percent. The vegetation consists of black sagebrush, spiny hopsage, Sandberg bluegrass, Indian ricegrass, and needleandthread. Elevation ranges from 6,500 to 7,000 feet. Mean annual precipitation is 8 to 12 inches. Mean annual air temperature is 45° to 47° F, and the length of the frost-free season is 80 to 100 days.

In a representative profile the surface layer is light brownish gray very stony fine sandy loam over gravelly very fine sandy loam about 4 inches thick. The next layer is pale brown cobbly very fine sandy loam about 7 inches thick. Below this is a very pale brown hardpan about 7 inches thick. It rests on basalt bedrock at a depth of 18 inches.

Nevoyer soils have moderate permeability to the hardpan and very slow permeability through it. Effective rooting depth is about 11 inches. Available water capacity is very low. Runoff is rapid, and the hazard of erosion is moderate.

Nevoyer soils are mapped only in the Vinini-Nevoyer association (VN).

Representative profile of Nevoyer very stony fine sandy loam, in an area of the Vinini-Nevoyer association, about 10 miles north of Tonopah, on a north

slope, 520 feet east and 520 feet north of the southwest corner sec. 1, T. 4 N., R. 43 E.:

A11—0 to 1 inch; light brownish gray (10YR 6/2) very stony fine sandy loam, dark brown (10YR 4/3) moist; massive; soft, very friable, nonsticky, nonplastic; few very fine roots; many very fine vesicular and common very fine tubular pores; neutral; abrupt smooth boundary.

A12—1 to 4 inches; light brownish gray (10YR 6/2) gravelly very fine sandy loam, dark brown (10YR 4/3) moist; weak medium platy structure; soft, very friable, nonsticky, slightly plastic; many very fine roots; many very fine tubular pores; about 20 percent gravel; neutral; clear smooth boundary.

B2—4 to 11 inches; pale brown (10YR 6/3) cobbly very fine sandy loam, brown (10YR 4/3) moist; weak medium subangular blocky structure; soft, very friable, nonsticky, slightly plastic; many very fine and few fine and medium roots; common very fine tubular pores; about 30 percent cobbles; mildly alkaline; abrupt smooth boundary.

Csicam—11 to 18 inches; very pale brown (10YR 7/3) duripan, light yellowish brown (10YR 6/4) cap, and light gray (5Y 6/1) solution pits; platy with thick to very thick continuous laminae coating stones; extremely hard, extremely firm laminae, remainder very hard; many very fine, and few fine roots; violently effervescent; moderately alkaline; abrupt wavy boundary.

R—18 inches; basalt.

Thickness of the solum and depth to the hardpan range from 9 to 18 inches. The solum is noncalcareous. The B horizon is fine sandy loam, very fine sandy loam, or loam that contains 25 to 35 percent coarse fragments when mixed. It has weak, fine or medium, subangular blocky structure or is massive. Depth to the underlying tuff, rhyolite, or basalt bedrock ranges from 9 to 18 inches.

Noyson Series

The Noyson series consists of well drained soils that are moderately deep to a strongly cemented hardpan. They formed in alluvium derived mostly from rhyolite and basalt rock. These soils are nearly level. They are on broad, smooth alluvial fans. Slopes range from 0 to 2 percent. The vegetation consists of Bailey greasewood, shadscale, bud sagebrush, Anderson wolfberry, Indian ricegrass, and false-yarrow. Elevation ranges from 5,200 to 5,500 feet. Mean annual precipitation is 4 to 6 inches. Mean annual air temperature is 47° to 51° F, and the length of the frost-free season is 130 to 150 days.

In a representative profile the surface layer is light grayish brown sand over light gray sandy loam about 6 inches thick. Below this is a layer of light gray sandy loam about 4 inches thick. The next layer is very pale brown, discontinuously weakly cemented sandy loam about 11 inches thick. Below this is light gray stratified gravelly coarse sandy loam about 10 inches thick. A light gray, strongly cemented hardpan is at a depth of 31 inches. It extends to a depth of 46 inches or more.

Noyson soils have moderately rapid permeability above the hardpan and slow permeability through it. Effective rooting depth is about 31 inches. Available water capacity is low. Runoff is medium, and the hazard of erosion is slight.

Representative profile of Noyson sand, about 6 miles south of Cloverdale Ranch, about 100 feet south of the north quarter corner sec. 18, T. 7 N., R. 41 E.:

A11—0 to 2 inches; light grayish brown (10YR 6/2) sand, dark grayish brown (10YR 4/2) moist; single grained; many very fine interstitial pores; moderately alkaline; abrupt smooth boundary.

A12—2 to 6 inches; light gray (10YR 7/2) sandy loam, dark grayish brown (10YR 4/2) moist; massive; soft, very friable, nonsticky, nonplastic; few very fine roots; many very fine vesicular pores; strongly effervescent; strongly alkaline; abrupt wavy boundary.

C1—6 to 10 inches; light gray (10YR 7/2) sandy loam, brown (10YR 4/3) moist; weak very thin platy structure; slightly hard, very friable, slightly sticky, slightly plastic; common very fine and few medium roots; many very fine tubular pores; violently effervescent; strongly alkaline; abrupt smooth boundary.

C2sica—10 to 21 inches; very pale brown (10YR 7/3) discontinuous weakly cemented sandy loam, brown (10YR 4/3) moist; thin platy structure; hard, firm, nonsticky, nonplastic; many very fine and few medium roots matting between plates; very fine tubular pores; few fine distinct black (10YR 2/1) manganese mottles, white (10YR 8/1) and brownish yellow (10YR 6/6) lime and silica coatings on underside of plates; violently effervescent; strongly alkaline; abrupt wavy boundary.

C3ca—21 to 31 inches; light gray (10YR 7/2) stratified gravelly coarse sandy loam, gravelly loamy sand, gravelly sand, brown (10YR 4/3) moist; massive; hard, friable, nonsticky, nonplastic; common very fine tubular pores; matrix is noneffervescent but is violently effervescent in horizontal seams and coatings on underside of gravel; strongly alkaline; abrupt smooth boundary.

C4sicam—31 to 46 inches; light gray (10YR 7/2) strongly cemented lenticular duripan with lenses 2 to 5 millimeters thick, pale brown (10YR 6/3) moist; massive; hard and very hard, firm and extremely firm; root mats on pan faces; white (10YR 8/1) lime coatings on underside of pan fragments; violently effervescent; very strongly alkaline.

Depth to the Csica horizon ranges from 6 to 18 inches, and depth to the strongly cemented duripan ranges from 20 to 36 inches. The soil ranges from noneffervescent to violently effervescent, depending upon the stratification. Strata of sand, loamy sand, sandy loam, and sandy clay loam are in places. The average texture is sandy loam. Gravel content ranges to 30 percent in places.

No—Noyson sand. This nearly level soil is in small, irregularly shaped areas on broad, smooth, low alluvial fans. It has the profile described as representative of the series. Included in mapping, and making up about 5 percent of the acreage, are Bluewing soils and soils similar to Noyson soils.

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

This soil has very limited suitability for irrigated crops if irrigation water is made available. It is used mainly for range and wildlife habitat. Capability unit IVs–12 irrigated; capability subclass VIIs dryland; range site NV 28–2 and NV 29–2, Desert Loamy Sal.

Np—Noyson gravelly sandy loam. This nearly level soil is very small, irregurarly shaped areas on alluvial fans. It has a profile similar to the one described as representative of the series, but the surface layer is gravelly sandy loam about 4 inches thick. Included in mapping, and making up about 10 percent of the acreage, are Bluewing soils and other Noyson soils.

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

This soil has very limited suitability for irrigated crops if irrigation water is made available. It is used mainly for range and wildlife habitat. Capability unit IVs–12 irrigated, capability subclass VIIs dryland; range site NV 28–2 and NV 29–2, Desert Loamy Sal.

Nyserva Series

The Nyserva series consists of very deep, moderately well drained, saline-alkali affected soils that formed in alluvium and lacustrine material derived mainly from basaltic and rhyolitic rocks. These soils are nearly level. They are on smooth alluvial fans and lake terraces. Slopes range from 0 to 2 percent. The vegetation consists of black greasewood and suaeda. Elevation is about 5,600 feet. Mean annual precipitation is 4 to 6 inches. Mean annual air temperature is 47° to 50° F, and the length of the frost-free season is 100 to 130 days.

In a representative profile the surface layer is light gray to pale brown loam about 5 inches thick. The next layer is about 14 inches of pale brown to light gray clay loam. Below this is light gray stratified sand, very fine sand, and loam that extends to a depth of 60 inches or more.

Nyserva soils have moderately slow permeability. Effective rooting depth is about 60 inches. Available water capacity is high. A seasonal high water table is at a depth of 7 to 10 feet. Runoff is medium, and the hazard of erosion is slight.

Representative profile of Nyserva loam, about 3 miles south of the junction of North Umberland Road and an ungraded road that skirts the playa on the east side about 150 feet north of the ungraded road, approximately 2,400 feet east and 1,300 feet south of assumed northwest corner sec. 28, T. 14 N., R. 44 E.:

A1—0 to 2 inches; light gray (10YR 7/2) loam, brown (10YR 5/3) moist; massive; slightly hard, very friable, slightly sticky, slightly plastic; many very fine and few fine vesicular pores; violently effervescent; very strongly alkaline; abrupt smooth boundary.

B21t—2 to 5 inches; pale brown (10YR 6/3) loam, brown (10YR 5/3) moist; strong very fine granular structure; soft, very friable, slightly sticky, slightly plastic; many very fine interstitial pores; many thin clay films on faces of peds; violently effervescent; very strongly alkaline; abrupt smooth boundary.

B22t—5 to 7 inches; pale brown (10YR 6/3) clay loam, brown (10YR 4/3) moist; moderate medium prismatic structure; slightly hard, very friable, sticky, plastic; few very fine, fine, medium, and coarse roots; many very fine tubular pores; many very thin clay films coating sand grains; violently effervescent; very strongly alkaline; clear smooth boundary.

C1sica—7 to 19 inches; light gray (10YR 7/2) clay loam, very dark brown (10YR 4/2) moist; massive; slightly hard, very friable, sticky, plastic; few very fine, fine, medium, and coarse roots; few very fine tubular pores; many hard and firm durinodes about ½-inch in diameter and 1½ inches long; violently effervescent; very strongly alkaline; clear smooth boundary.

C2ca—19 to 60 inches; light gray (10YR 7/2) stratified sand, very fine sand, and loam, brown (10YR 4/3) moist; massive; slightly hard, very friable, nonsticky and slightly sticky, nonplastic; common very fine and few medium pores; violently effervescent; very strongly alkaline.

Thickness of the solum is 6 to 19 inches. The A horizon has soft or slightly hard consistence. The Bt horizon has average clay content of 20 to about 30 percent. The pH is greater than 9.0. The B2t horizon has moderate or strong, very fine or fine, granular structure and very fine, fine, or medium, prismatic structure. They are clay loam or loam. The Csica horizon has common or many hard and firm durinodes that are ¼ to ½ inch in diameter and ½ inch to 1½ inches long. It is clay loam, loam, or fine sandy loam. The Cca horizon is stratified sand, very fine sand, fine sandy loam, loam, or clay loam that is gravelly in some places, and strata range in thickness from about 2 to 18 inches. There are faint or distinct relief mottles in some places.

Ny—Nyserva-Tipperary complex. This complex is in small, narrow bands on undulating lake terraces and low alluvial fans that are slightly higher than the playas. Nyserva loam makes up about 60 percent of the complex, and Tipperary fine sand, 4 to 30 percent slopes, makes up about 30 percent. Included in mapping, and making up about 10 percent of the acreage, are Mazuma and Zaba soils.

The Nyserva soil has a profile similar to that described as representative for the series except it is strongly saline-alkali affected. The Tipperary soil has a profile similar to the one that is representative for the series. The nearly level Nyserva soil is on the smooth lake terraces. The Tipperary soil is small sand dunes, 20 to 60 inches high, superimposed upon the Nyserva soil.

Runoff is medium on the Nyserva soil and very low on the Tipperary soil. The hazard of erosion is slight on the Nyserva soil. The hazard of soil blowing on the Tipperary soil is high.

This complex is not suited to irrigated crops. It is used mainly for range and wildlife habitat. Capability subclass VIIw dryland; Nyserva soil in range site NV 28–3 and NV 29–3, Sodic Flat; Tipperary soil in range site NV 28–18 and NV 29–18, Desert Dune.

Old Camp Series

The Old Camp series consists of shallow, well drained soils that formed in residuum and colluvium derived from metavolcanics and loess. These soils are steep. They are on ridges, hills, and mountain slopes. Slopes range from 30 to 50 percent. The vegetation consists of black sagebrush, Sandberg bluegrass, Indian ricegrass, spiny hopsage, and needleandthread. Elevation ranges from 6,000 to 7,200 feet. Mean annual precipitation is 8 to 12 inches. Mean annual air temperature is 40° to 43° F, and the length of the frost-free season is 80 to 100 days.

In a representative profile the surface layer is light brownish gray very gravelly fine sandy loam over pale brown gravelly very fine sandy loam about 6 inches thick. Below this is about 4 inches of pale brown very gravelly loam. Fractured metavolcanic rock is at a depth of 10 inches.

Old Camp soils have moderate permeability. Effective rooting depth is about 10 inches. Available water capacity is very low. Runoff is rapid, and the hazard of erosion is moderate.

Representative profile of Old Camp very gravelly fine sandy loam, 30 to 50 percent slopes, about 8 miles north of Tonopah, on a north slope about 1 mile west of the northeast corner sec. 25, T. 4 N., R. 42 E.:

A1—0 to 3 inches; light brownish gray (10YR 6/2) very gravelly fine sandy loam, dark grayish brown (10YR 4/2) moist; massive; slightly hard, very friable, nonsticky, nonplastic; common very fine roots; many very fine vesicular pores; neutral; abrupt smooth boundary.

A3—3 to 6 inches; pale brown (10YR 6/3) gravelly very fine sandy loam, brown (10YR 4/3) moist; weak, fine and medium subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; many very fine roots; many very fine interstitial and few fine tubular pores; neutral; clear smooth boundary.

B2t—6 to 10 inches; pale brown (10YR 6/3) very gravelly loam, brown (10YR 4/3) moist; weak fine and medium subangular blocky structure; soft, very friable, slightly sticky, slightly plastic; many very fine and few fine roots; common very fine tubular pores; some pebbles have white (10YR 8/2) silica-lime coating the underside; neutral; abrupt wavy boundary.

R—10 to 17 inches; fractured metavolcanic rock with silica-lime coating cracks and surfaces of rock fragments.

Depth to bedrock ranges from 10 to 20 inches. The average texture is loam or clay loam and consists of 60 to 80 percent angular gravel. Lime and silica is present only as coatings on the rock fragments and in crevices. The A horizon is massive; has weak, thin and medium, platy structure; or has weak, fine or medium, subangular blocky structure. The B2t horizon is massive or has weak subangular blocky structure.

OA—Old Camp-Mina association. This association of steep soils is in small, long, narrow areas on hilly uplands and mountain slopes. Old Camp very gravelly fine sandy loam, 30 to 50 percent slopes, makes up about 50 percent of the association, and Mina extremely stony fine sandy loam, 30 to 50 percent slopes, makes up about 30 percent. Included in mapping, and making up about 20 percent of the acreage, are Dobel soils and rock outcrops.

The Old Camp soil has the profile described as representative of the series. The Mina soil has a profile similar to the one described as representative of the series. The Old Camp soil is steep and shallow. It is on the north-facing hills and mountain slopes. The Mina soil is steep and deep. It is on the south- and west-facing, hilly uplands.

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

The soils in this association are not suited to irrigated crops. They are used mainly for range and wildlife habitat. Capability subclass VIIs dryland; Old Camp soil in range site NV 29–12, Semidesert Shallow Loamy; Mina soil in range site NV 29–10, Semidesert Loamy Slope.

OB—Old Camp-Osobb association. This association of moderately sloping to steep soils is in large, irregularly shaped areas on hilly uplands and mountain slopes. Old Camp very gravelly fine sandy loam, 30 to 50 percent slopes, makes up about 50 percent of the association, and Osobb gravelly fine sandy loam, 4 to 30 percent slopes, makes up 30 percent. Included in mapping, and making up about 20 percent of the acreage, are Gabbs and Stumble soils and other Old Camp soils.

The Old Camp soil has a profile similar to the one described as representative of its series. The steep Old Camp soil is on the north-facing hills and mountains and is generally higher than the Osobb soil. The Osobb soil has a profile similar to the one described as representative of its series. It is on the lower slopes of rounded rolling low hills and pediments.

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

The soils in this association are not suited to irrigated crops. They are used mainly for range and wildlife habitat. Capability subclass VIIs dryland; Old Camp soil in range site NV 29–12, Semidesert Shallow Loamy; Osobb soil in range site NV 28–2 and NV 29–2, Desert Loamy Sal.

OC—Old Camp-Pintwater association. This association of moderately steep to steep soils is in medium sized, irregularly shaped areas on foothills, pediments, and mountain slopes. Old Camp very gravelly fine sandy loam, 30 to 50 percent slopes, makes up about 50 percent of the association, and Pintwater very cobbly fine sandy loam, 15 to 50 percent slopes, makes up 30 percent. Included in mapping, and making up about 20 percent of the acreage, are Tybo soils and rock outcrops.

The Old Camp soil has a profile similar to the one described as representative of the series. The Pintwater soil has the profile described as representative of the series. The steep Old Camp soil is on the north-facing hills and mountain slopes and is slightly higher than the Pintwater soil. The Pintwater soil is on the foothills and pediment slopes and is slightly below the Old Camp soil.

Runoff is rapid on the Old Camp soil and very rapid on the Pintwater soil. Both soils have a moderate hazard of erosion.

The soils in this association are not suited to irrigated crops. They are used mainly for range and wildlife habitat. Capability subclass VIIs dryland; Old Camp soil in range site NV 29–12, Semidesert Shallow Loamy; Pintwater soil in range site NV 29–14, Desert Stony Hill.

OD—Old Camp-Rock outcrop complex. This complex is in large, irregularly shaped areas on narrow, rounded ridges, hills, and mountainsides. Old Camp very gravelly fine sandy loam, 30 to 50 percent slopes, makes up about 40 percent of the complex; Rock outcrop makes up 30 percent; and Pintwater very cobbly fine sandy loam, 15 to 50 percent slopes, makes up 20 percent. Included in mapping, and making up about 10 percent of the acreage, are Gabbs soils and other soils.

The Old Camp soil has a profile similar to the one described as representative of its series. The steep Old Camp soil is on north-facing hills and mountain slopes. Rock outcrop is throughout the association. It consists of extremely steep cliffs, ridges, and peaks. The Pintwater soil is mainly on the south-facing hills and pediments and is slightly below the Old Camp soil.

Runoff is rapid on the Old Camp soil, and the hazard of erosion is moderate on all soils. Capability subclass VIIs dryland; Old Camp soil in range site NV

29–12, Semidesert Shallow Loamy; Rock outcrop not placed in a range site; Pintwater soil in range site NV 29–14, Desert Stony Hill.

Orizaba Series

The Orizaba series consists of very deep, somewhat poorly drained and poorly drained, saline-alkali affected soils that formed in mixed alluvium derived from many kinds of rock. These soils are nearly level. They are on smooth flood plains, lake terraces, and low alluvial fans. Slopes are 0 to 2 percent. The vegetation consists of rubber rabbitbrush, black greasewood, big sagebrush, saltgrass, Great Basin wildrye, and alkali sacaton. Elevation is about 5,600 feet. Mean annual precipitation is 4 to 6 inches. Mean annual air temperature is 45° to 47° F, and the length of the frost-free season is 100 to 130 days.

In a representative profile the surface layer is light gray loam about 3 inches thick. Below this is 14 inches of gray silty clay loam and 6 inches of gray sand. This is underlain by light gray stratified loam and silty clay loam that extends to a depth of 60 inches or more.

Orizaba soils have moderately slow permeability. Effective rooting depth is about 60 inches. Available water capacity is high. Runoff is slow, and the hazard of erosion is slight.

Representative profile of Orizaba loam, slightly saline-alkali, about 1.5 miles northeast of Big Smoky Valley Highway maintenance station; about 1,000 feet west of the east quarter corner sec. 21, T. 11 N., R. 43 E.:

A11—0 to 3 inches; light gray (10YR 7/2) loam, olive (5Y 4/3) moist; massive; slightly hard, very friable, slightly sticky, slightly plastic; few very fine and fine roots; many very fine vesicular pores and common very fine tubular pores; violently effervescent; very strongly alkaline; abrupt smooth boundary.

A12—3 to 9 inches; gray (10YR 2/1) silty clay loam, dark grayish brown (10YR 4/2) moist, black (10YR 2/1) coatings on fracture planes; massive; slightly hard, very friable, sticky, plastic; many very fine and few fine and medium roots; many very fine and few fine tubular pores; violently effervescent; very strongly alkaline; abrupt smooth boundary.

C1—9 to 17 inches; gray (5Y 6/1) silty clay loam, olive sticky, plastic; few micro roots; common very fine (5Y 4/3) moist; massive; hard, very friable, tubular pores; violently effervescent; very strongly alkaline; abrupt wavy boundary.

C2—17 to 23 inches; gray (10YR 6/1) sand, dark grayish brown (10YR 4/2) moist; massive; slightly hard, very friable, nonsticky, nonplastic; few very fine roots; few very fine tubular pores; strongly alkaline; clear smooth boundary.

C3—23 to 60 inches; light gray (10YR 7/2) stratified loam and silty clay loam, brown (10YR 5/3) moist; common large black (10YR 2/1) mottles, moist; massive; slightly hard, very friable, sticky, plastic; few very fine roots; very few fine tubular pores; common white (10YR 8/1) lime coatings on pores; violently effervescent; strongly alkaline.

The soil is dominantly massive but has weak or moderate, fine or medium, subangular or platy structure in some places. It is dominantly silty clay loam or clay loam and has thin strata of loam, sandy loam, or sand. Reaction ranges from moderate to very strongly alkaline. There are a few or common segregated seams of filaments and concretions of lime in some places. In some places a few hard nodules are within 24 inches of the surface.

Oe—Orizaba loam, drained. This nearly level soil is in small, irregularly shaped areas on lake terraces and low alluvial fans. It has a profile similar to the one described as representative of the series, but it has been drained by local faulting and it is not saline-alkali affected. Included in mapping, and making up about 10 percent of the acreage, is a similar soil that is strongly saline-alkali affected.

Runoff is slow, and the hazard of erosion is slight. A seasonal water table is below a depth of 5.0 feet.

This soil is suited to irrigated crops if irrigation water is made available. It is used mainly for range and wildlife habitat. Capability unit IIw–60 irrigated, capability subclass VIw dryland; range site NV 28–4, Saline Bottom.

Of—Orizaba loam, slightly saline-alkali. This nearly level soil is in medium sized, irregularly shaped areas on smooth flood plains. It has the profile described as representative of the series. Included in mapping, and making up about 10 percent of the acreage, is a similar soil that is strongly saline-alkali affected.

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

This soil is suited to irrigated crops. It is used mainly for range and wildlife habitat. Capability unit IVw–61 irrigated, capability subclass VIw dryland; range site NV 28–4, Saline Bottom.

Og—Orizaba loam, strongly saline-alkali. This nearly level soil is in medium sized, irregularly shaped areas on smooth flood plains and lake terraces. It has a profile similar to the one described as representative of the series, but it is strongly saline-alkali affected. Included in mapping, and making up about 5 percent of the acreage, is a similar soil that has a surface of hummocky sand.

Runoff is slow, and the hazard of erosion is slight. A seasonal high water table is at a depth of 3 to 5 feet. The soil is subject to occasional flooding.

This soil is not suited to irrigated crops. It is used mainly for range and wildlife habitat. Capability subclass VIIw dryland; range site NV 28–13, Saline Meadow.

Oh—Orizaba loam, wet, slightly saline-alkali. This nearly level soil is in small, irregularly shaped areas on smooth flood plains and lake terraces. It has a profile similar to the one described as representative of the series, but it has a water table nearer the surface. Included in mapping, and making up about 10 percent of the acreage, is a similar soil that has a clay loam surface layer.

Runoff is slow, and the hazard of erosion is slight. A seasonal high water table is at a depth of 2.5 to 3.0 feet. This soil is subject to occasional flooding.

This soil is not suited to irrigated crops. It is used mainly for range and wildlife habitat. Capability subclass VIw dryland; range site NV 28–9, Wet Meadow.

Orovada Series

The Orovada series consists of very deep, well drained soils that formed in alluvium derived mainly from volcanic rocks. These soils are nearly level to gently sloping. They are on smooth alluvial fans and aprons. Slopes range from 0 to 4 percent. The vegetation consists of big sagebrush, black greasewood, and Indian ricegrass. Elevation ranges from 5,500 to 6,200 feet. Mean annual precipitation is 4 to 6 inches. Mean annual air temperature is 45° to 47° F, and the length of the frost-free season is 100 to 130 days.

In a representative profile the surface layer is light brownish gray gravelly fine sandy loam about 6 inches thick. The next layer is light brownish gray fine sandy loam about 15 inches thick. Below this is light gray very fine sandy loam that extends to a depth of 60 inches or more.

Orovada soils have moderate permeability. Effective rooting depth is about 60 inches. Available water capacity is moderate to high. Runoff is medium, and the hazard of erosion is slight to moderate.

Representative profile of Orovada gravelly fine sandy loam, 2 to 4 percent slopes, about 1¼ miles south of the highway maintenance station and south of a dirt road leading to Broad Canyon, about 2,400 feet west and 2,600 feet north of the southeast corner sec. 32, T. 11 N., R. 43 E.:

A1—0 to 6 inches; light brownish gray (10YR 6/2) gravelly fine sandy loam, dark grayish brown (10YR 4/2) moist; massive; soft, very friable, nonsticky, nonplastic; common very fine roots; many very fine interstitial and common very fine tubular pores; mildly alkaline; clear smooth boundary.

B2—6 to 15 inches; light brownish gray (10YR 6/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; massive; soft, very friable, nonsticky, nonplastic; common very fine and medium roots; many very fine and few very fine tubular pores; moderately alkaline; clear wavy boundary.

C1sica—15 to 21 inches; light brownish gray (10YR 6/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; massive; soft, very friable, nonsticky, nonplastic; common very fine roots; common very fine tubular pores; gravel has white (10YR 8/1) lime and very pale brown (10YR 7/3) silica coatings on the underside; violently effervescent; moderately alkaline; abrupt wavy boundary.

C2sica—21 to 60 inches; light gray (10YR 7/2) very fine sandy loam, dark grayish brown (10YR 4/2) moist; massive; soft, very friable, nonsticky, nonplastic; common very fine roots; common very fine tubular pores; about 20 percent slightly hard and firm durinodes; violently effervescent; moderately alkaline.

In places as much as 60 percent of the surface is covered by fine gravel. The thickness of the solum ranges from 12 to 24 inches. The solum is noneffervescent. The texture between depths of 10 and 40 inches is stratified fine sandy loam or light loam or very fine sandy loam. Gravel content ranges from 10 to 30 percent throughout the profile; in places 40 to 65 percent of the lower part of the profile is gravel. The A1 horizon is 4 to 10 inches thick. It is single grained or massive or has weak, thin or medium, platy structure. The B2 horizon is massive or has weak or moderate, medium, subangular blocky structure. The durinodes in the C2sica horizon range from 20 to about 40 percent.

OmA—Orovada very gravelly loamy sand, 0 to 2 percent slopes. This nearly level soil is in small, narrow areas adjacent to stream channels on smooth alluvial fans. It has a profile similar to the one described as representative of the series, but the surface layer is very gravelly loamy sand about 12 inches thick. Included in mapping, and making up about 10 percent of the acreage, is a similar soil that has a loam surface layer.

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

This soil is suited to irrigated crops if irrigation water is made available. It is used mainly for range and wildlife habitat. Small areas are planted to alfalfa. Capability unit IIIs–43 irrigated, capability subclass VIIs dryland; range site NV 29–6, Loamy Bottom.

OnA—Orovada fine sandy loam, 0 to 2 percent slopes. This nearly level soil is in medium sized, irregularly shaped areas on smooth alluvial fans and aprons that are slightly raised above the flood plain. It has a profile similar to the one described as representative of the series, but the surface layer is nongravelly. Included in mapping, and making up about 10 percent of the acreage, are other Orovada soils.

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

This soil is suited to irrigated crops if irrigation water is made available. It is used mainly for range and wildlife habitat. Capability unit IIc–1 irrigated, capability subclass VIIc dryland; range site NV 29–6, Loamy Bottom.

OpB—Orovada gravelly fine sandy loam, 2 to 4 percent slopes. This gently sloping soil is in medium sized, irregularly shaped areas on low alluvial fans and aprons. It has the profile described as representative of the series. Included in mapping, and making up about 10 percent of the acreage, is a similar soil that has a very gravelly loam surface layer.

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

This soil is suited to irrigated crops. It is planted to alfalfa where irrigation water has been made available. It is used mainly for range and wildlife habitat. Capability unit IIe–20 irrigated, capability subclass VIIc dryland; range site NV 29–6, Loamy Bottom.

Orphant Series

The Orphant series consists of well drained soils that are shallow to a strongly cemented hardpan. These soils formed in alluvium derived from basaltic rocks. They are nearly level to moderately sloping. They are on alluvial fans. Slopes range from 0 to 8 percent. The vegetation consists of Bailey greasewood, shadscale, bud sagebrush, galleta, littleleaf horsebrush, kochia, and ephedra. Elevation ranges from 5,500 to 6,200 feet. Mean annual precipitation is 5 to 8 inches. Mean annual air temperature is 45° to 48° F, and the length of the frost-free season is 100 to 130 days.

In a representative profile the surface layer is light brownish gray very gravelly fine sand over light gray fine sandy loam about 4 inches thick. Below this is yellowish brown and pale brown loam about 11 inches thick. A strong brown, strongly cemented hardpan is at a depth of 15 inches. It is about 7 inches thick.

Below the hardpan is light yellowish brown loamy sand about 19 inches thick. It is underlain by a pale brown, strongly cemented hardpan that extends to a depth of 60 inches or more.

Orphant soils have moderate permeability to the hardpan and slow permeability through it. Effective rooting depth is about 15 inches. Available water capacity is very low. Runoff is medium, and the hazard of erosion is slight.

Representative profile of Orphant very gravelly fine sandy loam, in an area of Orphant-Bluewing association, about 4.5 miles south of the San Antonio Ranch, about 1,500 feet south of the northwest corner sec. 2, T. 6 N., R. 42 E.:

A1—0 to 1 inch; light brownish gray (10YR 6/2) very gravelly fine sand, dark grayish brown (10YR 4/2) moist; single grained; loose; few very fine and fine roots; many very fine interstitial pores; neutral; clear smooth boundary.

A2—1 to 4 inches; light gray (10YR 7/1) fine sandy loam, dark grayish brown (10YR 4/2) moist; massive; slightly hard, very friable, nonsticky, nonplastic; common very fine and few fine and medium roots; many very fine and fine and common medium and coarse vesicular pores; mildly alkaline; abrupt smooth boundary.

B2t—4 to 8 inches; yellowish brown (10YR 5/4) loam, dark yellowish brown (10YR 4/4) moist; weak coarse prismatic structure parting to moderate thin and medium platy; slightly hard, friable, slightly sticky, slightly plastic; many very fine, common fine, and few medium roots; many very fine interstitial and common very fine and fine tubular pores; common thin clay films on ped faces and many thin clay films in pores; many bleached light gray (10YR 7/2) sand grains in upper 1 to 1½ inches; moderately alkaline; clear wavy boundary.

B3sica—8 to 15 inches; pale brown (10YR 6/3) loam, brown (10YR 4/3) moist; massive; hard and very hard, firm and very firm, slightly sticky, slightly plastic; common very fine and fine roots; few very fine tubular and common very fine interstitial pores; common thin dark yellowish brown (10YR 4/4) clay films bridging sand grains; many medium and coarse prominent white (10YR 8/1) lime seams, few weakly cemented discontinuous very thin silica laminae, and common thin silica bridging; noncalcareous matrix, violently effervescent in seams; very strongly alkaline; clear wavy boundary.

C1sicam—15 to 22 inches; strong brown (7.5YR 5/6) strongly cemented duripan consisting of many thin (less than 3 mm thick) very pale brown (10YR 7/4) and white (10YR 8/1) continuous laminae mostly horizontal but some vertical and diagonal with weakly cemented material between the laminae; dark brown (7.5YR 4/4) moist; moderate thin and medium platy structure; very hard and extremely hard, very firm and extremely firm; few very fine roots and some root mats on laminae; common very fine interstitial pores; strongly effervescent but violently effervescent in seams; very strongly alkaline; clear wavy boundary.

C2sica—22 to 41 inches, light yellowish brown (10YR 6/4) loamy sand, dark yellowish brown (10YR 4/4) moist; massive; hard and very hard, firm and very firm; slightly sticky, slightly plastic; few very fine roots; many very fine interstitial and common very fine and fine tubular pores; many medium and fine and few coarse and very coarse white (10YR 8/1) soft lime masses and common thin discontinuous silica laminae and bridging in pockets; strongly and violently effervescent; strongly alkaline; gradual wavy boundary.

C3sicam—41 to 60 inches, pale brown (10YR 6/3) strongly cemented duripan with many very thin continuous silica laminae and very thin silica bridging, dark brown (10YR 3/3) moist; massive; extremely hard, very firm; common very fine interstitial pores; effervescent to violently effervescent; moderately alkaline.

The thickness of the solum and the depth to the top of the upper hardpan range from 10 to 19 inches. The matrix of the solum is noncalcareous but in places is calcareous in the lower part. Reaction ranges from neutral to mildly alkaline in the A1 horizon and from moderately alkaline to very strongly alkaline in the B2t horizon. The A1 horizon has vesicular pores in places. It has a moderate to strong gravel pavement that has a desert varnish in places. The A1 horizon is fine sand or fine sandy loam that is cobbly, very gravelly, or stony. The B horizon is fine sandy loam, loam, or sandy clay loam modified by as much as 30 percent cobbles and gravel. The B2t horizon has weak or moderate, coarse or very coarse, prismatic structure that parts readily to moderate, very thin or medium, platy or very fine or medium subangular blocky structure. The Csica horizon is gravelly sand or loamy sand. It contains less than 50 percent gravel. The upper part of the C horizon contains common to many, thin or very thin (1 to 3 millimeters thick) continuous strongly silica-lime cemented laminae that are generally oriented to the horizon, but a few are vertical or diagonal.

OR—Orphant fine sand. This nearly level soil is in medium sized, irregularly shaped areas on smooth alluvial fans. It has a profile similar to the one described as representative of the series, but the surface layer is fine sand about 2 inches thick. Included in mapping, and making up about 10 percent of the acreage, are Timper and Bluewing soils.

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

This soil is not suited to irrigated crops. It is used mainly for range and wildlife habitat. Capability subclass VIIs dryland; range site NV 28–2 and NV 29–2, Desert Loamy Sal.

OS—Orphant-Bluewing association. This association of nearly level to moderately sloping soils is in medium sized, irregularly shaped areas on alluvial fans that are dissected by many narrow, dry stream channels that have been incised 2 to 5 feet deep. Orphant very gravelly fine sandy loam, 2 to 8 percent slopes, makes up about 70 percent of the association, and Bluewing stony loamy coarse sand, 0 to 8 percent slopes, makes up about 20 percent. Included in mapping, and making up about 10 percent of the acreage, are Broe, Dobel, and Stumble soils, and some Bluewing soils that are subject to occasional flooding.

The Orphant soil has the profile described as representative of the Orphant series. It is shallow and is on the convex tops of the alluvial fans. The Bluewing soil has a profile similar to the one described as representative of the Bluewing series, but it has a surface layer of stony loamy coarse sand. It is deep and is in the many dry washes that have been cut into the fans. It is subject to occasional flooding.

Runoff is medium on the Orphant soil and slow on the Bluewing soil. On both soils the hazard of erosion is slight.

This association is not suited to irrigated crops. It is used mainly for range and wildlife habitat. Capability subclass VIIs dryland; range site NV 28–2 and NV 29–2, Desert Loamy Sal.

Osobb Series

The Osobb series consists of shallow, well drained soils that formed in residuum weathered from volcanic materials, mostly tuffs and rhyolite. These soils are moderately sloping to moderately steep. They are on rolling uplands, pediments, and hills. Slopes range from 4 to 30 percent. The vegetation consists of Bailey greasewood, shadscale, bud sagebrush, spiny hopsage, ephedra, and galleta. Elevation ranges from 6,000 to 7,000 feet. Mean annual precipitation is 4 to 6 inches. Mean annual air temperature is 45° to 47° F, and the length of the frost-free season is 100 to 120 days.

In a representative profile the surface layer is light brownish gray gravelly fine sandy loam about 2 inches thick. The next layer is about 2 inches of light gray gravelly clay loam. Below this is pale brown very gravelly loam about 4 inches thick. A very pale brown indurated hardpan is at a depth of 8 inches. It is about 2 inches thick. It rests on metavolcanic bedrock that is at a depth of 10 inches.

Osobb soils have moderate permeability above the hardpan and very slow permeability through it. Effective rooting depth is about 8 inches. Available water capacity is very low. Runoff is rapid, and the hazard of erosion is moderate.

Representative profile of Osobb gravelly fine sandy loam, in an area of Osobb-Gabbs association, about 5 miles north of Tonopah, on a south slope about 2,100 feet south and 1,000 feet west of the northeast corner sec. 11, T. 3 N., R. 42 E.:

A1—0 to 2 inches; light brownish gray (10YR 6/2) gravelly fine sandy loam, dark grayish brown (10YR 4/2) moist; massive; slightly hard, very friable, nonsticky, nonplastic; few very fine roots; many very fine and fine and few medium vesicular pores; about 45 percent gravel; violently effervescent; moderately alkaline; abrupt smooth boundary.

C1—2 to 4 inches; light gray (10YR 7/2) gravelly clay loam, brown (10YR 4/3) moist; massive; hard, friable, sticky, plastic; few fine and medium and common very fine roots; common very fine and fine vesicular and many very fine and fine interstitial pores; few thin clay films bridging sand grains; about 45 percent gravel; violently effervescent; moderately alkaline; abrupt smooth boundary.

C2—4 to 8 inches; pale brown (10YR 6/3) very gravelly loam, brown (10YR 4/3) moist; massive; soft, very friable, slightly sticky, slightly plastic; few medium, common fine, and many very fine roots; many very fine and fine interstitial pores; about 70 percent gravel that has very pale brown (10YR 7/3 and 8/3) silica and lime coatings; violently effervescent; moderately alkaline; abrupt smooth boundary.

C3sicam—8 to 10 inches; very pale brown (10YR 7/3) indurated duripan, pale brown (10YR 6/3) moist; massive; extremely hard, extremely firm; root mats on surface of duripan; few very fine interstitial pores; violently effervescent; strongly alkaline; very abrupt irregular boundary.

R—10 inches; metavolcanic bedrock.

Depth to hardpan ranges from 8 to 16 inches and depth to bedrock ranges from 10 to 18 inches. Effervescence is slight to violent. The soil is sandy loam, fine sandy loam, or loam and has 55 to 80 percent coarse fragments. It contains from 30 to 75 percent gravel, as much as 15 percent cobbles, and as much as 15 percent stones. The surface has gravelly loamy fine sand hummocks 1 to 7 inches high surrounding some plants. The hummocks range from noneffervescent to strongly effervescent. The A1 horizon is massive or has weak thin platy structure. The C horizon is massive.

OT—Osobb-Gabbs association. This association is in medium sized, irregularly shaped areas on rounded and rolling pediments, hills, and mountain slopes. Osobb gravelly fine sandy loam, 4 to 30 percent slopes, makes up about 40 percent of the association, and Gabbs very cobbly very fine sandy loam, 30 to 50 percent slopes, makes up 30 percent. Included in mapping, and making up about 30 percent of the acreage, are Old Camp soils and Rock outcrop.

The Osobb soil has the profile described as representative of the Osobb series. It is shallow and is on the hilly uplands. The Gabbs soil has a profile similar to the one described as representative of the Gabbs series, but it has a surface layer of very cobbly very fine sandy loam. It is moderately deep and is on hilly and steep mountain slopes.

Runoff is rapid on the Osobb soil and medium on the Gabbs soil. The hazard of erosion is moderate on the Osobb soil and slight on the Gabbs soil.

This association is not suited to irrigated crops. It is used mainly for range and wildlife habitat. Capability subclass VIIs dryland; Osobb soil in range site NV 28–2 and NV 29–2, Desert Loamy Sal; Gabbs soil in range site NV 29–14, Desert Stony Hill.

Parran Series

The Parran series consists of very deep, somewhat poorly drained and poorly drained, saline-alkali affected soils that formed in lacustrine sediments derived from mixed rock sources. These soils are nearly level. They are on smooth, low lake terraces and small basins. Slopes are 0 to 2 percent. The vegetation consists of black greasewood and saltgrass. Elevation is about 5,600 feet. Mean annual precipitation is 4 to 6 inches. Mean annual temperature is 45° to 47° F, and the length of the frost-free season is 100 to 130 days.

In a representative profile the surface layer is light gray silty clay loam about 5 inches thick. Below this is light gray clay that extends to a depth of 60 inches or more.

Parran soils have very slow permeability. Effective rooting depth is about 60 inches. Available water capacity is high. Runoff is very slow or ponded, and the hazard of erosion is slight.

Representative profile of Parran silty clay loam, about 5.5 miles south of the junction of the Nye-Lander County line and State Route 8A, approximately 1,050 feet south of the northeast corner sec. 7, T. 14 N., R. 44 E.:

C1sa—0 to ½ inch; light gray (2.5Y 7/2) silty clay loam, grayish brown (2.5Y 5/2) moist; massive; slightly hard, very friable, sticky, plastic; few medium roots; many very fine and fine vesicular pores; violently effervescent; very strongly alkaline; abrupt wavy boundary.

C2sa—½ to 5 inches; light gray (2.5Y 7/2) silty clay loam, light olive brown (2.5Y 5/4) moist; massive parting to strong very fine granular structure; soft, very friable, sticky, plastic; few medium roots; many very fine interstitial and few very fine tubular pores; violently effervescent; very strongly alkaline; clear smooth boundary.

C3sa—5 to 28 inches; light gray (2.5Y 7/2) clay, light olive brown (2.5Y 5/4) moist; massive; slightly hard, very friable, very sticky, very plastic; few coarse, fine, and very fine roots; many very fine, medium, and very fine tubular pores; violently effervescent; very strongly alkaline; gradual smooth boundary.

C4—28 to 60 inches; light gray (2.5Y 7/2) clay, light olive brown (2.5Y 5/4) moist; massive parting to weak very thin platy structure; hard, very friable, very sticky, plastic; many very fine and medium tubular pores; violently effervescent; very strongly alkaline.

Parran soils are clay, silty clay, or silty clay loam and contain 35 to 55 percent clay. They are saturated above a depth of 40 inches during most of the year. The C1 and C2 horizons generally part to granular or weak, fine or medium, angular or subangular blocky structure.

PA—Parran silty clay loam. This nearly level soil is in medium sized, irregularly shaped areas on low lake terraces and basins. The lake terraces are 2 to 7 feet above the basins and have channels incised 1 to 5 feet deep. This soil has the profile described as representative of the series. Included in mapping, and making up about 10 percent of the acreage, are Umberland soils and small silt dunes 1 to 3 feet high.

Runoff is very slow, and the hazard of erosion is slight. A seasonal high water table is at a depth of 5 to 7 feet. This soil is strongly saline-alkali affected.

This soil is not suited to irrigated crops. It is used mainly for limited range and wildlife habitat. Capability subclass VIIw dryland; range site NV 28–3 and NV 29–3, Sodic Flat.

Penelas Variant

The Penelas variant consists of shallow, well drained soils that formed in shaly colluvium derived from interbedded micaceous shale, limestone, and quartzite. These soils are moderately steep to steep. They are on foothills and mountain slopes. Slopes range from 15 to 50 percent. The vegetation consists of black sagebrush, Sandberg bluegrass, Indian ricegrass, squirreltail, ephedra, and scattered pinyon and juniper trees. Elevation ranges from 6,500 to 7,500 feet. Mean annual precipitation is 12 to 16 inches. Mean annual air temperature is 40° to 43° F, and the length of the frost-free season is 80 to 100 days.

In a representative profile the soil is light brownish gray and grayish brown very cobbly loam and very shaly loam about 17 inches thick. Below is a white indurated hardpan about 1 inch thick that rests on shale bedrock at a depth of 18 inches.

Penelas variant soils have moderate permeability to the hardpan and slow permeability through it. Effective rooting depth is about 17 inches. Available water capacity is very low. Runoff is rapid, and the hazard of erosion is moderate.

Representative profile of Penelas very cobbly loam, dark surface variant, 15 to 50 percent slopes, in an area of Penelas association about 3 miles southwest of Manhattan, about 1,000 feet east of the southwest corner sec. 24, T. 8 N., R. 43 E.:

A11—0 to 1 inch; light brownish gray (10YR 6/2) very cobbly loam, very dark grayish brown (10YR 3/2) moist; massive; soft, very friable, nonsticky, slightly plastic; many very fine and few fine roots; common very fine and fine vesicular and tubular pores; 25 percent cobbles and 15 percent gravel; mildly alkaline; abrupt wavy boundary.

A12—1 to 3 inches; grayish brown (10YR 5/2) very shaly loam, very dark grayish brown (10YR 3/2) moist; massive; soft, very friable, slightly sticky, slightly plastic; many very fine and fine roots; common very fine and fine vesicular and tubular pores; mildly alkaline; abrupt wavy boundary.

A13—3 to 9 inches; grayish brown (10YR 5/2) very shaly loam, dark brown (10YR 3/3) moist; massive; soft, very friable, slightly sticky, slightly plastic; common very fine and fine and few medium roots; common very fine tubular pores; mildly alkaline; abrupt wavy boundary.

C1ca—9 to 17 inches; light brownish gray (10YR 6/2) very shaly loam, dark brown (10YR 3/3) moist; massive; soft, very friable, nonsticky, nonplastic; common very fine and fine and few medium roots; many very fine interstitial pores; violently effervescent; strongly alkaline; abrupt wavy boundary.

C2sicam—17 to 18 inches; white (10YR 8/1) indurated duripan, light gray (10YR 7/2) moist; massive; extremely hard, extremely firm; silica laminae 1 to 2 millimeters thick; violently effervescent; strongly alkaline; abrupt smooth boundary.

R—18 inches, shale.

Depth to the duripan capping the bedrock ranges from 12 to 20 inches. Thickness of the duripan ranges from ½ inch to about 2 inches. The A horizon is 7 to 11 inches thick and is loam or very fine sandy loam. The C horizon is loam or very fine sandy loam and has 40 to 70 percent coarse shale fragments that are dominantly cobble and gravel size. Stones are in the C horizon in some places.

PD—Penelas association. This association of strongly sloping to steep soils is in very small areas on foothills and mountains slopes. Penelas very cobbly loam, dark surface variant, 15 to 50 percent slopes, makes up about 50 percent of the association, and Penelas very shaly loam, 8 to 30 percent slopes, makes up 30 percent. Included in mapping, and making up about 20 percent of the acreage, are a shallow soil and outcrops of shale, slate, limestone, and quartz.

These soils have the profiles described as representative of the Penelas variant and the Penelas series. The Penelas variant is shallow and is on the steeper and higher parts of the foothills and mountain slopes. Penelas very shaly loam, 8 to 30 percent slopes, is on the lower and flatter slopes of the foothills and pediments.

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

This association is not suited to irrigated crops. It is used mainly for range and wildlife habitat. Capability subclass VIIs dryland; Penelas very cobbly loam, dark surface variant, 15 to 50 percent slopes, in range site NV 28–7 and NV 29–7, Upland Juniper Slope; Penelas very shaly loam, 8 to 30 percent slopes, in range site NV 29–13, Semidesert Shallow Loamy.

Penelas Series

The Penelas series consists of very shallow and shallow, well drained soils that formed in colluvium derived from highly micaecous shale. These soils are gently sloping to moderately steep. They are on rounded pediments, foothills, and hills. Slopes range from 2 to 30 percent. The vegetation consists of shadscale, ephedra, galleta, Indian ricegrass, and scattered

juniper trees. Elevation ranges from 6,000 to 7,000 feet. Mean annual precipitation is 8 to 12 inches. Mean annual air temperature is 43° to 45° F, and the length of the frost-free season is 100 to 115 days.

In a representative profile the surface layer is pale brown very shaly loam about 2 inches thick. The next layer is very pale brown very shaly silty clay loam about 3 inches thick. Gray platy soft shale is at a depth of 5 inches.

Penelas soils have moderately slow permeability. Effective rooting depth varies from 5 to 14 inches. Available water capacity is very low. Runoff is rapid, and the hazard of erosion is moderate.

Representative profile of Penelas very shaly loam, 8 to 30 percent slopes, about 5 miles west-southwest of Manhattan, on a west-facing slope about 750 feet east of the west quarter corner sec. 28, T. 8 N., R. 43 E.:

A1—0 to 2 inches; pale brown (10YR 6/3) very shaly loam, brown (10YR 4/3) moist; weak very thin platy structure; slightly hard, very friable, slightly sticky, slightly plastic; many very fine vesicular and few very fine and fine tubular pores; moderately alkaline; abrupt smooth boundary.

B2t—2 to 5 inches; very pale brown (10YR 7/3) very shaly silty clay loam, brown (10YR 4/3) moist; strong very fine and fine angular and subangular blocky structure; slightly hard, very friable, very sticky, very plastic; many very fine, common fine, and few medium roots; many very fine interstitial pores; common thin clay films bridging and coating sand grains; mildly alkaline; abrupt irregular boundary.

Cr—5 to 10 inches; gray (N 5/0) platy soft shale; nearly continuous pale brown (10YR 6/3) clay films lining fracture faces, brown (10YR 4/3) moist; few fine distinct dark brown (2.5YR 3/2) and light yellowish brown (2.5Y 6/4) organic stains and mottles on fracture faces.

Depth to shale ranges from 5 to 14 inches. The soils are generally noncalcareous but in places are slightly effervescent in the A1 horizon and in coatings on shale fragments. Reaction ranges from mildly alkaline to strongly alkaline. The A1 horizon is massive or has moderate, very thin or medium, platy structure. Consistence is soft or slightly hard. Thin flat fragments of shale range from 60 to 75 percent throughout the A1 horizon. The B2t horizon is massive or has moderate or strong, very fine to medium, angular or subangular blocky or granular structure and contains 60 to 80 percent shale fragments. Consistence is soft or slightly hard and sticky to very sticky. The shale is generally platy or is massive.

PE—Penelas-Kyler association. This association of strongly sloping to steep soils is in small, irregularly shaped areas on hills and mountain slopes. Penelas very shaly loam, 8 to 30 percent slopes, makes up about 50 percent of the association, and Kyler very gravelly very fine sandy loam, 30 to 50 percent slopes, makes up 30 percent. Included in mapping, and making up about 20 percent of the acreage, are other soils and outcrops of shale, slate, limestone, and quartz.

The Penelas soil has a profile similar to the one described as representative of its series. The Penelas soil is shallow and is on slightly lower positions of the foothills. The Kyler soil has a profile similar to the one described as representative of its series. It is very shallow and is on upper and steeper parts of the foothills and mountain slopes.

Runoff is rapid. The hazard of erosion is moderate on the Penelas soil and high on the Kyler soil.

This association is not suited to irrigated crops. It is used mainly for range and wildlife habitat. Capability subclass VIIs dryland; range site NV 29–12, Semidesert Shallow Loamy.

PF—Penelas-Laxal association. This association of nearly level to moderately sloping soils is in small, narrow bands between the coalescing alluvial fans and the foothills. Penelas gravelly loam, 2 to 8 percent slopes, makes up about 60 percent of the association, and Laxal gravelly loam, 2 to 4 percent slopes, makes up 30 percent. Included in mapping, and making up about 10 percent of the acreage, is a soil that is very deep and that has a very gravelly, moderately fine textured surface layer.

The Penelas soil has a profile similar to the one described as representative of the Penelas series, but the surface layer is gravelly loam. It is shallow and is on the rolling pediments and foothills. The Laxal soil has a profile similar to the one described as representative of the Laxal series. It is very deep and is on the smooth, low-lying alluvial fans.

Runoff on the Penelas soil is rapid, and on the Laxal soil it is medium. The hazard of erosion is moderate.

This association is not suited to irrigated crops. It is used mainly for range and wildlife habitat. Capability subclass VIIs dryland; Penelas soil in range site NV 28–2 and NV 29–2, Desert Loamy Sal; Laxal soil in range site NV 28–1 and NV 29–1, Desert Loamy.

PG—Penelas-Rock outcrop complex. This complex of strongly sloping to moderately steep soils is in small, irregularly shaped areas on rounded and rolling uplands. Penelas very shaly loam, 8 to 30 percent slopes, makes up about 70 percent of the complex, and Rock outcrop makes up 20 percent. Included in mapping, and making up about 10 percent of the acreage, are Kyler and Pintwater soils.

The Penelas soil has a profile similar to the one described as representative of the Penelas series. It is shallow and is on the slopes of the rounded and rolling uplands. Rock outcrop is shale, limestone, slate, and quartzite. It is on the ridgetops and in the draws, or makes small islands slightly raised above the Penelas soil.

Runoff is rapid, and the hazard of erosion is moderate on the Penelas soil.

This complex is not suited to irrigated crops. It is used mainly for range and wildlife habitat. Capability subclass VIIs dryland; Penelas soil in range site NV 29–12, Semidesert Shallow Loamy; Rock outcrop not placed in a range site.

Pintwater Series

The Pintwater series consists of shallow, well drained soils that formed in colluvium derived from rhyolitic rock. These soils are gently sloping to steep. They are on foothills and mountain slopes. Slopes range from 2 to 50 percent. The vegetation consists of black sagebrush, ephedra, Indian ricegrass, squirreltail, galleta, bud sagebrush, and, in a few places, spiny

menodora. Elevation ranges from 5,500 to 7,000 feet. Mean annual precipitation is 6 to 10 inches. Mean annual air temperature is 43° to 47° F, and the length of the frost-free season is 100 to 120 days.

In a representative profile the surface layer is light brownish gray very cobbly fine sandy loam about 1 inch thick. Below this is 13 inches of light gray and very pale brown very gravelly fine sandy loam and 3 inches of pale brown very cobbly fine sandy loam. Rhyolitic bedrock is at a depth of 17 inches.

Pintwater soils have moderately rapid permeability. Effective rooting depth is about 17 inches. Available water capacity is very low. Runoff is rapid or very rapid, and the hazard of erosion is moderate.

Representative profile of Pintwater very cobbly fine sandy loam, 15 to 50 percent slopes, on a south slope of Mount Oddie near the boundary of Tonopah, 2,600 feet north of the southwest corner sec. 36, T. 3 N., R. 42 E.:

A11—0 to 1 inch; lightly brownish gray (10YR 6/2) very cobbly fine sandy loam, dark grayish brown (10YR 4/2) moist; massive; slightly hard, very friable, nonsticky, nonplastic; few very fine roots; many very fine and fine tubular pores; 50 percent cobbles; violently effervescent; strongly alkaline; abrupt smooth boundary.

A12—1 to 3 inches; light gray (10YR 7/2) very gravelly fine sandy loam, brown (10YR 4/3) moist; weak medium granular structure; loose, very friable, nonsticky, nonplastic; few very fine roots; many very fine tubular and many very fine interstitial pores; violently effervescent; strongly alkaline; abrupt smooth boundary.

C1—3 to 14 inches; very pale brown (10YR 7/3) very gravelly fine sandy loam, brown (10YR 4/3) moist; massive; soft, very friable, nonsticky, nonplastic; many very fine roots; many very fine tubular pores; violently effervescent; strongly alkaline; clear smooth boundary.

R&C—14 to 17 inches; pale brown (10YR 6/3) very cobbly fine sandy loam, dark grayish brown (10YR 4/2) moist; few fine distinct brownish yellow (10YR 6/6) silica mottling; massive; slightly hard, very friable, nonsticky, nonplastic; many very fine and common fine roots; many very fine tubular pores; violently effervescent; strongly alkaline; abrupt wavy boundary.

R—17 inches; rhyolitic bedrock.

The depth to bedrock ranges from 10 to 20 inches. The surface is very gravelly, very cobbly, or very stony. The soil is generally calcareous throughout, and effervescence ranges from slight to violent, but in places the A1 horizon is not calcareous. Coarse fragments make up about 60 to 80 percent of the soil mass. Silica coatings are on some of the coarse fragments. The A1 horizon has weak, medium, granular or platy structure, or it is massive. The C1 horizon is dominantly fine sandy loam or sandy loam and includes loess deposits of loam or very fine sandy loam. In places thin coatings of silica and lime laminae are on the top of the bedrock and in crevices.

PH—Pintwater-Bluewing association. This association of nearly level to strongly sloping soils is in medium sized, long, narrow areas on alluvial fans, foothills, and mountain slopes. Pintwater very gravelly fine sandy loam, 2 to 15 percent slopes, makes up about 50 percent of the association, and Bluewing stony loamy coarse sand, 0 to 8 percent slopes, makes up 30 percent. Included in mapping, and making up about 20 percent of the acreage, are Dobel soils, Rock outcrop, and some Bluewing soils in the washes that are occasionally flooded.

The Pintwater soil has a profile similar to the one described as representative of the series, but it has a surface layer of very gravelly fine sandy loam. It is shallow and is on the higher parts of foothills and mountain slopes. The Bluewing soil has a profile similar to the one described as representative of the Bluewing series, but it has a surface layer of stony loamy coarse sand. It is very deep and is in a lower position on the alluvial fans.

On the Pintwater soil runoff is rapid, and the hazard of erosion is moderate. On the Bluewing soil runoff is very slow, and the hazard of erosion is slight.

This association is not suited to irrigated crops. It is used mainly for range and wildlife habitat. Capability subclass VIIs dryland; Pintwater soil in range site NV 29–12, Semidesert Shallow Loamy; Bluewing soil in range site NV 28–2 and NV 29–2, Desert Loamy Sal.

PK—Pintwater-Rock outcrop complex. This complex of moderately steep and steep soils is in large, irregularly shaped areas on foothills and mountain slopes. Pintwater very cobbly fine sandy loam, 15 to 50 percent slopes, makes up about 50 percent of the complex, and rhyolitic Rock outcrop makes up 30 percent. Included in mapping, and making up about 20 percent of the acreage, are Old Camp, Malpais, and Roic soils.

The Pintwater soil has a profile similar to the one described as representative of the Pintwater series. It is shallow and is on the foothills and mountain slopes. Rock outcrop is many small, slightly raised islands scattered throughout the Pintwater soil.

On the Pintwater soil runoff is rapid, and the hazard of erosion is moderate.

This complex is not suited to irrigated crops. It is used mainly for range and wildlife habitat. Capability subclass VIIs dryland; Pintwater soil in range site NV 29–14, Desert Stony Hill; Rock outcrop not placed in a range site.

PM—Pintwater-Rock outcrop complex, stony. This complex of moderately steep and steep soils is in medium sized, irregularly shaped areas on foothills and mountain slopes. Pintwater very stony fine sandy loam, 15 to 50 percent slopes, makes up about 40 percent of the complex, and Rock outcrop makes up 40 percent. Included in mapping, and making up about 20 percent of the acreage, are Bluewing soils and other Pintwater soils.

The Pintwater soil has a profile similar to the one described as representative of the Pintwater series, but the surface layer is very stony fine sandy loam. The soil is shallow, and the surface is very stony. It is on the foothills and mountain slopes. Rock outcrop is many small, very jagged, slightly raised islands scattered throughout the Pintwater soil. In places it has a very thin layer of soil material over the rock.

On the Pintwater soil runoff is rapid, and the hazard of erosion is moderate.

This complex is not suited to irrigated crops. It is used mainly for range and wildlife habitat. Capability subclass VIIs dryland; Pintwater soil in range site NV 29–14, Desert Stony Hill; Rock outcrop is not placed in a range site.

Playas

Playas are nearly level, saline-alkali affected stratified soil material that has been deposited in smooth, shallow basins. Many contain shallow water for short periods in winter and in spring and for shorter periods in summer following thunderstorms. Playas are essentially barren. In places sand or silty clay hummocks 3 to 12 inches high have been superimposed upon the Playas. These support a sparse stand of black greasewood.

There are two types of Playas in this survey area. In the northern part of the area, the Playas are deep, stratified clay and silty clay, and they are wet. In the southern part of the Area, they are shallow, stratified silt loam and silty clay loam; they have silica cementation below a depth of 10 inches, and they are dry.

Playas have very slow permeability. Available water capacity varies from very low to high. Runoff is very slow or ponded, and the hazard of erosion is slight.

PN—Playas. This land type is mainly in the northern part of the survey area but includes about 800 acres in the southern part. In the southern part of the Area, Playas are shallow, well drained, and have silica cementation below a depth of 10 inches. Playas in the northern part are very large, oval, undrained areas on the smooth, nearly level floor of ancient Lake Toiyabe. Included in mapping, and making up about 10 percent of the acreage, are Parran soils and some sandy or clayey, hummocky areas.

This land type is essentially barren. It is periodically flooded, mainly in winter and spring. High-intensity summer storms may leave water standing for short periods.

Runoff is very slow or ponded, and the hazard of erosion is slight.

This land type is not suited to irrigated crops or range, and it is of little use for wildlife habitat. It may have limited use for recreation and esthetic purposes. Capability subclass VIIIw dryland; Playas are not placed in a range site.

PO—Playas-Parran complex. This nearly level complex is in medium sized, irregularly shaped areas on saline-alkali affected low lake plains, basins, and low lake terraces. Playas make up about 65 percent of the complex, and Parran silty clay loam makes up 20 percent. Included in mapping, and making up about 15 percent of the acreage, are Umberland soils, other Parran soils, and sandy or silty dunes superimposed upon the Playas.

Playas are broad, flat areas that are essentially barren and that surround small islands of the Parran soil. The Parran soil has a profile similar to the one described as representative of the Parran series. It is in small terraces or dunelike hummocks that have been highly dissected. The Parran soil supports a sparse stand of black greasewood and saltgrass.

Runoff is ponded to very slow, and the hazard of erosion is slight.

This complex is not suited to irrigated crops. It has very limited use for range and wildlife habitat. Capability subclass VIIw dryland; Parran soil in range site NV 28–3 and NV 29–3, Sodic Flat; Playas are not placed in a range site.

Pumel Series

The Pumel series consists of very shallow, well drained soils that formed in colluvium derived mainly from granodiorite. These soils are gently sloping to strongly sloping. They are on rounded, undulating to rolling hills and pediments. Slopes range from 2 to 15 percent. The vegetation consists of black sagebrush, bud sagebrush, spiny hopsage, winterfat, Indian ricegrass, desert needlegrass, squirreltail, and galleta. Elevation ranges from 6,000 to 6,500 feet. Mean annual precipitation is 8 to 10 inches. Mean annual air temperature is 43° to 47° F, and the length of the frost-free season is 100 to 120 days.

In a representative profile the surface layer is light brownish gray gravelly sandy loam about 2 inches thick. The next layer is about 3 inches of pale brown very gravelly coarse sandy loam. It is underlain by light brownish gray weathered granodiorite about 18 inches thick over unweathered granodiorite.

Pumel soils have moderately rapid permeability. Effective rooting depth is about 5 inches. Available water capacity is very low. Runoff is medium, and the hazard of erosion is moderate.

Representative profile of Pumel gravelly sandy loam, in an area of Pumel-Rock outcrop complex, about 6 miles north of Tonopah, 265 feet south and 130 feet west of the northeast corner sec. 1, T. 3 N., R. 42 E.:

A1—0 to 2 inches; light brownish gray (2.5Y 6/2) gravelly sandy loam, dark grayish brown (2.5Y 4/2) moist; massive; soft, very friable, nonsticky, nonplastic; common very fine tubular pores; about 45 percent gravel; violently effervescent; strongly alkaline; clear smooth boundary.

C1—2 to 5 inches; pale brown (10YR 6/3) very gravelly coarse sandy loam, dark grayish brown (10YR 4/2) moist; massive; soft, very friable, nonsticky, nonplastic; many very fine roots; common very fine tubular pores; about 60 percent gravel; violently effervescent; strongly alkaline; clear wavy boundary.

C2—5 to 23 inches; light brownish gray (10YR 6/2) weathered granodiorite, dark grayish brown (10YR 4/2) moist; white (10YR 8/1) silica seams and dark grayish brown (2.5Y 3/2) mica flakes; massive; hard, firm, nonsticky, nonplastic; few very fine roots in cleavage planes; clear wavy boundary.

R—23 to 28 inches; granodiorite.

Depth to partially weathered granodiorite ranges from 4 to 14 inches. Depth to unweathered granodiorite is 20 to 40 inches. The soil is effervescent to violently effervescent. Reaction ranges from moderately alkaline to strongly alkaline. Gravel content after mixing ranges from 50 to 75 percent. The C horizon is very gravelly sandy loam or coarse sandy loam.

PR—Pumel-Rock outcrop complex. This complex of gently sloping to strongly sloping soils is in medium sized, irregularly shaped areas on rounded, undulating to rolling hills and pediments. Pumel gravelly sandy loam, 2 to 15 percent slopes, makes up about 70 percent of the complex, and Rock outcrop makes up 30 percent. Included in mapping, and making up about 10 percent of the acreage, are Bluewing soils in the dry washes.

The Pumel soil has the profile described as representative of the Pumel series. It is on hills and pedi-

ment slopes, and it surrounds the Rock outcrop. The Rock outcrop is small islands that are slightly higher than the surrounding soil, and it is near the tops of the hills and pediments.

Runoff on the Pumel soil is medium, and the hazard of erosion is moderate.

This complex is not suited to irrigated crops. It is used mainly for grazing and wildlife habitat. Capability subclass VIIs dryland; Pumel soil in range site NV 29–12, Semidesert Shallow Loamy; Rock outcrop is not placed in a range site.

Quima Series

The Quima series consists of very deep, well drained soils that formed in alluvium derived from granite, rhyolite, tuff, and ash. These soils are nearly level to gently sloping. They are on alluvial fans. Slopes range from 0 to 4 percent. The vegetation consists of fourwing saltbush, Indian ricegrass, bud sagebrush, winterfat, and spiny hopsage. Elevation ranges from 5,500 to 6,000 feet. Mean annual precipitation is 4 to 6 inches. Mean annual air temperature is 45° to 50° F, and the length of the frost-free season is 100 to 130 days.

In a representative profile the soil is pale brown, light brownish gray, and light gray coarse sandy loam that extends to a depth of 60 inches or more.

Quima soils have moderately rapid permeability. Effective rooting depth is about 60 inches. Available water capacity is moderate. Runoff is medium, and the hazard of erosion is slight to moderate.

Representative profile of Quima coarse sandy loam, 0 to 2 percent slopes, about 3 miles northwest of Round Mountain, about 800 feet east and 250 feet north of the southwest corner sec. 12, T. 10 N., R. 43 E.:

A11—0 to 2 inches; pale brown (10YR 6/3) coarse sandy loam, brown (10YR 4/3) moist; massive; soft, very friable, nonsticky, nonplastic; few very fine roots; many very fine tubular and common very fine interstitial pores; moderately alkaline; abrupt smooth boundary.

A12—2 to 5 inches; light brownish gray (10YR 6/2) coarse sandy loam, brown (10YR 4/3) moist; massive; soft, very friable, nonsticky, nonplastic; few very fine and fine roots; common very fine tubular and many very fine interstitial pores; moderate amounts of mica flakes; moderately alkaline; clear smooth boundary.

B2—5 to 16 inches; pale brown (10YR 6/3) coarse sandy loam, brown (10YR 4/3) moist; massive; slightly hard, very friable, nonsticky, nonplastic; few very fine and fine roots; common very fine tubular pores; moderate amount of mica flakes; moderately alkaline; clear smooth boundary.

C1ca—16 to 60 inches; light gray (10YR 7/2) coarse sandy loam, brown (10YR 4/3) moist; massive; soft, very friable, nonsticky, nonplastic; few very fine and fine roots; few fine tubular pores; moderate amounts of mica flakes; strongly alkaline.

Thickness of the solum ranges from 12 to 30 inches. The solum is generally noncalcareous except in the lower part, and reaction ranges from mildly alkaline to strongly alkaline. Texture between depths of 10 and 40 inches is dominantly coarse sandy loam that is more than 25 percent coarse and very coarse sand and has moderate amounts of mica flakes. Thin strata of fine sandy loam or sandy loam contain as much as 30 percent gravel in places. The A1 horizon has weak, very thin to medium, platy structure or is massive. The A11 horizon is calcareous in places. The B2 horizon is generally massive but in places has weak, coarse or medium, subangular blocky or prismatic structure.

QrA—Quima coarse sandy loam, 0 to 2 percent slopes. This nearly level soil is in large, broad, smooth areas on alluvial fans. It has the profile described as representative of the series. Included in mapping, and making up about 5 percent of the acreage, are Bluewing soils and other Quima soils.

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

This soil is suited to irrigated crops if irrigation water is made available. It is used mainly for range and wildlife habitat. Capability units IIIs–43 irrigated, capability subclass VIIc dryland; range site NV 28–1 and NV 29–1, Desert Loamy.

QsB—Quima fine sandy loam, 2 to 4 percent slopes. This gently sloping soil is in medium sized, irregularly shaped areas on broad alluvial fans. It has a profile similar to the one described as representative of the series, but the surface layer is fine sandy loam and has coppice dunes around the bases of plants. Dunes are as much as 12 inches high. Included in mapping, and making up about 5 percent of the acreage, are areas of soils that are similar but that have a loamy surface layer.

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

This soil is suited to irrigated crops if irrigation water is made available. It is used mainly for range and wildlife habitat. Capability unit IIe–20 irrigated, capability subclass VIIc dryland; range site NV 28–1 and NV 29–1, Desert Loamy.

Rock Outcrop

This nearly level to extremely steep land type consists of various sized areas on alluvial fans, hills, and mountain slopes. The rock is mainly basalt, rhyolite, tuffs, granite, limestone, and shale. Other igneous sedimentary and metamorphic rocks are included. Some areas have a very thin mantle of soil material over bedrock.

This land is essentially barren or has sparse vegetation where plants become established in rock fractures.

This land type has no value for farming. It does have value for wildlife, recreation, and esthetic purposes. Rock outcrop is mapped only in associations and complexes with Kyler, Laxal, Malpais, Old Camp, Penelas, Pintwater, Pumel, and Silverbow soils.

Roic Series

The Roic series consists of well drained soils that are very shallow to shallow over semiconsolidated, lake-laid sediment. These soils formed in colluvium derived from semiconsolidated, loamy, lake-laid sediment. They are moderately sloping to strongly sloping. They are on highly dissected terraces. Slopes range from 4 to 15 percent. The vegetation consists of Bailey greasewood, shadscale, bud sagebrush, ephedra, and Indian ricegrass. Elevation ranges from 5,500 to 6,000 feet. Mean annual precipitation is 4 to 6 inches. Mean

annual air temperature is 47° to 50° F, and the length of the frost-free season is 100 to 130 days.

In a representative profile the surface layer is pale brown very gravelly fine sandy loam about 2 inches thick. The next layer is pale brown very fine sandy loam about 3 inches thick. Below is light gray and very pale brown semiconsolidated lacustrine sediment that extends to a depth of 60 inches or more.

Roic soils have moderately rapid permeability above the lake-laid sediment and very slow permeability through it. Effective rooting depth is about 5 inches. Available water capacity is very low. Runoff is rapid, and the hazard of erosion is high.

Representative profile of Roic very gravelly fine sandy loam, in an area of Roic-Dobel association, about 3 miles east of the San Antonio Ranch on a north slope, about 2,100 feet south of the northeast corner sec. 22, T. 7 N., R. 42 E.:

A1—0 to 2 inches; pale brown (10YR 6/3) very gravelly fine sandy loam, brown (10YR 4/3) moist; massive; soft, very friable, nonsticky, nonplastic; common very fine, fine, and medium roots; many very fine interstitial and few very fine and fine tubular pores; 50 percent gravel-sized fragments; moderately alkaline; abrupt smooth boundary.

C1—2 to 5 inches; pale brown (10YR 6/3) fine sandy loam, brown (10YR 4/3) moist; 50 percent gravel-sized fragments of lacustrine material that crushes to silt loam, very fine sandy loam, or loam; massive; soft, very friable, nonsticky, slightly plastic; many very fine, common fine, and few medium roots; many very fine interstitial and many very fine tubular pores; strongly effervescent; strongly alkaline; abrupt wavy boundary.

C2r—5 to 15 inches; light gray (10YR 7/2) semiconsolidated lacustrine sediment, brown (10YR 5/3) moist; few fine distinct yellowish brown (10YR 6/6) mottles; massive; very hard, extremely firm; root mats in fracture planes; common fine and medium white (10YR 8/1) and yellowish brown (10YR 5/4) lime and silica coatings on fracture planes; common fine gypsum masses; strongly alkaline; clear wavy boundary.

C3r—15 to 60 inches; very pale brown (10YR 7/3) semiconsolidated lacustrine sediment, yellowish brown (10YR 5/4) moist; massive; very hard, very firm, few fine lime seams along fracture planes; strongly alkaline.

Depth to the semi-consolidated lacustrine material ranges from 4 to 17 inches. The soil is fine sandy loam, very fine sandy loam, or loam and has less than 18 percent clay. The A horizon is very gravelly and contains some cobbles. The C horizon is slightly effervescent to strongly effervescent. Reaction ranges from moderately alkaline to strongly alkaline. The lacustrine material is very firm or extremely firm, has hardness of less than 3 on the Mohs scale, and is difficult to dig with a spade when moist.

RO—Roic-Dobel association. This association of gently sloping to strongly sloping soils is in large, irregularly shaped areas on highly dissected alluvial fans and terraces. Roic very gravelly fine sandy loam, 4 to 15 percent slopes, makes up about 50 percent of the association, and Dobel very gravelly fine sandy loam, 2 to 8 percent slopes, makes up 30 percent. Included in mapping, and making up about 20 percent of the acreage, are Bluewing and Vigus soils.

The Roic soil has the profile described as representative of the Roic series. It is on the terrace tops that have sharp breaks to the alluvial fans. The Dobel soil has a profile similar to the one described as representative of the Dobel series, but the surface layer is very gravelly fine sandy loam. This soil is on dissected alluvial fans slightly lower than the terraces. Both soils are highly dissected.

Runoff is rapid. The hazard of erosion on the Roic soil is high and on the Dobel soil is slight.

This association is not suited to irrigated crops. It is used mainly for range and wildlife habitat. Capability subclass VIIs dryland; range site NV 28–2 and NV 29–2, Desert Loamy Sal.

Settlemeyer Series

The Settlemeyer series consists of very deep, poorly drained soils that formed in alluvium derived from mixed rock sources including basalt, rhyolite, and shale. These soils are nearly level. They are on flood plains and low lake terraces. Slopes range from 0 to 2 percent. The vegetation consists of meadow grasses and sedges. Elevation is about 5,600 feet. Mean annual precipitation is 4 to 6 inches. Mean annual air temperature is 43° to 45° F, and the length of the frost-free season is 100 to 130 days.

In a representative profile the surface layer is grayish brown silt loam about 5 inches thick. Below this is 11 inches of gray silty clay, 8 inches of light brownish gray loam, 6 inches of light brownish gray clay loam, and 20 inches of light brownish gray loam. This is underlain by olive gray sandy clay loam to a depth of 60 inches or more.

Settlemeyer soils have moderately slow permeability. Effective rooting depth is about 60 inches. Available water capacity is high. Runoff is very slow or ponded, and the hazard of erosion is slight.

Representative profile of Settlemeyer silt loam, in a lane 1,000 feet east of R.O. Ranch headquarters, near the southeast corner sec. 4 of the unsurveyed T. 12 N., R. 43 E.:

A11—0 to 5 inches; grayish brown (10YR 5/2) silt loam, very dark brown (10YR 2/2) moist; moderate fine and very fine subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; many very fine and fine roots; few very fine tubular pores; slightly effervescent; moderately alkaline; clear smooth boundary.

A12—5 to 16 inches; gray (10YR 5/1) silty clay, very dark gray (10YR 3/1) moist; weak medium prismatic structure parting to moderate medium and coarse subangular blocky; slightly hard, friable, very sticky, very plastic; common very fine and fine roots; common very fine and medium tubular pores; noncalcareous; neutral; clear irregular boundary.

C1—16 to 24 inches; light brownish gray (10YR 6/2) loam, dark grayish brown (10YR 4/2) moist; common fine very dark brown (10YR 2/2) and yellowish brown (10YR 5/4) and few fine dark brown (10YR 4/3) mottles; few small fine and medium black (10YR 2/1) manganese concretions; massive; slightly hard, friable, sticky, plastic; common very fine and fine roots; common fine tubular pores; very slightly effervescent with few fine filaments that are slightly effervescent; neutral; abrupt smooth boundary.

C2—24 to 30 inches; light brownish gray (10YR 6/2) clay loam, dark grayish brown (10YR 4/2) moist; common small fine and medium black (10YR 2/1) manganese concretions; very dark gray (10YR 3/1) coatings on ped faces; weak medium and fine

angular blocky structure; slightly hard, firm, sticky, plastic; common very fine and fine roots; few fine tubular pores; noncalcareous; neutral; clear smooth boundary.

C3ca—30 to 50 inches; light brownish gray (10YR 6/2) loam, dark grayish brown (2.5Y 4/2) moist; few small fine black (10YR 2/1) manganese concretions; many faint light olive brown (2.5Y 5/4) mottles; massive; slightly hard, friable, slightly sticky, slightly plastic; common very fine roots; few fine tubular pores; very slightly effervescent; moderately alkaline; clear smooth boundary.

C4ca—50 to 60 inches; olive gray (5Y 5/2) sandy clay loam, olive (5Y 4/3) moist; common small fine black (5Y 2/1) manganese concretions; many fine dark brown (7.5YR 3/2), common coarse dark greenish gray (5G 4/1 and 5BG 4/1), and many brown (10YR 4/3) mottles; massive; slightly hard, firm, sticky, plastic; very slightly effervescent; moderately alkaline.

In places the soil has an O horizon as much as 6 inches thick. This horizon is made up mainly of undecomposed plant stems and roots. The A horizon has weak to strong fine or medium prismatic or subangular blocky structure, or it is massive. A few fine ¼- to ¾-inch lime concretions are in some profiles. The A horizon is high in organic matter and ranges from 6 to 18 inches in thickness. The upper part of the A horizon is calcareous in places, but the lower part is noncalcareous, and the C horizon is noncalcareous to very slightly calcareous. The reaction ranges from neutral to mildly alkaline in the A12, C1, and C2 horizons and is moderately to strongly alkaline in the C3ca and C4ca horizons. The C horizon is stratified clay, clay loam, loam, or fine sandy loam. Gravel or heavy clay loam is below a depth of 36 inches in places.

Sb—Settlemeyer loam, drained. This nearly level soil is in very narrow bands adjacent to Peavine Creek, which has become entrenched on the flood plain. It has a profile similar to the one described as representative of the series, but it has a loam surface layer and it has been partly drained by the entrenchment of the creek. Included in mapping, and making up about 5 percent of the acreage, is a soil that is saline-alkali affected.

Runoff is very slow, and the hazard of erosion is slight. A seasonal high water table is below a depth of 5 feet.

This soil is suited to irrigated crops. It is used for limited production of alfalfa hay in some years, but it is used mainly for range and wildlife habitat. Capability unit IIw–60 irrigated, capability subclass VIw dryland; range site NV 28–9, Wet Meadow.

Se—Settlemeyer silt loam. This nearly level soil is in medium sized, irregularly shaped areas on low lake terraces and alluvial fans. It has the profile described as representative of the series. Included in mapping, and making up about 10 percent of the acreage, are an Orizaba soil that is strongly saline-alkali affected and a soil that is similar to this Settlemeyer soil but that is very poorly drained.

Runoff is very slow, and the hazard of erosion is slight. A seasonal high water table is at a depth of 2.0 to 3.5 feet. It is highest in winter and in spring, and it is generally below a depth of 2.5 feet in summer.

This soil has limited suitability for irrigated crops. Some of it is mowed for meadow hay. It is also used for range and wildlife habitat. Capability unit IIIw–60 irrigated, capability subclass VIw dryland; range site NV 28–9, Wet Meadow.

SF—Settlemeyer-Yobe complex. This complex of nearly level soils is in medium sized, irregularly shaped areas on low lake terraces that are dissected by wide, slightly concave channels. Settlemeyer silt loam makes up about 40 percent of the complex, and Yobe silt loam makes up 40 percent. Included in mapping, and making up about 20 percent of the acreage, are Charnock soils and small playas.

The Settlemeyer and Yobe soils have a profile similar to the one described as representative of their respective series. The Settlemeyer soil is in slightly lower positions on the terraces and has a darker surface layer. The Yobe soil is on slightly raised parts of the terraces, has a lighter color, and is strongly saline-alkali affected.

Runoff is very slow, and the hazard of erosion is slight. A seasonal high water table in the Settlemeyer soil is at a depth of 2.0 to 3.5 feet and in the Yobe soil is at a depth of 3.0 to 6.0 fett.

This complex is not suited to irrigated crops. It is used mainly for range and wildlife habitat. Capability subclass VIIw dryland; Settlemeyer soil in range site NV 28–9, Wet Meadow; Yobe soil in range site NV 28–13, Saline Meadow.

Silverbow Series

The Silverbow series consists of shallow, well drained soils that formed in colluvium derived from basaltic rock. These soils are strongly sloping to moderately steep. They are on rolling hills. Slopes range from 8 to 30 percent. The vegetation consists of spiny menodora, Bailey greasewood, bud sagebrush, shadscale, wolfberry, galleta, Indian ricegrass, and kings desertgrass. Elevation ranges from 5,200 to 6,000 feet. Mean annual precipitation is 4 to 6 inches. Mean annual air temperature is 45° to 50° F, and the length of the frost-free season is 100 to 130 days.

In a representative profile the surface layer is light brownish gray very stony fine sandy loam and very gravelly fine sandy loam about 4 inches thick. The next layer is very pale brown gravelly loam about 2 inches thick. Below this is about 6 inches of very pale brown very gravelly clay loam. A white very gravelly indurated hardpan is at a depth of 12 inches. It is about 16 inches thick. Below the hardpan is white stony sand that extends to a depth of 40 inches or more.

Silverbow soils have moderately slow permeability above the hardpan and very slow permeability through it. Effective rooting depth is about 12 inches. Available water capacity is very low. Runoff is medium, and the hazard of erosion is slight.

Representative profile of Silverbow very stony fine sandy loam, in an area of Silverbow-Rock outcrop complex, about 25 miles northwest of Tonopah, on a west-facing slope about 2,100 feet south of the northwest corner sec. 9, T. 6 N., R. 40 E.:

A11—0 to 2 inches; light brownish gray (10YR 6/2) very stony fine sandy loam, dark grayish brown (10YR 4/2) moist; moderate very thick platy structure; soft, very friable, nonsticky, nonplastic; few very fine roots; many very fine vesicular pores; strongly effervescent; strongly alkaline; clear smooth boundary.

A12—2 to 4 inches; light brownish gray (10YR 6/2) very gravelly fine sandy loam, dark grayish brown (10YR 4/2) moist; strong very thick platy structure; slightly hard, very friable, nonsticky, nonplastic; few very fine and fine roots; many very fine vesicular and common very fine tubular pores; violently effervescent; strongly alkaline; abrupt smooth boundary.

B1—4 to 6 inches; very pale brown (10YR 7/3) gravelly loam, brown (10YR 4/3) moist; strong very thick platy structure; hard, friable, sticky, plastic; few micro roots; many very fine, common fine vesicular, and common very fine and fine tubular pores; violently effervescent; very strongly alkaline; abrupt wavy boundary.

B2t—6 to 12 inches; very pale brown (10YR 7/3) very gravelly clay loam, brown (10YR 5/3) moist; weak fine medium and coarse subangular blocky structure; slightly hard, friable, sticky, plastic; common very fine and fine roots; many very fine tubular pores; few thin clay films on ped faces, common thin clay films in pores; violently effervescent; very strongly alkaline; abrupt wavy boundary.

C1sicam—12 to 28 inches; white (10YR 8/2) indurated very gravelly duripan, pale brown (10YR 6/3) moist; massive; extremely hard, extremely firm; violently effervescent; very strongly alkaline; abrupt wavy boundary.

C2sica—28 to 40 inches; white (10YR 8/2) stony sand that has lime and silica coatings on underside of stones, very dark grayish brown (10YR 3/2) moist; massive; slightly hard, very friable, violently effervescent; strongly alkaline.

Depth to the hardpan and thickness of the solum range from 10 to 18 inches. The upper part of the solum is noneffervescent to violently effervescent. Reaction ranges from mildly alkaline to strongly alkaline. The B horizon is dominantly clay loam but includes sandy clay loam or loam in places. Coarse fragments in the B2t horizon range from 50 to 70 percent. The B2t horizon has weak to strong, fine to coarse, subangular blocky structure. Bedrock is below a depth of 40 inches in some places.

SH—Silverbow-Rock outcrop complex. This complex of strongly sloping to moderately steep soils is in medium sized, irregularly shaped areas on rounded, rolling, hilly uplands. Silverbow very stony fine sandy loam, 8 to 30 percent slopes, makes up about 60 percent of the complex, and Rock outcrop makes up 25 percent. Included in mapping, and making up about 15 percent of the acreage, are Dobel, Bluewing, and Osobb soils.

The Silverbow soil has the profile described as representative of the Silverbow series. It is shallow and is on the upland slopes. Rock outcrop is small islands of jagged cliffs, escarpments, and peaks and is essentially barren.

On the Silverbow soil runoff is medium, and the hazard of erosion is slight.

This complex is not suited to irrigated crops. It is used mainly for range and wildlife habitat. Capability subclass VIIs dryland, Silverbow soil in range site NV 29–14, Desert Stony Hill; Rock outcrop not placed in a range site.

Slickens

SK—Slickens. This nearly level to gently sloping land type is made up of accumulations of fine textured materials separated in ore milling operations. Slickens are mostly freshly ground rock that generally has undergone chemical treatment during the milling process. They are in small, irregularly shaped areas on alluvial fans or flood plains. The materials are detrimental to plant growth, but they are generally confined in specially constructed basins. Fertility is very low. Slickens are essentially barren.

This land type is not suited to irrigated crops, and it does not have any value as range. It may have some recreational or esthetic value. Capability subclass VIIIw dryland; not placed in a range site.

Spanel Series

The Spanel series consists of well drained soils that are shallow to an indurated hardpan. These soils formed in alluvium derived from volcanic rocks, mainly basalt and rhyolite. They are nearly level and are on smooth alluvial fans. Slopes are 0 to 2 percent. The vegetation consists of shadscale, Bailey greasewood, bud sagebrush, ephedra, galleta, and Indian ricegrass. Elevation ranges from 5,500 to 6,000 feet. Mean annual precipitation is 4 to 6 inches. Mean annual air temperature is 45° to 50° F, and the length of the frost-free season is 100 to 130 days.

In a representative profile the surface layer is light brownish gray gravelly loamy sand about 2 inches thick. The next layer is light gray fine sandy loam about 4 inches thick. Below this is about 4 inches of light yellowish brown clay loam. Next is light yellowish brown loam about 4 inches thick. A light gray indurated hardpan is at a depth of 14 inches. It is about 9 inches thick. Below the hardpan is light brownish gray very gravelly sand that extends to a depth of 60 inches or more.

Spanel soils have moderately slow permeability above the hardpan and very slow permeability through it. Effective rooting depth is about 14 inches. Available water capacity is very low. Runoff is medium, and the hazard of erosion is slight.

Representative profile of Spanel gravelly loamy sand, near the mouth of Peavine Creek, about 2,400 feet west and 200 feet north of the southeast corner sec. 15, T. 8 N., R. 42 E.:

A1—0 to 2 inches; light brownish gray (10YR 6/2) gravelly loamy sand, dark grayish brown (10YR 4/2) moist; massive; soft, very friable, nonsticky, nonplastic; few very fine roots; many very fine interstitial and few very fine tubular pores; moderately alkaline; abrupt smooth boundary.

A2—2 to 6 inches; light gray (10YR 7/2) fine sandy loam, brown (10YR 4/3) moist; moderate very thick platy structure; slightly hard, very friable, nonsticky, slightly plastic; few very fine, fine, and medium roots; many very fine and fine and common medium vesicular pores; strongly alkaline; abrupt smooth boundary.

B2t—6 to 10 inches; light yellowish brown (10YR 6/4) clay loam, dark yellowish brown (10YR 4/4) moist; weak coarse prismatic structure parting to moderate medium and thin platy; light gray (10YR 7/6) lime coatings on plates; hard, very friable, sticky, plastic; many very fine and fine roots; common very fine tubular pores; few thin clay films on ped faces and in pores; strongly alkaline; clear smooth boundary.

B3ca—10 to 14 inches; light yellowish brown (10YR 6/4) loam, dark yellowish brown (10YR 4/4) moist; massive; soft, very friable, slightly sticky, slightly

plastic; common very fine and fine roots; common very fine tubular pores; few thin clay films in pores; strongly effervescent; strongly alkaline; abrupt smooth boundary.

IIC1sicam—14 to 23 inches; light gray (10YR 7/2) indurated duripan, brown (10YR 4/3) moist; massive; extremely hard, extremely firm; few very fine root mats in fracture planes; few very fine tubular pores; violently effervescent; very strongly alkaline; clear smooth boundary.

IIC2ca—23 to 60 inches; light brownish gray (10YR 6/3) very gravelly sand, dark grayish brown (10YR 4/2) moist; massive; slightly hard, very friable; few very fine roots; many very fine interstitial pores; many thin pale brown (10YR 6/3) silica coats and few thin white (10YR 8/2) lime coats on underside of gravel; noncalcareous matrix but violently effervescent on underside of gravel; very strongly alkaline.

Thickness of the solum and depth to the hardpan range from 10 to 16 inches. The A horizon is modified by as much as 30 percent gravel and cobbles in places. The A2 horizon is calcareous in places. The B2t horizon is loam or clay loam that contains less than 25 percent rock fragments. The lower part is calcareous. This horizon has weak, medium or coarse, prismatic structure. The hardpan is massive or has weak, medium to very thick, platy structure.

SP—Spanel gravelly loamy sand. This nearly level soil is in large, broad, fan-shaped areas on alluvial fans. Included in mapping, and making up about 15 percent of the acreage, are Bluewing soils and a soil that is similar to the Spanel soils but that has only a weakly cemented hardpan.

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

This soil is not suited to irrigated crops. It is used mainly for range and wildlife habitat. Capability subclass VIIs dryland; range site NV 28–2 and NV 29–2, Desert Loamy Sal.

Stargo Series

The Stargo series consists of very deep, somewhat excessively drained soils that formed in alluvium derived from mixed rock sources. These soils are nearly level. They are on smooth valley-fill plains and small flood plains. Slopes are 0 to 2 percent. The vegetation consists of Bailey greasewood, shadscale, bud sagebrush, wolfberry, and Indian ricegrass. Elevation ranges from 4,800 to 5,200 feet. Mean annual precipitation is 4 to 6 inches. Mean annual air temperature is 49° to 52° F, and the length of the frost-free season is 130 to 150 days.

In a representative profile the surface layer is light gray coarse sandy loam about 5 inches thick. The next layer is very pale brown clay loam about 8 inches thick. Below this is about 9 inches of very pale brown and light brownish gray stratified loamy fine sand, fine sand, and sand. This is underlain by light brownish gray and very pale brown finely stratified sand, gravelly sand, very gravelly coarse sand, fine sandy loam, and very fine sandy loam extending to a depth of 60 inches or more.

Stargo soils have rapid permeability. Effective rooting depth is about 60 inches. Available water capacity is moderate. Runoff is slow, and the hazard of erosion is slight.

Representative profile of Stargo coarse sandy loam, about 9 miles southwest of the San Antonio Ranch, about 1,000 feet north and 100 feet east of the west quarter corner sec. 18, T. 6 N., R. 41 E.:

A1—0 to 5 inches; light gray (10YR 7/2) coarse sandy loam, brown (10YR 4/3) moist; weak thin and medium platy structure; soft, very friable, nonsticky, nonplastic; few very fine, fine, and medium roots; many fine and common medium vesicular pores; effervescent; strongly alkaline; abrupt smooth boundary.

C1—5 to 13 inches; very pale brown (10YR 7/3) clay loam, brown (10YR 4/3) moist; moderate medium and thin platy structure; slightly hard, friable, sticky, plastic; common very fine and few fine roots; common very fine and few fine tubular pores; few pockets and seams, 1 inch thick, of very gravelly coarse sandy loam; strongly effervescent; strongly alkaline; abrupt wavy boundary.

C2—13 to 22 inches; very pale brown (10YR 7/3) finely stratified loamy fine sand and light brownish gray (10YR 4/2) fine sand and sand, brown (10YR 4/3) and dark grayish brown (10YR 4/2) moist; massive; soft, very friable, nonsticky, nonplastic; common very fine and few fine roots; many very fine and fine interstitial pores; strongly alkaline; abrupt wavy boundary.

C3sica—22 to 32 inches; light brownish gray (10YR 6/2) finely stratified sand and very gravelly coarse sand, dark grayish brown (10YR 4/2) moist; massive; hard, friable, nonsticky, nonplastic; few very fine and fine roots, many very fine and fine and few medium interstitial pores; ⅛-inch thick strata of very pale brown (10YR 7/3) fine sandy loam, brown (10YR 4/3) moist; weakly cemented at the stratification contacts, contact planes are very hard and firm; some gravel have silica and lime coating the underside; effervescent; strongly alkaline; abrupt smooth boundary.

C4—32 to 43 inches; very pale brown (10YR 7/3) and light brownish gray (10YR 6/2) stratified fine sandy loam, gravelly sand, and sand, brown (10YR 4/3) and dark grayish brown (10YR 4/2) moist; massive; soft and loose, very friable and loose, nonsticky, nonplastic; few very fine and fine roots; many very fine and fine interstitial pores; moderately alkaline; abrupt smooth boundary.

C5—43 to 70 inches; very pale brown (10YR 7/3) very fine sandy loam, brown (10YR 4/3) moist; massive; soft, very friable, nonsticky, nonplastic; few very fine and fine roots; many very fine interstitial pores; strongly effervescent; moderately alkaline.

The soils are generally calcareous but in places contain horizons that are noneffervescent to strongly effervescent. Reaction ranges from mildly alkaline to strongly alkaline. The average rock fragment content is less than 15 percent. Texture between depths of 10 and 40 inches averages loamy sand or sand and includes strata of mainly sand, loamy sand, loamy fine sand, sandy loam, fine sandy loam, or loam, and thin strata of fine gravel in places.

Sr—Stargo gravelly loamy sand. This nearly level soil is in medium sized, irregularly shaped areas on flood plains. It has a profile similar to the one described as representative of the series, but the surface layer is gravelly loamy sand about 3 inches thick. This soil is not subject to flooding. Included in mapping, and making up about 5 percent of the acreage, is a soil that is similar to Stargo soils but that has a fine sandy loam surface layer, and other soils that are sandy throughout.

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

This soil has limited suitability for irrigated crops if irrigation water is made available. It is used mainly

for range and wildlife habitat. Capability unit IIIs–22 irrigated, capability subclass VIIs dryland; range site NV 28–2 and NV 29–2, Desert Loamy Sal.

Ss—Stargo coarse sandy loam. This nearly level soil is in large, narrow areas on flood plains. It has the profile described as representative of the series. Included in mapping, and making up about 10 percent of the acreage, are Koyen and Yomba soils and small playas.

Runoff is slow, and hazard of erosion is slight. This soil is subject to occasional flooding.

This soil has limited suitability for irrigated crops if irrigation water is made available. Some areas have been cleared for farming but are now idle. The soil is used mainly for range and wildlife habitat. Capability unit IIIw–39 irrigated, capability subclass VIIw dryland; range site NV 28–2 and NV 29–2, Desert Loamy Sal.

Stumble Series

The Stumble series consists of very deep, somewhat excessively drained soils that formed in alluvium derived from mixed rock sources. These soils are nearly level to moderately sloping. They are on alluvial fans. Slopes are 0 to 8 percent. The vegetation consists of fourwing saltbush, littleleaf horsebrush, sand dropseed, and Indian ricegrass. Elevation ranges from 5,000 to 6,000 feet. Mean annual precipitation is 4 to 6 inches. Mean annual air temperature is 47° to 51° F, and the length of the frost-free season is 100 to 150 days.

In a representative profile the surface layer is light brownish gray loamy fine sand about 15 inches thick. Below this is pale brown loamy fine sand that extends to a depth of 60 inches or more.

Stumble soils have rapid permeability. Effective rooting depth is about 60 inches. Available water capacity is low to moderate. Runoff is very slow. The hazard of soil blowing is high.

Representative profile of Stumble loamy fine sand, 0 to 8 percent slopes, about 20 miles north of Tonopah, about 1,600 feet north and 1,600 feet east of the southwest corner sec. 2, T. 5 N., R. 41 E.:

A1—0 to 8 inches; light brownish gray (10YR 6/2) loamy fine sand, brown (10YR 4/3) moist; single grained; soft, very friable, nonsticky, nonplastic; many very fine roots; many very fine interstitial and few very fine tubular pores; neutral; clear smooth boundary.

C1—8 to 15 inches; light brownish gray (10YR 6/2) loamy fine sand, brown (10YR 4/3) moist; massive; soft, very friable, nonsticky, nonplastic; many very fine and few fine roots; many very fine interstitial and few very fine tubular pores; mildly alkaline; clear smooth boundary.

C2ca—15 to 60 inches; pale brown (10YR 6/3) loamy fine sand, brown (10YR 4/3) moist; massive; soft, very friable, nonsticky, nonplastic; many very fine and fine roots; many very fine interstitial and few very fine tubular pores; strongly effervescent; moderately alkaline; clear smooth boundary.

Depth to the Cca horizon ranges from 15 to 22 inches. Reaction ranges from neutral to strongly alkaline throughout. In places the soil contains as much as 35 percent cobbles and gravel moderately deep or deep in the profile. Texture between depths of 10 and 40 inches is dominantly loamy sand or loamy fine sand, and includes some strata of sand or fine sand. The Cca horizon is very slightly effervescent to strongly effervescent.

STC—Stumble loamy fine sand, 0 to 8 percent slopes. This nearly level to moderately sloping soil is in very large, irregularly shaped areas on smooth alluvial fans slightly above the valley floor. This soil has the profile described as representative of the series. Included in mapping, and making up about 5 percent of the acreage, are severely eroded Stumble soils.

Runoff is very slow. The hazard of soil blowing is high.

This soil has limited suitability for irrigated crops if irrigation water is made available. It is used mainly for range and wildlife habitat. Capability unit IIIs–22 irrigated, capability subclass VIIs dryland; range site NV 29–16, Desert Sand.

SuA—Stumble fine sandy loam, 0 to 2 percent slopes. This nearly level soil is in small, irregularly shaped areas on alluvial fans. It has a profile similar to the one described as representative of the series, but the surface layer is fine sandy loam about 8 inches thick. Included in mapping, and making up about 5 percent of the acreage, is a soil that is coarse sand throughout.

Runoff is very slow, and the hazard of soil blowing is high.

This soil has limited suitability for irrigated crops if irrigation water is made available. It is used mainly for range and wildlife habitat. Capability unit IIIs–45 irrigated, capability subclass VIIs dryland; range site NV 29–16, Desert Sand.

Sundown Series

The Sundown series consists of very deep, somewhat excessively drained soils that formed in alluvium derived from mixed rock sources. These soils are nearly level. They are on smooth toeslopes of alluvial fans. Slopes are 0 to 2 percent. Vegetation consists of Bailey greasewood, littleleaf horsebrush, shadscale, Indian ricegrass, spiny hopsage, bud sagebrush, and dalea. Elevation ranges from 5,000 to 5,500 feet. Mean annual precipitation is 4 to 6 inches. Mean annual air temperature is 47° to 51° F, and the length of the frost-free season is 130 to 150 days.

In a representative profile the surface layer is light brownish gray fine sand about 2 inches thick. Below this is light brownish gray loamy fine sand that extends to a depth of 60 inches or more.

Sundown soils have rapid permeability. Effective rooting depth is about 60 inches. Available water capacity is low to moderate. Runoff is very slow. The hazard of soil blowing is high.

Representative profile of Sundown fine sand, about 6 miles southwest of the Cloverdale Ranch, 1,000 feet south and 50 feet west of the northeast corner sec. 20, T. 7 N., R. 40 E.:

A1—0 to 2 inches; light brownish gray (10YR 6/2) fine sand, dark grayish brown (10YR 4/2) moist; massive; soft, very friable, nonsticky, nonplastic; few very fine roots; many very fine interstitial pores; moderately alkaline; clear smooth boundary.

C1—2 to 18 inches; light brownish gray (10YR 6/2) loamy fine sand, brown (10YR 4/3) moist; massive; slightly hard, very friable, nonsticky, nonplastic; common very fine and fine roots; many very fine interstitial pores; strongly effervescent; strongly alkaline; gradual smooth boundary.

C2—18 to 60 inches; light brownish gray (10YR 6/2) loamy fine sand, very dark grayish brown (10YR 4/2) moist; massive; soft, very friable; nonsticky, nonplastic; common very fine, fine, and medium roots; many very fine interstitial pores; strongly effervescent; strongly alkaline.

The soils are commonly calcareous throughout. Generally the lime is disseminated and there is no apparent horizon of accumulation. Reaction ranges from moderately to strongly alkaline. Texture between depths of 10 and 40 inches is generally loamy fine sand but includes loamy sand, and these are strata of sand or fine sand that contain as much as 15 percent gravel in places. In places very thin lime coatings are on the gravel.

Sw—Sundown fine sand. This nearly level soil is in medium sized, irregularly shaped areas on smooth alluvial fans that are slightly higher than the flood plain. Included in mapping, and making up about 10 percent of the acreage, are Bluewing, Noyson, Jolan, and Stumble soils.

Runoff is very slow. The hazard of soil blowing is high.

This soil has limited suitability for irrigated crops if irrigation water is made available. It is used mainly for range and wildlife habitat. Capability unit IIIs–22 irrigated, capability subclass VIIs dryland; range site NV 29–16, Desert Sand.

Timblin Series

The Timblin series consists of well drained soils that are moderately deep to a strongly cemented hardpan. These soils formed in residuum weathered from basalt, andesite, and tuff. They are moderately sloping to strongly sloping and are on plateaus. Slopes range from 4 to 15 percent. The vegetation consists of black sagebrush, galleta, squirreltail, Sandberg bluegrass, Indian ricegrass, and juniper trees. Elevation ranges from 7,000 to 8,500 feet. Mean annual precipitation is 10 to 14 inches. Mean annual air temperature is 40° to 44° F, and the length of the frost-free season is 80 to 100 days.

In a representative profile the surface layer is grayish brown very cobbly fine sandy loam about 2 inches thick. Below this is light gray stony silt loam about 2 inches thick. The next layer is about 32 inches of pale brown and brown stony clay loam and stony clay. Below this is yellowish brown stony loam about 3 inches thick. A white strongly cemented hardpan is at a depth of 39 inches and extends to a depth of 41 inches or more.

Timblin soils have slow permeability above the hardpan and very slow permeability through it. Effective rooting depth is about 39 inches. Available water capacity is moderate. Runoff is medium, and the hazard of erosion is slight.

Representative profile of Timblin very cobbly fine sandy loam in an area of Timblin-McCann association, 20 miles north of Tonopah, about 1,800 feet south and 800 feet east of the northwest corner of unsurveyed sec. 6, T. 5 N., R. 43 E.:

A1—0 to 2 inches; grayish brown (10YR 5/2) very cobbly fine sandy loam, very dark grayish brown (10YR 3/2) moist; massive; soft, very friable, nonsticky, nonplastic; few very fine roots; few very fine tubular pores; about 70 percent cobbles and gravel; neutral; abrupt smooth boundary.

A2—2 to 4 inches; light gray (10YR 7/2) stony silt loam, dark grayish brown (10YR 4/2) moist; moderate thin platy structure; soft, very friable, slightly sticky, slightly plastic; few very fine and common fine roots; many very fine vesicular pores; about 1 percent stones; neutral; abrupt smooth boundary.

A&B—4 to 5 inches; pale brown (10YR 6/3) stony clay loam, brown (10YR 4/3) moist, with many light gray (10YR 7/2) clean sand grains; moderate thin and very thin platy structure; slightly hard, very friable, sticky, plastic; few very fine and fine roots; common very fine tubular pores; about 1 percent stones; few thin clay films on ped faces; neutral; abrupt wavy boundary.

B2t—5 to 15 inches; brown (10YR 4/3) stony clay, brown (10YR 4/3) moist ; moderate fine and medium columnar structure parting to fine and medium blocky; many clean sand grains coating the tops of the columns; very hard, friable, very sticky, very plastic; few fine and very fine roots; common very fine tubular pores; about 1 percent stones; few thin clay films on ped faces; neutral; abrupt wavy boundary.

B31tca—15 to 19 inches; brown (10YR 5/3) stony heavy clay loam, brown (10YR 4/3) moist; massive; hard, very friable, sticky, plastic; few very fine and fine roots; common very fine and fine tubular pores; few fine prominent white (10YR 8/1) violently effervescent soft lime masses; many very thin clay films bridging sand grains and few thin clay films in pores; about 1 percent stones; moderately alkaline; gradual wavy boundary.

B32tca—19 to 36 inches; brown (10YR 5/3) stony heavy clay loam, brown (10YR 4/3) moist; massive; slightly hard, very friable, sticky, plastic; few very fine and fine roots; common very fine and fine tubular pores; common medium and coarse prominent white (10YR 8/1) soft masses of lime; many thin and few moderately thick clay bridges; about 1 percent stones; strongly effervescent; strongly alkaline; clear wavy boundary.

C1ca—36 to 39 inches; yellowish brown (10YR 5/4) stony loam, dark grayish brown (10YR 4/2) moist; massive; soft, very friable, nonsticky, slightly plastic; few very fine roots; few fine tubular pores; about 1 percent stones; violently effervescent; moderately alkaline; abrupt smooth boundary.

C2sicam—39 to 41 inches; white (10YR 8/2) strongly cemented duripan, very pale brown (10YR 7/3) moist, light yellowish brown (10YR 6/4) silica coating; extremely hard, extremely firm; violently effervescent; strongly alkaline.

Thickness of the solum ranges from 22 to 38 inches. Depth to the hardpan ranges from 22 to 40 inches. The upper part of the solum is noncalcareous, and the lower part of the solum, the C horizon, and the hardpan are calcareous. There are few to many, fine to medium lime segregations in the lower part of the solum. Reaction ranges from neutral to mildly alkaline in the A horizon, mildly alkaline to moderately alkaline in the B2t horizon, moderately alkaline to strongly alkaline in the B3t horizon, and moderately alkaline to very strongly alkaline in the C horizon and hardpan. The A horizon is massive or has weak to moderate, very thin or thin, platy structure. The A1 horizon is very stony, very cobbly, or gravelly. The Bt horizon has moderate, medium or fine, columnar or prismatic structure that parts to angular blocky when displaced. It is dominantly clay but includes subhorizons of heavy clay loam.

TC—Timblin-McCann association. This association of moderately sloping to steep soils is in large, irregu-

larly shaped areas on mountains and plateaus. Timblin very cobbly fine sandy loam, 4 to 15 percent slopes, makes up about 50 percent of the association, and McCann extremely stony loam, 15 to 50 percent slopes, makes up 30 percent. Included in mapping, and making up about 20 percent of the acreage, are Old Camp and Vinini soils and Rock outcrop.

Both soils have the profiles described as representative of their respective series. The Timblin soil is on the slightly higher plateaus, and the McCann soil is on moderately steep to steep mountainsides.

Runoff is medium. On the Timblin soil the hazard of erosion is slight, and on the McCann soil the hazard of erosion is moderate.

This association is not suited to irrigated crops. It is used mainly for range and wildlife habitat. Capability subclass VIIs dryland; range site NV 28–7 and NV 29–7, Upland Juniper Slope.

Timper Series

The Timper series consists of well drained soils that are shallow to a strongly cemented hardpan. These soils formed in alluvium derived mainly from tuff and other volcanic rock. They are nearly level to gently sloping and are on smooth valley-fill plains, alluvial fans, and low lake terraces. Slopes range from 0 to 4 percent. The vegetation is Bailey greasewood, shadscale, Anderson wolfberry, bud sagebrush, kochia, and globemallow. Elevation ranges from 4,700 to 5,200 feet. Mean annual precipitation is 4 to 6 inches. Mean annual air temperature is 48° to 51° F, and the length of the frost-free season is 130 to 150 days.

In a representative profile the surface layer is light brownish gray gravelly sandy loam over light gray sandy loam about 3 inches thick. The next layer is very pale brown loam about 5 inches thick. Below this is very pale brown sandy loam about 4 inches thick. A very pale brown strongly cemented hardpan is at a depth of 12 inches. It is about 3 inches thick. Below the hardpan is light gray gravelly sandy loam that extends to a depth of 60 inches or more.

Timper soils have moderately rapid permeability above the hardpan and very slow permeability through it. Effective rooting depth is about 12 inches. Available water capacity is very low. Runoff is slow, and the hazard of erosion is slight.

Representative profile of Timper gravelly sandy loam, 0 to 4 percent slopes, about 50 feet east of the old Austin-Tonopah road, about 20 miles north of Tonopah, about 300 feet south of the northwest corner sec. 9, T. 5 N., R. 41 E.:

A11—0 to 1 inch; light brownish gray (10YR 6/2) gravelly sandy loam, dark grayish brown (10YR 4/2) moist; single grained; soft, very friable, nonsticky, nonplastic; many very fine interstitial pores; strongly alkaline; abrupt smooth boundary.

A12—1 to 3 inches; light gray (10YR 7/2) sandy loam, dark grayish brown (10YR 4/2) moist; strong very coarse prismatic structure; soft, very friable; nonsticky, nonplastic; few very fine and fine roots; many very fine and fine vesicular pores; strongly effervescent; strongly alkaline; clear smooth boundary.

C1—3 to 8 inches; very pale brown (10YR 7/3) loam, brown (10YR 5/3) moist; strong very coarse prismatic structure; hard, friable, slightly sticky, slightly plastic; many very fine and few fine and medium roots; many very fine vesicular and common very fine and fine tubular pores; violently effervescent; very strongly alkaline; clear smooth boundary.

C2sica—8 to 12 inches; very pale brown (10YR 7/3) sandy loam, dark yellowish brown (10YR 4/3) moist; strong thick and very thick weakly cemented platy structure; hard and very hard, very friable and firm, nonsticky, nonplastic; many very fine and few fine roots; many very fine vesicular and few very fine tubular pores; white (10YR 8/1) lime and very pale brown (10YR 7/3) silica coatings on the underside of plates and in tubular pores; violently effervescent; strongly alkaline; abrupt wavy boundary.

C3sicam—12 to 15 inches; very pale brown (10YR 7/3) strongly cemented duripan, brown (10YR 4/3) moist; strong thick platy structure; very hard, very firm, nonsticky, nonplastic; white (10YR 8/1) lime and yellowish brown (10YR 5/4) silica coatings on plates; violently effervescent; very strongly alkaline; abrupt smooth boundary.

C4sica—15 to 24 inches; light gray (10YR 7/2) gravelly sandy loam, brown (10YR 5/3) moist; massive; very hard, firm; few micro tubular pores; white (10YR 8/1) and light gray (10YR 7/2) silica coatings on gravel; violently effervescent; strongly alkaline; abrupt wavy boundary.

C5sica—24 to 60 inches; light gray (10YR 7/2) gravelly sandy loam, brown (10YR 5/3) moist; massive; very hard, friable, nonsticky, nonplastic; pockets of white (10YR 8/1) lime and pale brown (10YR 7/2) silica coatings on gravel and plates; violently effervescent; strongly alkaline.

Depth to the hardpan ranges from 12 to 20 inches. Above the hardpan, the texture is sand, sandy loam, fine sandy loam, or loam, and the soil is gravelly in places. Below the hardpan the texture includes loam, gravelly sandy loam, gravelly sand, or fine sand. Depth to lime ranges from 1 to 15 inches. The A horizon is soft to slightly hard.

TdA—Timper sand, 0 to 2 percent slopes. This soil is in medium sized, irregularly shaped areas on slightly undulating valley-fill plains. This soil has a profile similar to the one described as representative of the series, but the surface layer is sand about 4 inches thick, and the substratum is stratified loamy sand and sand. Included in mapping, and making up about 5 percent of the acreage, are Stargo and Belcher soils.

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

This soil has very limited suitability for irrigated crops if irrigation water is made available. It is used mainly for range and wildlife habitat. Capability unit IVs–50 irrigated, capability subclass VIIs dryland; range site NV 28–2 and NV 29–2, Desert Loamy Sal.

TEB—Timper gravelly sandy loam, 0 to 4 percent slopes. This nearly level to gently sloping soil is in very large, irregularly shaped areas on alluvial fans. It has the profile described as representative of the series. Included in mapping, and making up about 10 percent of the acreage, are Timper sand and Belcher, Belted, and Stargo soils.

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

This soil has very limited suitability for irrigated crops if irrigation water is made available. It is used mainly for range and wildlife habitat. Capability unit IVs–50 irrigated, capability subclass VIIs dryland; range site NV 28–2 and NV 29–2, Desert Loamy Sal.

TF—Timper-Playas complex. This complex of early level to gently sloping soils is in small, irregularly shaped areas on basins, low lake terraces, and alluvial fans. Timper gravelly sandy loam, 0 to 4 percent slopes, makes up about 65 percent of the complex, and Playas make up 25 percent. Included in mapping, and making up about 10 percent of the acreage, are Bluewing and Youngston soils.

The Timper soil has a profile similar to the one described as representative of the series. It is on the slightly raised areas surrounding the small flat basins. The surface layer is darker and it supports vegetation. Playas are in slightly lower, basinlike areas that are surrounded by the Timper soil. They have a light colored surface and are essentially barren.

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

This complex is not suited to irrigated crops. It is used for limited range and wildlife habitat. Capability subclass VIIs dryland; Timper soil in range site NV 28–2 and NV 29–2, Desert Loamy Sal; Playas not placed in a range site.

Tipperary Series

The Tipperary series consists of very deep, excessively drained soils that formed in alluvial material and loess deposits derived from mixed rock sources. These soils are nearly level to moderately steep. They are on old terraces, lake plains, and alluvial fans. Slopes range from 4 to 30 percent. The vegetation consists of black greasewood, fourwing saltbush, hairy horsebrush, Indian ricegrass, needleandthread, and sand dropseed. Elevation ranges from 5,000 to 6,000 feet. Mean annual precipitation is 4 to 6 inches. Mean annual air temperature is 43° to 51° F, and the length of the frost-free season is 100 to 150 days.

In a representative profile the surface layer is light brownish gray fine sand about 6 inches thick. Below this is light brownish gray fine sand that extends to a depth of 60 inches or more.

Tipperary soils have very rapid permeability. Effective rooting depth is about 60 inches. Available water capacity is low. Runoff is very slow. The hazard of soil blowing is high.

Representative profile of Tipperary fine sand, 4 to 30 percent slopes, about 2 miles southwest of the San Antonio Ranch and 1,000 feet north of a graded road, 4,200 feet south and 4,200 feet west of the northeast corner sec. 23, T. 7 N., R. 41 E.:

C1—0 to 6 inches; light brownish gray (10YR 6/2) fine sand, dark grayish brown (10YR 4/2) moist; single grained; slightly hard, very friable, nonsticky, nonplastic; common very fine roots; few very fine and fine tubular pores; strongly alkaline; abrupt wavy boundary.

C2—6 to 60 inches; light brownish gray (10YR 6/2) fine sand, dark grayish brown (10YR 4/2) moist; single grained; soft, very friable, nonsticky, nonplastic; many very fine and fine and few medium roots; common very fine tubular pores; effervescent; strongly alkaline.

The profile ranges from sand to fine sand throughout. The soil is generally calcareous except in the surface layer. In some places unconformable material restricts root penetration and permeability below a depth of 30 inches.

TGE—Tipperary fine sand, 4 to 30 percent slopes. This moderately sloping to moderately steep soil is in small, irregularly shaped areas on sand ridges and dunes 20 to 60 inches high. These dunes are superimposed upon other soils on the alluvial fans. This soil has the profile described as representative of the series. Included in mapping, and making up about 10 percent of the acreage, are Nyserva soils and Dune land.

Runoff is very slow. The hazard of soil blowing is high.

This soil is not suited to irrigated crops. It is used mainly for range and wildlife habitat. Capability subclass VIIs dryland; range site NV 28–18 and NV 29–18, Desert Dune.

TH—Tipperary-Fivemile complex. This complex of nearly level to moderately steep soils is in medium, long, narrow areas on flood plains. Tipperary fine sand, 4 to 30 percent slopes, makes up about 70 percent of the complex, and Fivemile loam, 0 to 2 percent slopes, makes up 20 percent. Included in mapping, and making up about 10 percent of the acreage, are soils similar to Fivemile soils.

The Tipperary soil has a profile similar to the one described as representative of the series. It is sand ridges and dunes that are 30 inches to 10 feet high and that are superimposed upon the Fivemile soil. Side slopes of the dunes are as steep as 30 percent. The Fivemile soil has a profile similar to the one described as representative of the series, but it has a loam surface layer. It is nearly level, is on flood plains, surrounds the small islands of sand ridges and dunes, and is saline alkali affected.

On the Tipperary soil runoff is very slow. The hazard of soil blowing is high. On the Fivemile soil runoff is slow, and the hazard of erosion is slight.

This complex is not suited to irrigated crops. It is used mainly for range and wildlife habitat. Capability subclass VIIs dryland; Tipperary soil in range site NV 28–18 and NV 29–18, Desert Dune; Fivemile soil in range site NV 29–6, Loamy Bottom.

TM—Tipperary-Playas complex. This complex of nearly level to moderately steep soils is in large, irregularly shaped areas in basins and on low lake terraces. Tipperary fine sand, 4 to 30 percent slopes, makes up about 60 percent of the complex, and Playas make up 30 percent. Included in mapping, and making up about 10 percent of the acreage, are Parran and Umberland soils, and some playas that have 4 to 20 inches of sand on the surface.

The Tipperary soil has a profile similar to the one described as representative of the series. It is sand ridges and dunes that are 30 inches to 10 feet high and that have been superimposed upon the Playas. Side slopes of the dunes are as steep as 30 percent. Playas are basin areas that are smooth, nearly level, and essentially barren.

On the Tipperary soil runoff is very slow. The hazard of soil blowing is high.

This complex is not suited to irrigated crops. It is used for limited range and wildlife habitat. Capability subclass VIIs dryland; Tipperary soil in range site NV 28–18 and NV 29–18, Desert Dune; Playas not placed in a range site.

Tomel Series

The Tomel series consists of well drained soils that are shallow to an indurated hardpan. These soils formed in alluvium derived mainly from shale, schistose, limestone, chert, and interbedded quartz. They are gently sloping to moderately sloping and are on alluvial fans. Slopes range from 2 to 8 percent. The vegetation consists of Bailey greasewood, shadscale, bud sagebrush, galleta, kings desertgrass, kochia, ephedra, Indian ricegrass, and sand dropseed. Elevation ranges from 5,800 to 6,200 feet. Mean annual precipitation is 4 to 6 inches. Mean annual air temperature is 43° to 47° F, and the length of the frost-free season is 100 to 130 days.

In a representative profile the surface layer is light gray very gravelly sandy loam about 2 inches thick. Next is about 5 inches of very pale brown and brown gravelly clay loam and about 2 inches of pale brown very gravelly clay loam. Below this is very pale brown gravelly sandy loam about 3 inches thick. A very pale brown gravelly indurated hardpan is at a depth of 12 inches. It is about 15 inches thick. Below the hardpan is gray very gravelly sand that extends to a depth of 60 inches or more.

Tomel soils have moderately slow permeability above the hardpan and very slow permeability through it. Effective rooting depth is about 12 inches. Available water capacity is very low. Runoff is medium to rapid, and the hazard of erosion is slight.

Representative profile of Tomel very gravelly sandy loam, in an area of Tomel-Laxal association, about 8 miles southwest of Manhattan, about 100 feet north of the southeast corner sec. 30, T. 8 N., R. 43 E.:

A1—0 to 2 inches; light gray (10YR 7/2) very gravelly sandy loam, dark grayish brown (10YR 4/2) moist; massive; slightly hard, very friable, nonsticky, slightly plastic; common medium roots; many very fine and fine vesicular pores; slightly effervescent; strongly alkaline; abrupt wavy boundary.

A2—2 to 3 inches; very pale brown (10YR 7/3) gravelly clay loam, brown (10YR 4/3) moist; weak thin platy structure; slightly hard, very friable, slightly sticky, slightly plastic; common medium roots; many very fine vesicular and few very fine tubular pores; slightly effervescent; strongly alkaline; abrupt smooth boundary.

B2t—3 to 7 inches; brown (10YR 5/3) gravelly clay loam, dark yellowish brown (10YR 4/4) moist; weak medium prismatic and weak very fine and fine angular and subangular blocky structure; hard, very friable, very sticky, plastic; many very fine and few fine and medium roots; few very fine tubular pores; 25 percent gravel; common thin clay films on ped faces and in pores; moderately alkaline; clear smooth boundary.

B31t—7 to 9 inches; pale brown (10YR 6/3) very gravelly clay loam, brown (10YR 4/3) moist; moderate fine subangular blocky structure; slightly hard, very friable, sticky, plastic; many very fine and few fine roots; common very fine tubular pores; 60 percent gravel; few thin clay films bridging and coating sand grains; slightly effervescent; gravel has violently effervescent white (10YR 8/1) lime and very pale brown (10YR 7/4) silica coatings on the underside; strongly alkaline; abrupt smooth boundary.

B32ca—9 to 12 inches; very pale brown (10YR 7/3) gravelly sandy loam, brown (10YR 4/3) moist; massive; slightly hard, very friable, nonsticky, nonplastic; common very fine roots; few very fine tubular pores; strongly effervescent; gravel has violently effervescent white (10YR 8/1) lime and very pale brown (10YR 7/4) silica coatings on the underside; strongly alkaline; abrupt smooth boundary.

C1sicam—12 to 27 inches; very pale brown (10YR 7/3) gravelly indurated duripan, pale brown (10YR 6/3) moist, with very pale brown (10YR 7/4) pendants and continuous laminae 2 to 5 millimeters thick on rocks and capping duripan; massive; very hard and extremely hard, extremely firm; few very fine roots; violently effervescent; strongly alkaline; clear smooth boundary.

IIC2sica—27 to 60 inches; gray (10YR 6/1) very gravelly sand, dark gray (10YR 4/1) moist, with white (10YR 8/1) lime and very pale brown (10YR 7/4) silica coatings on the underside of gravel; massive; soft, very friable, common very fine roots; many very fine interstitial pores; violently effervescent; strongly alkaline.

Thickness of the solum and depth to the hardpan range from 10 to 20 inches. The A horizon is fine sandy loam, loamy sand, clay loam, or loam and generally is gravelly or very gravelly. It is commonly massive but has weak thin platy structure in some places. The B2t horizon is clay loam or sandy clay loam and has 20 to 30 percent clay and 10 to 35 percent gravel. This horizon has weak or moderate prismatic structure that parts to weak or moderate very fine to medium subangular or angular blocky structure. The B3 horizon has moderate or weak fine subangular blocky structure or it is massive. It has 40 to 65 percent gravel. The IIC horizon has 50 to 80 percent rock fragments.

TN—Tomel-Laxal association. This association of gently sloping to moderately sloping soils is in large, irregularly shaped areas on smooth, dissected alluvial fans. Tomel very gravelly sandy loam, 2 to 8 percent slopes, makes up about 60 percent of the association, and Laxal gravelly loam, 2 to 8 percent slopes, makes up 30 percent. Included in mapping, and making up about 10 percent of the acreage, are Bluewing soil in the dry washes and some Tomel soils from which 2 to 4 inches of the surface layer has been eroded.

The Tomel soil is on older and slightly higher alluvial fans. The Laxal soil is on younger and lower alluvial fans and aprons.

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

This Tomel soil is not suited to irrigated crops, but the Laxal soil is suited to irrigated crops if irrigation water is made available. The association is used mainly for range and wildlife habitat. Tomel soil in capability subclass VIIs dryland, range site NV 28–2 and NV 29–2, Desert Loamy Sal; Laxal soil in capability unit IIIe–25 irrigated, capability subclass VIIs dryland, range site NV 28–1 and NV 29–1, Desert Loamy.

Tybo Series

The Tybo series consists of well drained soils that are shallow to an indurated hardpan. These soils formed in alluvium derived from volcanic rocks that have a high percentage of ash. They are gently sloping to moderately sloping and are on truncated alluvial fans. Slopes range from 2 to 8 percent. The vegetation consists of Bailey greasewood, shadscale, ephedra, gal-

leta, and Indian ricegrass. Elevation ranges from 5,500 to 6,500 feet. Mean annual precipitation is 4 to 6 inches. Mean annual air temperature is 45° to 50° F, and the length of the frost-free season is 100 to 130 days.

In a representative profile the surface layer is light gray gravelly fine sandy loam about 2 inches thick. The next layer is very pale brown and pale brown fine sandy loam about 5 inches thick. Below this is about 4 inches of very pale brown gravelly sandy loam. A white indurated hardpan is at a depth of 11 inches and extends to a depth of 34 inches or more.

Tybo soils have moderately rapid permeability above the hardpan but very slow permeability through it. Effective rooting depth is about 11 inches. Available water capacity is very low. Runoff is rapid, and the hazard of erosion is low to moderate.

Representative profile of Tybo gravelly fine sandy loam, in an area of Tybo-Stumble association, 2 to 8 percent slopes, about 12 miles north of Tonopah, 10 feet south and 28 feet west of the northeast corner sec. 8, T. 3 N., R. 41 E.:

A1—0 to 2 inches; light gray (10YR 7/2) gravelly fine sandy loam, dark grayish brown (10YR 4/2) moist; weak very thick platy structure; soft, very friable, nonsticky, nonplastic; many very fine roots; many very fine and fine vesicular pores; about 25 percent gravel; violently effervescent; very strongly alkaline; abrupt smooth boundary.

B1—2 to 4 inches; very pale brown (10YR 7/3) fine sandy loam, brown (10YR 4/3) moist; weak thin and medium platy structure; soft, very friable, nonsticky, nonplastic; few very fine, fine, and medium roots; many very fine interstitial pores; few thin clay films coating sand grains; strongly effervescent; very strongly alkaline; abrupt wavy boundary.

B2—4 to 7 inches; pale brown (10YR 6/3) fine sandy loam, brown (10YR 4/3) moist; massive; soft, very friable, slightly sticky, slightly plastic; few very fine, fine, and medium roots; common very fine interstitial pores; few thin clay films coating sand grains; effervescent; strongly alkaline; clear broken boundary.

C1ca—7 to 11 inches; very pale brown (10YR 7/3) gravelly sandy loam, yellowish brown (10YR 5/4) moist; massive; soft, very friable, nonsticky, nonplastic; many very fine, common fine, and few medium roots; few very fine and fine interstitial and tubular pores; about 20 percent gravel; violently effervescent; very strongly alkaline; abrupt wavy boundary.

C2sicam—11 to 34 inches; white (10YR 8/2) indurated duripan, very pale brown (10YR 7/4) moist; massive; extremely hard, extremely firm; violently effervescent; strongly alkaline.

Depth to the hardpan is 8 to 17 inches. Texture is dominantly fine sandy loam but is sandy loam or very fine sandy loam in some places that have less than 18 percent clay. As much as 30 percent rock fragments are in any one horizon. The soil is slightly effervescent to violently effervescent. Reaction ranges from strongly alkaline to very strongly alkaline. The A horizon has weak or moderate, thin to very thick, platy structure, or it is massive. The B2 horizon has weak or moderate, coarse, prismatic structure, or it is massive.

TOB—Tybo loamy fine sand, 2 to 4 percent slopes. This gently sloping soil is in small, irregularly shaped areas on undulating alluvial fans. It has a profile similar to the one described as representative of the series, but the surface layer is loamy fine sand about 3 inches thick, and the soil is noncalcareous. This soil as mapped in this area is slightly outside the range in characteristics of the series because it is noncalcareous. Included in mapping, and making up about 5 percent of the acreage, are Bluewing and Stumble soils.

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

This soil is not suited to irrigated crops. It is used mainly for range and wildlife habitat. Capability subclass VIIs dryland; range site NV 28–2 and NV 29–2, Desert Loamy Sal.

TR—Tybo-Bluewing association. This association of nearly level to moderately sloping soils is in medium sized, irregularly shaped areas on alluvial fans that have been highly dissected by dry washes 2 to 5 feet deep. Tybo loamy fine sand, 2 to 8 percent slopes, makes up about 80 percent of the association, and Bluewing stony loamy coarse sand, 0 to 8 percent slopes, makes up 15 percent. Included in mapping, and making up about 5 percent of the acreage, are Dobel soils.

The Tybo soil has a profile similar to the one described as representative of the Tybo series, but it has a surface layer of loamy fine sand. It is on the raised surfaces of the alluvial fans. The Bluewing soil has a profile similar to the one described as representative of the Bluewing series, but it has a surface layer of stony loamy coarse sand. It is in the numerous dry washes that have been cut 2 to 5 feet into the fans.

On the Tybo soil runoff is rapid, and the hazard of erosion is moderate. On the Bluewing soil runoff is very slow, and the hazard of erosion is slight.

This association is not suited to irrigated crops. It is used for range and wildlife habitat. Capability subclass VIIs dryland; range site NV 28–2 and NV 29–2, Desert Loamy Sal.

TS—Tybo-Stumble association. This association of nearly level to moderately sloping soils is in large, irregularly shaped areas on alluvial fans. Tybo gravelly fine sandy loam, 2 to 8 percent slopes, makes up about 60 percent of the association, and Stumble loamy fine sand, 0 to 8 percent slopes, makes up 30 percent. Included in mapping, and making up about 10 percent of the acreage, is a Bluewing soil in the dry washes that dissect the fans.

The Tybo soil has the profile described as representative of the Tybo. The Stumble soil has a profile similar to the one described as representative of the Stumble series. The Tybo soil is shallow and has a hardpan at a depth of about 11 inches. It has a gravelly surface layer and is on truncated alluvial fans. The Stumble soil is deep and nongravelly, is nearly level or slightly convex, and is on the alluvial fans.

On the Tybo soil runoff is rapid, and the hazard of erosion is moderate. On the Stumble soil runoff is very slow, and the hazard of erosion is high.

The Tybo soil is not suited to irrigated crops. The Stumble soil is suited to irrigated crops if irrigation water is made available. The association is used mainly for range and wildlife habitat. Tybo soil in capability subclass VIIs dryland, range site NV 28–2 and NV 29–2, Desert Loamy Sal; Stumble soil in capability unit IIIs–22 irrigated, capability subclass VIIs dryland, range site NV 29–16, Desert Sand.

Umberland Series

The Umberland series consists of very deep, somewhat poorly drained, strongly saline-alkali affected soils that formed in silty lacustrine sediments derived from mixed rock sources. These soils are level and nearly level. They are on lake terraces. Slopes are 0 to 2 percent. The vegetation consists of saltgrass, black greasewood, pickleweed, wiregrass, alkali cordgrass, alkali sacaton, Great Basin wildrye, and buffaloberry. Elevation is about 5,600 feet. Mean annual precipitation is 4 to 6 inches. Mean annual air temperature is 43° to 45° F, and the length of the frost-free season is 100 to 130 days.

In a representative profile the surface layer is light gray clay loam about 3 inches thick. The next layer is light gray silty clay about 12 inches thick. Below this is light gray mottled silty clay loam that extends to a depth of 60 inches or more.

Umberland soils have very slow permeability. Effective rooting depth is about 60 inches. Available water capacity is high. Runoff is very slow or ponded, and the hazard of erosion is slight.

Representative profile of Umberland clay loam, about 5 miles south of junction of State Route 8A and the Nye-Lander County line, 0.3 mile south of dirt road, 0.3 mile south of northeast corner sec. 7, T. 14 N., R. 44 E.:

A1—0 to 3 inches; light gray (2.5Y 7/2) clay loam, light olive brown (2.5Y 5/4) moist; massive, with ¼ to ½-inch surface crust; slightly hard, very friable, sticky, plastic; many medium roots; many very fine vesicular and common very fine tubular pores; violently effervescent; very strongly alkaline; clear smooth boundary.

C1—3 to 7 inches; light gray (2.5Y 7/2) silty clay, light olive brown (2.5Y 5/4) moist; strong very fine granular structure; slightly hard, very friable, sticky, plastic; many medium, few fine and many very fine roots; many very fine interstitial and common very fine tubular pores; violently effervescent; very strongly alkaline; clear smooth boundary.

C2—7 to 15 inches; light gray (10YR 7/2) silty clay, light olive brown (10YR 5/4) moist; massive; hard, very friable, sticky, plastic; few coarse and medium, and common very fine roots; many very fine and fine tubular pores; violently effervescent; very strongly alkaline; gradual smooth boundary.

C3ca—15 to 54 inches; light gray (2.5Y 7/2) heavy silty clay loam, light olive brown (2.5Y 5/4) moist; few fine faint dark brown (7.5YR 4/4) mottles, dark reddish brown (5YR 4/4) moist; moderate very fine angular and subangular blocky structure; hard, firm, sticky, plastic; few very fine and fine roots; common very fine, and few fine tubular pores; few small lime nodules; violently effervescent; very strongly alkaline; gradual smooth boundary.

C4ca—54 to 60 inches; light gray (10YR 7/2) silty clay loam, olive gray (5Y 5/2) moist; common fine and medium distinct dark reddish brown (5YR 3/4) moist mottles; moderate very fine angular and subangular blocky structure; hard, firm, sticky, plastic; few small lime nodules; violently effervescent; strongly alkaline.

These soils have a high water table between depths of 20 and 40 inches for at least a month during most years. Texture between depths of 10 and 40 inches is dominantly silty clay loam and light clay. These soils are calcareous throughout, and lime concretions are in some profiles. Reaction is strongly alkaline to very strongly alkaline.

UM—Umberland clay loam. This level and nearly level soil is in very large, irregularly shaped areas on basins and low lake terraces. It has the profile described as representative of the series. Included in mapping, and making up about 10 percent of the acreage, is an Umberland soil that is poorly drained.

Runoff is very slow or ponded, and the hazard of erosion is slight. A seasonal water table fluctuates between depths of 20 and 60 inches and is highest in the spring. This soil is strongly saline-alkali affected.

This soil is not suited to irrigated crops. It is used mainly for range and wildlife habitat. Capability subclass VIIw dryland; range site NV 28–13, Saline Meadow.

UN—Umberland-Parran complex. This complex of nearly level soils is in medium sized, irregularly shaped areas in basins and on low lake terraces. Umberland clay loam makes up about 40 percent of the complex, and Parran silty clay loam makes up 40 percent. Included in mapping, and making up about 20 percent of the acreage, are an Umberland soil that is poorly drained and some small playas.

Both soils have a profile that is similar to the one described as representative of their respective series. The Umberland soil is in small basinlike areas that are 1 to 3 feet lower than the surrounding terraces. It is somewhat poorly drained and has a water table between depths of 20 and 60 inches. It is strongly saline-alkali affected. The Parran soil is on low lake terraces that are slightly higher than the basins. It is somewhat poorly drained and has a water table between depths of 60 and 72 inches. It is strongly saline-alkali affected.

Runoff is very slow or ponded, and the hazard of erosion is slight.

This complex is not suited to irrigated crops. It is used mainly for range and wildlife habitat. Capability subclass VIIw dryland; Umberland soil in range site NV 28–13, Saline Meadow; Parran soil in range site NV 28–3 and NV 29–3, Sodic Flat.

UR—Umberland-Playas complex. This complex of nearly level soils and playas is in large, irregularly shaped areas on basins and low lake terraces. Umberland sand makes up about 45 percent of the complex, Playas make up 30 percent, and Tipperary sand makes up 15 percent. Included in mapping, and making up about 10 percent of the acreage, are Orizaba, Yobe, and Nyserva soils.

The Umberland soil has a profile similar to the one described as representative of the Umberland series, but the surface layer is sand 4 to 20 inches thick. It is on the low lake terraces. It has a sandy surface of small dunes that are 4 to 20 inches high and that are superimposed on typical Umberland soil. Playas are in basins, have a smooth surface, and are barren. The Tipperary soil has a profile similar to the one described as representative of the Tipperary series. It consists of sand dunes that are 2 to 7 feet high and that have been superimposed upon low lake terraces.

On the Umberland soil runoff is very slow, and the hazard of erosion is slight. On the Tipperary soil runoff is very rapid, and the hazard of soil blowing is high.

This complex is not suited to irrigated crops. It is used for limited range and wildlife habitat. Capability subclass VIIw dryland; Umberland soil in range site NV 28–13, Saline Meadow; Tipperary soil in range site NV 28–18 and NV 29–18, Desert Dune; Playas not placed in a range site.

Unsel Series

The Unsel series consists of very deep, well drained soils that formed in alluvium derived mostly from volcanic rocks. These soils are gently sloping to moderately sloping. They are on dissected alluvial fans. Slopes range from 2 to 8 percent. The vegetation consists of Bailey greasewood, shadscale, bud sagebrush, galleta, kochia, and Douglas rabbitbrush. Elevation ranges from 5,600 to 6,200 feet. Mean annual precipitation is 4 to 6 inches. Mean annual air temperature is 47° to 50° F, and the length of the frost-free season is 100 to 130 days.

In a representative profile the surface layer is light gray gravelly loam about 4 inches thick. Below this is dark yellowish brown and pale brown gravelly clay loam about 6 inches thick. The next layer is about 21 inches of pale brown gravelly sandy loam. It is underlain by very pale brown very gravelly sand that extends to a depth of 60 inches or more.

Unsel soils have moderately rapid permeability. Effective rooting depth is about 60 inches. Available water capacity is low. Runoff is rapid, and the hazard of erosion is slight.

Representative profile of Unsel gravelly loam in an area of Unsel-Bluewing complex, about 1.5 miles northwest of the mouth of North Umberland Canyon and 530 feet south of the road, 0.7 mile west of the north quarter corner sec. 36, T. 14 N., R. 44 E.:

A1—0 to 4 inches; light gray (10YR 7/2) gravelly loam, dark grayish brown (10YR 4/2) moist; massive; slightly hard, very friable, slightly sticky, slightly plastic; many very fine and fine vesicular, and few very fine and fine tubular pores; 25 percent gravel; violently effervescent; very strongly alkaline; abrupt wavy boundary.

B21t—4 to 7 inches; dark yellowish brown (10YR 4/2) gravelly clay loam, brown (7.5YR 5/4) moist; compound weak medium prismatic and weak fine and medium subangular blocky structure; slightly hard, very friable, sticky, plastic; common very fine roots; few very fine and fine tubular pores; few thin clay films on ped faces, in pores, and bridging sand grains; 20 percent gravel; noncalcareous matrix that has few fine and medium soft lime masses that are strongly effervescent to violently effervescent; mildly alkaline; abrupt wavy boundary.

B22tca—7 to 10 inches; pale brown (10YR 6/3) gravelly clay loam, brown (10YR 5/4) moist; weak fine and medium subangular blocky structure; slightly hard, very friable, sticky, plastic; common very fine and fine roots; few very fine tubular pores; few thin clay films on ped faces, in pores, and bridging and coating sand grains; 25 percent gravel; noncalcareous matrix that has many fine and medium soft lime masses that are strongly effervescent to violently effervescent; strongly alkaline; abrupt smooth boundary.

C1sica—10 to 31 inches; pale brown (10YR 6/3) gravelly sandy loam containing pockets and thin strata of very gravelly loamy sand and sand, brown (10YR 4/3) moist; massive; soft, very friable, nonsticky, nonplastic; few very fine roots; few very fine tubular pores; discontinuous strongly silica-cemented strata that have discontinuous laminae, 30 percent gravel that has lime and silica coatings on the underside; violently effervescent; strongly alkaline; abrupt smooth boundary.

IIC2—31 to 60 inches; very pale brown (10YR 7/3) very gravelly sand, brown (10YR 5/3) and very dark grayish brown (10YR 3/2) moist; massive; soft, very friable, few very fine roots; 60 percent gravel; violently effervescent; strongly alkaline.

Thickness of the solum and depth to the Csica horizon is 10 to 20 inches. Depth to unconformable very gravelly sand is 20 to 36 inches. The solum has 15 to 30 percent gravel. The A1 horizon has an erosion pavement of fine gravel. It has weak, thin or medium, platy structure, or it is massive. The B horizon is dominantly clay loam but is sandy clay loam in some profiles. It has weak or moderate, fine or medium, subangular blocky or weak, medium or coarse, prismatic structure, but subhorizons in some profiles are massive. The dry consistence is hard or slightly hard. The Csica horizon has many nodules or discontinuous strongly cemented strata that are hard or very hard when dry, firm when moist, and brittle when wet. The gravel content of the IIC horizon ranges from 50 to 70 percent.

UT—Unsel-Bluewing complex. This complex of nearly level to moderately sloping soils is in large, fan-shaped areas on alluvial fans that have many dry washes incised 1 to 5 feet deep. Unsel gravelly loam, 2 to 8 percent slopes, makes up about 65 percent of the complex, and Bluewing stony loamy coarse sand, 0 to 8 percent slopes, makes up 20 percent. Included in mapping, and making up about 15 percent of the acreage, are other Bluewing soils and some Unsel soils in which the surface layer has been eroded.

The Unsel soil has the profile described as representative of the Unsel series. It is on the smooth alluvial fan surfaces. The Bluewing soil has a profile similar to the one described as representative of the Bluewing series, but it has a surface layer of stony loamy coarse sand. It is in the dry washes which have been incised 1 to 5 feet into the fan surface.

On the Unsel soil runoff is rapid, and the hazard of erosion is slight. On the Bluewing soil runoff is very slow, and the hazard of erosion is slight.

This complex is not suited to irrigated crops. It is used mainly for range and wildlife habitat. Capability subclass VIIs dryland; range site NV 28–2 and NV 29–2, Desert Loamy Sal.

Vigus Series

The Vigus series consists of well drained soils that are moderately deep to a weakly cemented layer. These soils formed in alluvium derived from volcanic and sedimentary rocks. They are nearly level to moderately sloping and are on alluvial fans. Slopes range from 0 to 8 percent. The vegetation consists of Bailey greasewood, shadscale, bud sagebrush, galleta, and Indian ricegrass. Elevation ranges from 5,500 to 6,200 feet. Mean annual precipitation is 4 to 6 inches. Mean annual air temperature is 47° to 50° F, and the length of the frost-free season is 100 to 130 days.

In a representative profile the surface layer is light brownish gray gravelly loamy sand about 2 inches thick. Below this is light gray fine sandy loam about 5 inches thick. Next is about 6 inches of brown sandy clay loam. Below this is about 8 inches of pale brown

gravelly loamy sand and about 15 inches of brown sandy loam. White weakly cemented sandy loam is at a depth of 36 inches. It extends to a depth of about 44 inches or more.

Vigus soils have moderately slow permeability. Effective rooting depth is about 36 inches. Available water capacity is moderate. Runoff is medium, and the hazard of erosion is moderate.

Representative profile of Vigus gravelly loamy sand, 2 to 8 percent slopes, about 6 miles south-southeast of the San Antonio Ranch, about 100 feet south of the east quarter corner sec. 36, T. 7 N., R. 42 E.:

A11—0 to 2 inches; light brownish gray (10YR 6/2) gravelly loamy sand, dark grayish brown (10YR 4/2) moist; massive; soft, very friable, nonsticky, nonplastic; common very fine interstitial pores; many very fine tubular pores; neutral; abrupt smooth boundary.

A12—2 to 4 inches; light gray (10YR 7/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; moderate thin platy structure; soft, very friable, nonsticky, nonplastic; common very fine and fine roots; many very fine vesicular and common very fine tubular pores; mildly alkaline; abrupt smooth boundary.

A13—4 to 7 inches; light gray (10YR 7/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; strong medium platy structure; slightly hard, very friable, nonsticky, nonplastic; common very fine and fine roots; many very fine interstitial pores; neutral; abrupt wavy boundary.

B2t—7 to 13 inches; brown (10YR 5/3) sandy clay loam, brown (10YR 4/3) moist, many light gray (10YR 7/2) bleached sand grains; weak medium columnar structure; hard, very friable, slightly sticky, plastic; many very fine, common fine, and few medium roots; common very fine tubular pores; common thin clay films in pores and bridging sand grains; strongly alkaline; clear smooth boundary.

IIC1si—13 to 21 inches; pale brown (10YR 6/3) gravelly loamy sand; massive; soft, very friable, nonsticky, nonplastic; few very fine roots; many very fine tubular pores; about 20 percent durinodes that are hard and firm; strongly alkaline; clear wavy boundary.

IIIC2sica—21 to 36 inches; brown (10YR 5/3) sandy loam, brown (10YR 4/3) moist; massive; slightly hard, very friable, nonsticky, nonplastic; common very fine tubular pores; about 70 percent durinodes that are hard and very firm; many fine white (10YR 8/1) strongly effervescent lime filaments; strongly alkaline; abrupt smooth boundary.

IIIC3sica—36 to 44 inches; white (10YR 8/2) weakly cemented sandy loam, pale brown (10YR 6/3) moist; strong medium and thin platy structure; very hard, firm; violently effervescent; moderately alkaline.

Thickness of the solum and depth to the nodules range from 10 to 24 inches. The A horizon is 4 to 9 inches thick. It is massive or single grained or has moderate to strong, thin or medium, platy structure. Commonly the A horizon is noneffervescent, but it is effervescent in some places. The B2t horizon has weak or moderate, fine to coarse, prismatic or columnar primary structure. It is fine sandy loam, loam, or sandy clay loam and has as much as 25 percent gravel in places. Reaction ranges from moderately alkaline to very strongly alkaline. The C horizon is noneffervescent to strongly effervescent and contains as much as 30 percent gravel. The weakly cemented horizon is hard or very hard and firm. A strongly cemented hardpan that is very hard or extremely hard and very firm or extremely firm is below a depth of 40 inches in some places.

VGC—Vigus gravelly loamy sand, 2 to 8 percent slopes. This gently sloping to moderately sloping soil is in medium sized, irregularly shaped areas on smooth alluvial fans. It has the profile described as representative of the series. Included in mapping, and making up about 10 percent of the acreage, are Bluewing and Koyen soils and other Vigus soils.

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

This soil is suited to irrigated crops if irrigation water is made available. It is used mainly for range and wildlife habitat. Capability unit IIIe–26 irrigated, capability subclass VIIc dryland; range site NV 28–2 and NV 29–2, Desert Loamy Sal.

VK—Vigus-Koyen association. This association of nearly level to gently sloping soils is in very large, irregularly shaped areas on smooth, low alluvial fans. Vigus gravelly fine sandy loam, 0 to 8 percent slopes, makes up 60 percent of the association, and Koyen fine sandy loam, 2 to 4 percent slopes, makes up 25 percent. Included in mapping, and making up about 15 percent of the acreage, are Bluewing, Dobel, and Wardenot soils.

The Vigus soil has a profile similar to the one described as representative of the Vigus series, but it has a surface layer of gravelly sandy loam about 4 inches thick. It is in slightly raised areas of the alluvial fans. The Koyen soil has a profile similar to the one described as representative of the Koyen series, but the surface layer is nongravelly fine sandy loam. This soil is in slight depressions on the alluvial fans.

On the Vigus soil runoff is medium, and the hazard of erosion is moderate. On the Koyen soil runoff is slow, and the hazard of erosion is moderate.

This association is suited to irrigated crops if irrigation water is made available. It is used mainly for range and wildlife habitat. Vigus soil in capability unit IIIe–26 irrigated, Koyen soil in capability unit IIe–20 irrigated; both soils capability subclass VIIc dryland, in range site NV 28–2 and NV 29–2, Desert Loamy Sal.

Vinini Series

The Vinini series consists of well drained soils that are shallow to an indurated hardpan. These soils formed in alluvium and residuum derived from volcanic rocks. They are strongly sloping to moderately steep and are on the uplands. Slopes range from 8 to 30 percent. The vegetation consists of black sagebrush, galleta, Indian ricegrass, ephedra, globemallow, cheatgrass, squirreltail, spiny hopsage, bud sagebrush, and needleandthread. Elevation ranges from 6,000 to 7,200 feet. Mean annual precipiation is 8 to 12 inches. Mean annual air temperature is 40° to 44° F, and the length of the frost-free season is 80 to 100 days.

In a representative profile the surface layer is grayish brown very stony fine sandy loam over light gray very fine sandy loam about 3 inches thick. The next layer is brown very gravelly clay loam about 5 inches thick. Below this is about 5 inches of brown extremely

stony clay loam. A white indurated hardpan is at a depth of 13 inches. It extends to a depth of 30 inches or more.

Vinini soils have moderately slow permeability above the hardpan and very slow permeability through it. Effective rooting depth is about 13 inches. Available water capacity is very low. Runoff is medium, and the hazard of erosion is slight.

Representative profile of Vinini very stony fine sandy loam, 8 to 30 percent slopes, about 10 miles north of Tonopah, on a south slope 250 feet north and 250 feet west of the southeast corner sec. 24, T. 4 N., R. 42 E.:

A11—0 to 1 inch; grayish brown (10YR 5/2) very stony fine sandy loam, dark brown (10YR 3/3) moist; massive; soft, very friable, nonsticky, nonplastic; few very fine roots; many very fine interstitial pores; 5 percent stones; mildly alkaline; abrupt smooth boundary.

A12—1 to 3 inches; light gray (10YR 7/2) very fine sandy loam, brown (10YR 4/3) moist; strong very thin and thin platy structure; slightly hard, very friable, slightly sticky, slightly plastic; few very fine, fine and medium roots; common very fine and fine tubular pores; slightly effervescent; moderately alkaline; abrupt wavy boundary.

B21t—3 to 8 inches; brown (10YR 5/3) very gravelly clay loam, brown (10YR 4/3) moist; strong very fine subangular and angular blocky structure; slightly hard, very friable, sticky, plastic; many very fine interstitial pores; 60 percent gravel; few thin clay films on ped faces and in pores; moderately alkaline; abrupt wavy boundary.

B22tca—8 to 13 inches; brown (10YR 5/3) extremely stony clay loam, brown (10YR 5/3) moist; massive; slightly hard, very friable, sticky, plastic; common very fine and fine and few medium roots; many very fine tubular pores; few thin clay films on ped faces and in pores; 10 percent stones, 30 percent cobbles, and 40 percent gravel; strongly effervescent; moderately alkaline; abrupt wavy boundary.

Csicam—13 to 30 inches; white (10YR 8/2) indurated duripan that is very stony, cobbly, and gravelly; light yellowish brown (10YR 6/4) silica coatings; massive; extremely hard, extremely firm; violently effervescent, moderately alkaline (pH 8.4).

Thickness of the solum and depth to the hardpan are 10 to 20 inches. Reaction ranges from neutral to moderately alkaline. The soil is commonly slightly effervescent in some subhorizons but is noncalcareous in some profiles. The volume of coarse fragments is 35 to 80 percent. The A horizon has very thin to medium, moderate or strong platy structure, or it is massive. The B2t horizon has strong, very fine or fine, angular or subangular blocky structure or moderately fine or medium, prismatic structure.

VM—Vinini-Mina association. This association of strongly sloping to steep soils is in medium sized, irregularly shaped areas on uplands. Vinini very stony fine sandy loam, 8 to 30 percent slopes, makes up about 60 percent of the association, and Mina extremely stony fine sandy loam, 30 to 50 percent slopes, makes up 20 percent. Included in mapping, and making up about 20 percent of the acreage, are Nevoyer soils and Rock outcrop.

The Vinini soil has the profile described as representative of the Vinini series. The Mina soil has a profile similar to the one described as representative of the Mina series. The Vinini soil is shallow and is on the lower slopes of the rolling, hilly uplands. The Mina soil is extremely stony and is on the steeper slopes of the north- and west-facing uplands.

On the Vinini soil runoff is medium, and the hazard of erosion is slight. On the Mina soil runoff is rapid, and the hazard of erosion is moderate.

This association is not suited to irrigated crops. It is used mainly for range and wildlife habitat. Capability subclass VIIs dryland; Vinini soil in range site NV 29–12, Semidesert Shallow Loamy; Mina soil in range site NV 29–10, Semidesert Loamy Slope.

VN—Vinini-Nevoyer association. This association of strongly sloping to steep soils is in small, irregularly shaped areas on rolling and hilly uplands. Vinini very stony fine sandy loam, 8 to 30 percent slopes, makes up about 60 percent of the association, and Nevoyer very stony fine sandy loam, 15 to 50 percent slopes, makes up 20 percent. Included in mapping, and making up about 20 percent of the acreage, are soils that are similar to the Vinini soil, and Rock outcrop.

The Vinini soil has a profile similar to the one described as representative of the Vinini series. The Nevoyer soil has the profile described as representative of its series. The Vinini soil is shallow over a hardpan and is on the south-facing slopes of the rolling uplands. The Nevoyer soil is shallow over a hardpan and is on the north-facing, steeper slopes of the uplands.

On the Vinini soil runoff is medium, and the hazard of erosion is slight. On the Nevoyer soil runoff is rapid, and the hazard of erosion is moderate.

This association is not suited to irrigated crops. It is used mainly for range and wildlife habitat. Capability subclass VIIs dryland; range site NV 29–12, Semidesert Shallow Loamy.

Wardenot Series

The Wardenot series consists of very deep, excessively drained soils that formed in alluvium derived from mixed rocks. These soils are nearly level to moderately sloping. They are on smooth alluvial fans. Slopes range from 0 to 8 percent. The vegetation consists of shadscale, bud sagebrush, kings desertgrass, Indian ricegrass, and galleta. Elevation ranges from 5,500 to 6,000 feet. Mean annual precipitation is 4 to 6 inches. Mean annual air temperature is 43° to 45° F, and the length of the frost-free season is 100 to 130 days.

In a representative profile the surface layer is light brownish gray to pale brown gravelly fine sandy loam about 5 inches thick. The next layer is light brownish gray very gravelly fine sandy loam about 20 inches thick. Below this is pale brown very gravelly loamy sand that extends to a depth of 60 inches or more.

Wardenot soils have rapid permeability. Effective rooting depth is about 60 inches. Available water capacity is low. Runoff is medium, and the hazard of erosion is slight.

Representative profile of Wardenot gravelly fine sandy loam, 0 to 8 percent slopes, about 1.1 miles east of State Route 8A and 2 miles north of State Route

69, ½ mile north and 500 feet east of the southeast corner sec. 34, T. 9 N., R. 42 E.:

A11—0 to 3 inches; light brownish gray (10YR 6/2) gravelly fine sandy loam, very dark grayish brown (10YR 3/2) moist; massive; soft, very friable, nonsticky, nonplastic; few very fine, fine, medium, and coarse roots; many very fine and few fine vesicular pores; moderately alkaline; abrupt smooth boundary.

A12—3 to 5 inches; pale brown (10YR 6/3) gravelly fine sandy loam, very dark grayish brown (10YR 3/2) moist; massive; soft, very friable, nonsticky, nonplastic; few very fine, fine, and medium roots; many very fine interstitial and few very fine tubular pores; moderately alkaline; abrupt wavy boundary.

C1sica—5 to 25 inches; light brownish gray (10YR 6/2) very gravelly fine sandy loam, brown (10YR 4/3) moist; massive; soft, very friable, nonsticky, nonplastic; many very fine and few fine roots; many very fine tubular pores; moderately thick white (10YR 8/1) lime coats on top and bottom of gravel and very pale brown (10YR 7/3) silica coats on bottom of gravel; violently effervescent; strongly alkaline; gradual wavy boundary.

C2ca—25 to 60 inches; pale brown (10YR 6/3) very gravelly loamy sand, brown (10YR 4/3) moist; massive; soft, very friable, nonsticky, nonplastic; many very fine and common fine roots; many very fine interstitial pores; white (10YR 8/1) lime coats on the underside of gravel; strongly alkaline.

Reaction of the soil ranges from mildly alkaline to strongly alkaline, and it is highest in the Csica horizon. Silica and lime are on only the undersides of pebbles. The pebbles are generally rounded, and most of them are ¼ inch and 1½ inches across. Cobbles and stones make up as much as 25 percent of the coarse fragments in some places. The gravel content of the C horizon ranges from 45 to 70 percent.

WA—Wardenot gravelly fine sandy loam, 0 to 8 percent slopes. This nearly level to moderately sloping soil is in very large, irregularly shaped areas on alluvial fans and toeslopes. This soil has the profile described as representative of the series. Included in mapping, and making up about 10 percent of the acreage, are Bluewing and Lathrop soils and other Wardenot soils that have stony surfaces.

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

This soil is not suited to irrigated crops. It is used for range and wildlife habitat. Capability subclass VIIs dryland; range site NV 28–1 and NV 29–1, Desert Loamy.

Wrango Series

The Wrango series consists of very deep, excessively drained soils that formed in alluvium derived from mixed rock, mostly volcanics and shale. These soils are in midslope positions and on toeslopes of alluvial fans. Slopes are 0 to 8 percent. The vegetation is black sagebrush, bud sagebrush, kings desertgrass, sand dropseed, squirreltail, and Indian ricegrass. Elevation ranges from 5,600 to 6,200 feet. Mean annual precipitation is 6 to 8 inches. Mean annual air temperature 43° to 45° F, and the length of the frost-free season is 100 to 120 days.

In a representative profile the surface layer is light brownish gray stony fine sandy loam and light gray gravelly fine sandy loam about 10 inches thick. Below this is light gray very gravelly loamy sand and very gravelly sand that extends to a depth of 60 inches or more.

Wrango soils have very rapid permeability. Effective rooting depth is 60 inches. Available water capacity is low. Runoff is medium, and the hazard of erosion is slight.

Representative profile of Wrango stony fine sandy loam, 2 to 8 percent slopes, 0.7 mile east of the mouth of Jett Canyon, 500 feet south and 500 feet east of the north quarter corner sec. 19, T. 10 N., R. 43 E.:

A1—0 to 3 inches; light brownish gray (10YR 6/2) stony fine sandy loam, dark brown (10YR 3/3) moist; massive; slightly hard, very friable, nonsticky, nonplastic; many very fine and fine vesicular pores; 2 percent stones, 10 percent cobbles, and 50 percent gravel; moderately alkaline; clear smooth boundary.

C1—3 to 10 inches; light gray (10YR 7/2) gravelly fine sandy loam, brown (10YR 4/3) moist; massive; soft, very friable, nonsticky, nonplastic; many very fine, fine, and medium roots; common very fine tubular pores; strongly effervescent in spots; mildly alkaline; clear wavy boundary.

IIC2ca—10 to 20 inches; light gray (10YR 7/2) very gravelly loamy sand, dark brown (10YR 3/3) moist; massive; slightly hard, very friable, nonsticky, nonplastic; few very fine and fine roots; thin lime coats on underside of gravel; violently effervescent; moderately alkaline; clear wavy boundary.

IIC3ca—20 to 60 inches; light gray (10YR 7/2) very gravelly sand, dark brown (10YR 3/3) moist; massive; slightly hard, very friable, nonsticky, nonplastic; few very fine roots; lime coats on underside of gravel; violently effervescent; moderately alkaline.

The soil is calcareous except in the top few inches. Lime coatings are on the undersides of pebbles. The soil is mildly alkaline to moderately alkaline. It is least alkaline in the C1 horizon and most alkaline in the Cca horizon. Texture between depths of 10 and 40 inches is dominantly loamy coarse sand or sand and contains 60 to 75 percent coarse fragments. The coarse fragments are dominantly round and subrounded pebbles 1 inch to 3 inches across. Cobble and stone content is as much as 20 to 30 percent in some places.

WBB—Wrango gravelly fine sandy loam, 0 to 4 percent slopes. This nearly level to gently sloping soil is in irregularly shaped areas in smooth midslope positions and on toeslopes of alluvial fans that have dry washes incised 1 to 3 feet deep. The soil has a profile similar to the one described as representative of the series, but the surface layer is gravelly fine sandy loam. Included in mapping, and making up about 25 percent of the acreage, are Wrango stony fine sandy loam, 0 to 4 percent slopes, which is adjacent to dry washes, and Bluewing stony loamy coarse sand, 0 to 8 percent slopes, which is in dry washes.

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

This soil is not suited to irrigated crops. It is used mainly for range and wildlife habitat. Capability subclass VIIs dryland; range site NV 29–6, Loamy Bottom.

WDC—Wrango stony fine sandy loam, 2 to 8 percent slopes. This convex soil is in fan-shaped areas on broad alluvial fans that are generally smooth. The soil has the profile described as representative of the series. Included in mapping, and making up about 25

percent of the acreage, are Wrango soils that have a very stony surface and are adjacent to the dry washes, and Bluewing stony loamy coarse sand, 0 to 8 percent slopes, which is in dry washes.

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

This soil is not suited to irrigated crops. It is used mainly for range and wildlife habitat. Capability subclass VIIs dryland; range site NV 28–2 and NV 29–2, Desert Loamy Sal.

Yobe Series

The Yobe series consists of very deep, somewhat poorly drained soils that are strongly saline-alkali affected. These soils formed in silty lacustrine material. They are on generally smooth to slightly undulating lake terraces. Slopes range from 0 to 2 percent. The vegetation is black greasewood, saltgrass, pickleweed, common reedgrass, alkali cordgrass, and quailbush. Elevation is 5,600 feet. Mean annual precipitation is 4 to 6 inches. Mean annual air temperature is 43° to 45° F, and the length of the frost-free season is 115 days.

In a representative profile the surface layer is light gray, strongly saline-alkali silt loam about 24 inches thick. Below this is very pale brown, strongly saline-alkali affected silty clay loam that extends to a depth of 60 inches or more.

Yobe soils have moderately slow permeability. Effective rooting depth is 60 inches. Available water capacity is high. Runoff is very slow or ponded, and the hazard of erosion is slight.

Representative profile of Yobe silt loam, about 4.5 miles west-southwest of the mouth of Northumberland Canyon, about 0.4 mile west of ungraded access road, about 1,300 feet west and 2,600 feet south of the northeast corner sec. 9, T. 13 N., R. 44 E.:

A1—0 to 0.5 inch; light gray (10YR 7/1) silt loam, grayish brown (2.5Y 5/2) moist; massive; slightly hard, very friable, nonsticky, nonplastic; many very fine and few fine interstitial pores and few fine tubular pores; very few ½- by 1½-inch lime nodules; violently effervescent; very strongly alkaline; abrupt smooth boundary.

C1—0.5 to 7 inches; light gray (10YR 7/2) silt loam, light brownish gray (2.5Y 6/2) moist; massive; soft, very friable, nonsticky, nonplastic; few fine and medium roots; many very fine interstitial pores; very few ½- by 1½-inch lime nodules; violently effervescent; strongly alkaline; clear wavy boundary.

C2—7 to 24 inches; light gray (10YR 7/2) silt loam, brown (10YR 5/3) moist; massive; slightly hard, very friable, nonsticky, nonplastic; common medium roots; many very fine tubular pores; very few ½- by 1½-inch lime nodules; violently effervescent; mildly alkaline; clear wavy boundary.

C3—24 to 60 inches; very pale brown (10YR 7/3) light silty clay loam, yellowish brown (10YR 5/4) moist; massive; slightly hard, very friable, sticky, plastic; few very fine and fine roots; common very fine and fine tubular pores; few ½- by 1½-inch lime nodules; violently effervescent; mildly alkaline.

The soils are strongly saline and alkali. Soluble salts generally decrease as depth increases in the soil profile. Lime nodules range from few to common. The soils are calcareous throughout. Texture between depths of 10 and 40 inches is very fine sandy loam, silt, or silty clay loam that is 18 to 30 percent clay.

YB—Yobe silt loam. This nearly level soil is in narrow bands on lake terraces above playas and below alluvial fans that are generally smooth and slightly undulating. This soil has the profile described as representative of the series. Included in mapping, and making up about 10 percent of the acreage, are barren playas and Charnock clay loam, strongly saline-alkali, at slightly higher elevations in small seep areas.

Runoff is very 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 not suited to irrigated crops. It is used mainly for range and wildlife habitat. Capability subclass VIIw dryland; range site NV 28–13, Saline Meadow.

YC—Yobe-Tipperary complex. This complex of nearly level soils is in narrow bands on lake terraces below and adjacent to alluvial fans. The soils are smooth and have low sand dunes superimposed on the terraces. Yobe silt loam makes up about 50 percent of the complex, and Tipperary fine sand, 4 to 30 percent slopes, makes up about 40 percent. Included in mapping, and making up about 10 percent of the acreage, are Yobe soils that have a clay loam surface, and poorly drained soils in lower areas.

These soils have a profile similar to the one described as representative of their respective series. The Yobe soil is on the smooth lake terraces and is silty throughout. The Tipperary soil is on sand dunes and is sandy throughout.

On the Yobe soil runoff is very slow, and the hazard of erosion is slight. On the Tipperary soil runoff is very slow, and the hazard of soil blowing is high.

These soils are not suited to irrigated crops. They are used mainly for range and wildlife habitat. Capability subclass VIIw dryland; Yobe soil in range site NV 28–13, Saline Meadow; Tipperary soil in range site NV 28–18 and NV 29–18, Desert Dune.

YD—Yobe-Umberland complex. This complex of nearly level soils is in large bands on lake terraces above the lake basin. Areas are generally smooth and slightly undulating and have numerous seeps and springs. Yobe silt loam makes up about 45 percent of the complex; Umberland clay loam makes up 25 percent, and Umberland clay loam, poorly drained, makes up about 15 percent. Included in mapping, and making up about 15 percent of the acreage, are elongated areas of soils that are very high in content of organic matter and that are in seeps and springs, and Yobe soils that are poorly drained.

The Yobe soil and the Umberland clay loam have a profile similar to the one described as representative of their respective series. The Yobe soil is near the outer edges of the generally smooth terraces. The Umberland clay loam is near the center of the generally smooth lake terraces. The Umberland clay loam, poorly drained, has a profile similar to the one described as representative of the series, but it is poorly drained. It has a water table at a depth of

about 30 inches, and it is very strongly saline-alkali affected. It is adjacent to the seeps and springs.

Runoff is very slow or ponded, and the hazard of erosion is slight.

These soils are not suited to irrigated crops. They are used mainly for range and wildlife habitat. Capability subclass VIIw dryland; range site NV 28–13, Saline Meadow.

Yomba Series

The Yomba series consists of very deep, somewhat excessively drained soils that formed in alluvium derived from mixed rocks, mostly basalt, rhyolite, and tuff. These soils are on broad, smooth valley-fill plains and alluvial fans. Slopes are 0 to 2 percent. The vegetation is Bailey greasewood, shadscale, bud sagebrush, Anderson wolfberry, kochia, and Indian ricegrass. Elevation is about 4,800 to 5,500 feet. Mean annual precipitation is 4 to 6 inches. Mean annual air temperature is 50° to 52° F, and the length of the frost-free season is about 130 to 150 days.

In a representative profile the surface layer is light brownish gray gravelly sand about 2 inches thick. Below this is 12 inches of light gray fine sandy loam and loam and 6 inches of weakly cemented, light gray gravelly coarse sandy loam. This is underlain by gray very gravelly sand to a depth of 60 inches or more.

Yomba soils have moderately rapid permeability. Effective rooting depth is 60 inches. Available water capacity is low. Runoff is slow, and the hazard of erosion is slight.

Representative profile of Yomba gravelly sand, about 19 miles northwest of Tonopah, about 1,000 feet east and 1,000 feet south of the northwest corner sec. 25, T. 5 N., R. 40 E.:

A11—0 to 2 inches; light brownish gray (10YR 6/2) gravelly sand, very dark grayish brown (10YR 3/2) moist; single grained; many very fine interstitial pores; neutral; abrupt smooth boundary.

A12—2 to 4 inches; light gray (10YR 7/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; weak medium and thick platy structure; soft, very friable, nonsticky, nonplastic; few very fine, fine, and medium roots; many very fine and fine vesicular pores; mildly alkaline; abrupt smooth boundary.

B2—4 to 9 inches; light gray (10YR 7/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; weak very coarse prismatic structure; soft, very friable, nonsticky, nonplastic; few very fine, fine, and medium roots; common very fine tubular pores; common medium and large white (10YR 8/1) lime segregations; mildly alkaline; abrupt wavy boundary.

B3ca—9 to 14 inches; light gray (10YR 7/2) loam, brown (10YR 4/3) moist; weak coarse prismatic structure; slightly hard, very friable, slightly sticky, slightly plastic; common very fine and fine tubular pores; common medium and coarse distinct white (10YR 8/1) lime segregations; violently effervescent; moderately alkaline; abrupt smooth boundary.

C1sica—14 to 20 inches; light gray (10YR 7/2) gravelly coarse sandy loam that is weakly silica cemented, brown (10YR 4/3) moist; hard and very hard, friable and firm, nonsticky, nonplastic; few very fine and fine roots; common very fine tubular pores; few thin silica bridges between sand grains and lining pores; 30 percent gravel; common medium and large distinct white (10YR 8/1) lime masses; few medium and large prominent yellow (10YR 7/6) opal coatings on discontinuous laminae; strongly effervescent; moderately alkaline; abrupt wavy boundary.

IIC2—20 to 60 inches; gray (10YR 6/1) very gravelly sand, very dark grayish brown (10YR 3/2) moist; massive; soft, very friable, nonsticky, nonplastic; few very fine roots; many very fine and fine interstitial pores; 65 percent gravel; very few large distinct dark brown (10YR 4/4) mottles in 2-inch wide pockets; mildly alkaline.

Thickness of the solum is 9 to 23 inches, and depth to gravel and sand ranges from 18 to 23 inches. Average texture between depths of 10 and 40 inches is very gravelly loamy sand containing 40 to 60 percent rock fragments. The B2 horizon is sandy loam, fine sandy loam, or loam. This horizon has weak, coarse or very coarse, prismatic structure or is massive. It is soft or slightly hard. The IIC horizon has strata of sand, gravel, and cobbles. It is commonly noncalcareous but is slightly effervescent in some profiles. The matrix of the Csica horizon is slightly hard to very hard. It has laminae which have cementation ranging from weak, containing only few thin silica bridges, to strong, containing ¼-inch discontinuous layers in pockets and seams.

Ym—Yomba gravelly sand. This nearly level soil is in irregularly shaped areas on smooth, undulating valley fill plains and alluvial fans. It has the profile described as representative of the series. Included in mapping, and making up about 10 percent of the acreage, are small playas that are barren; Koyen gravelly fine sandy loam, 0 to 2 percent slopes; and Timper gravelly sandy loam in isolated areas.

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

This soil has limited suitability for irrigated crops if irrigation water is made available. It is used mainly for range and wildlife habitat. Capability unit IIIs–22 irrigated, capability subclass VIIs dryland; range site NV 28–2 and NV 29–2, Desert Loamy Sal.

Yn—Yomba gravelly fine sandy loam. This nearly level soil is on broad, smooth, valley-fill plains and alluvial fans. It has a profile similar to the one described as representative of the series, but the surface layer is gravelly fine sandy loam about 6 inches thick. In places sandy hummocks as much as 15 inches high support most of the vegetation. Included in mapping, and making up about 10 percent of the acreage, are isolated, barren areas near the dry washes, and areas of Koyen gravelly fine sandy loam, 0 to 2 percent, in long, narrow, inset alluvial fans.

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

This soil has limited suitability for irrigated crops if irrigation water is made available. It is used mainly for range and wildlife habitat. Capability unit IIIw–39 irrigated, capability subclass VIIw dryland; range site NV 28–2 and NV 29–2, Desert Loamy Sal.

YO—Yomba-Playas complex. This complex of nearly level soils is in large, irregularly shaped areas on smooth valley-fill plains. Yomba gravelly sand makes up about 60 percent of the complex, and Playas make up about 30 percent. Included in mapping, and making up about 10 percent of the acreage, are Domez fine sandy loam on the valley fill plains; Youngston silt

loam in the dry washes, and other Yomba soils in isolated areas within the Playas.

The Yomba soil has the profile described as representative of the series. It is on slightly raised areas that have a loose sandy surface which supports most of the vegetation. Playas are in depressions surrounded by Yomba soils. They are barren.

On the Yomba soil runoff is slow, and the hazard of erosion is slight. On Playas runoff is slow or ponded, and the hazard of erosion is slight.

This complex is not suited to irrigated crops. It is used mainly for range and wildlife habitat. Capability subclass VIIw dryland; Yomba soil in range site NV 28–2 and NV 29–2, Desert Loamy Sal; Playas not placed in a range site.

Youngston Series

The Youngston series consists of very deep, well drained soils that formed in alluvium derived mainly from volcanic rocks. These soils are nearly level. They are on flood plains and terraces. Slopes are 0 to 2 percent. The vegetation is black greasewood, shadscale, kochia, and big sagebrush. Elevation is 4,800 to 5,500 feet. Mean annual precipitation is 4 to 6 inches. Mean annual air temperature is 47° to 51° F, and the length of the frost-free season is 130 to 150 days.

In a representative profile the surface layer is light gray silt loam about 4 inches thick. Below this is about 4 inches of light gray sandy loam, about 7 inches of pale brown sandy clay loam, about 4 inches of brown silt loam, and pale brown loam that extends to a depth of 60 inches or more.

Youngston soils have moderately slow permeability. Effective rooting depth is 60 inches. Available water capacity is high. Runoff is slow, and the hazard of erosion is slight.

Representative profile of Youngston silt loam, east of State Route 91, about 26 miles northwest of Tonopah, 1,580 feet west and 528 feet north of the southeast corner sec. 10, T. 6 N., R. 40 E.:

C1—0 to 4 inches; light gray (10YR 7/2) silt loam, dark grayish brown (10YR 4/2) moist; strong thin and medium platy structure; slightly hard, very friable, slightly sticky, slightly plastic; many very fine vesicular pores and few very fine tubular pores; violently effervescent; very strongly alkaline; abrupt smooth boundary.

C2—4 to 8 inches; light gray (10YR 7/2) sandy loam, brown (10YR 4/3) moist; strong thin platy structure; slightly hard, very friable, slightly sticky, slightly plastic; many very fine and fine vesicular pores; violently effervescent; very strongly alkaline; abrupt smooth boundary.

C3—8 to 15 inches; pale brown (10YR 6/3) sandy clay loam stratified with coarse sand, brown (10YR 4/3) moist; massive; slightly hard, very friable, sticky, plastic; many very fine tubular pores; violently effervescent; strongly alkaline; abrupt smooth boundary.

A1b—15 to 19 inches; brown (10YR 5/3) silt loam, dark brown (10YR 3/3) moist; strong medium prismatic and thin platy structure; slightly hard, very friable, slightly sticky, slightly plastic; few fine and medium roots; common very fine tubular pores; effervescent; moderately alkaline; clear wavy boundary.

C4—19 to 60 inches; pale brown (10YR 6/3) loam, brown (10YR 4/3) moist; many fine faint yellowish brown (10YR 5/4) and few fine prominent black (10YR 2/1) mottles, and few fine faint white (10YR 8/1) lime seams; massive; slightly hard, very friable, sticky, plastic; few very fine and fine tubular pores; effervescent in matrix, violently effervescent in seams; strongly alkaline.

Reaction is generally strongly alkaline. Strata include fine sandy loam, loam, silt loam, and in places, thin layers of gravel. Relict mottles range from few to many and from faint to prominent. They are yellowish brown and black. The lime masses are few or common in seams or filaments. They are generally below a depth of 15 inches. The C1 and C2 horizons are generally silt loam, sandy loam, or loam. Structure is generally strong, thin or medium, platy. The C3 and C4 horizons are sandy clay loam, clay loam, silt loam, or loam and have strata of fine sandy loam. These horizons are massive or have strong, medium, prismatic or platy structure.

Yp—Youngston loamy sand. This nearly level soil is in long narrow areas on stream terraces of the valley-fill plains. The surface has coppice dunes 10 to 16 inches high. The soil has a profile similar to the one described as representative of the series, but the surface layer is loamy sand about 10 inches thick. The growing season on this soil is slightly shorter than the growing season on the representative Youngston soil. Included in mapping, and making up about 5 percent of the acreage, are similar soils that have a surface of silt loam, and small playas.

Runoff is slow, and the hazard of erosion is slight. This soil is subject to occasional flooding.

This soil has moderate limitations for crops if irrigation water is made available. It is used mainly for range and wildlife habitat. Capability unit IIw–37 irrigated, capability subclass VIIw dryland; range site NV 29–6, Loamy Bottom.

Yr—Youngston fine sandy loam. This nearly level soil is in narrow bands on stream terraces slightly above the flood plains. It has a profile similar to the one described as representative of the series, but the surface layer is fine sandy loam about 4 inches thick. Included in mapping, and making up about 5 percent of the acreage, is Youngston loamy sand.

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

This soil has few limitations for crops if irrigation water is made available. It is used mainly for range and wildlife habitat. Capability unit IIc–1 irrigated, capability subclass VIIc dryland; range site NV 29–6, Loamy Bottom.

Ys—Youngston silt loam. This nearly level soil is in large, irregularly shaped areas on narrow flood plains. It has the profile described as representative of the series. Included in mapping, and making up about 5 percent of the acreage, are Koyen gravelly fine sandy loam, 0 to 2 percent slopes, and Timper gravelly sandy loam, 0 to 4 percent slopes, on adjacent fans.

Runoff is slow, and the hazard of erosion is slight. This soil is subject to occasional flooding.

This soil has moderate limitations for crops if irrigation water is made available. It is used mainly for range and wildlife habitat. Capability unit IIw–91 irrigated, capability subclass VIIw dryland; range site NV 29–6, Loamy Bottom.

Zaba Series

The Zaba series consists of very deep, well drained soils that formed in lake-deposited sand and gravel derived mainly from basalt, rhyolite, and some granitic rocks on old gravelly lake terraces and gravel bars. Slopes range from 0 to 8 percent. The vegetation is a very sparse stand of black greasewood and suaeda. Elevation is about 5,600 feet. Mean annual precipitation is about 4 inches. Mean annual air temperature is 43° to 45° F, and the length of the frost-free season is about 115 days.

In a representative profile the surface layer is white very gravelly loam about 4 inches thick. The next layer is pale brown gravelly coarse sandy loam stratified with white loamy very coarse sand about 17 inches thick. Below this is light brownish gray very gravelly sand that extends to a depth of 60 inches or more.

Zaba soils have moderate permeability. Effective rooting depth is 60 inches. Available water capacity is low. Runoff is very rapid, and the hazard of erosion is slight.

Representative profile of Zaba very gravelly loam, in an area of Zaba-Nyserva association, approximately ¼ mile south of junction of Northumberland Road and ungraded motor road that skirts the edge of the playas, about 900 feet west of the assumed northeast corner sec. 17, T. 14 N., R. 44 E.:

A1—0 to 4 inches; white (10YR 8/2) very gravelly loam, grayish brown (2.5Y 4/2) moist; massive; slightly hard, very friable, slightly sticky, slightly plastic; many coarse vesicular pores; violently effervescent; very strongly alkaline.

B2t—4 to 21 inches; pale brown (10YR 6/3) gravelly coarse sandy loam, yellowish brown (10YR 5/4) moist; stratified with white (10YR 8/2) loamy very coarse sand, brown (10YR 5/3) moist; massive; slightly hard, friable, slightly sticky, slightly plastic; nonsticky, nonplastic in the white layers; few very fine and fine vesicular pores; about 40 percent gravel; strongly effervescent and violently effervescent in the white layers; very strongly alkaline; abrupt smooth boundary.

Cca—21 to 60 inches; light brownish gray (10YR 6/2) very gravelly sand, pale brown (10YR 6/3) moist; slightly hard, very friable, nonsticky, nonplastic; about 50 percent gravel; thin lime and silica coatings on underside of gravel; effervescent to violently effervescent; very strongly alkaline.

Thickness of the solum is 5 to 25 inches. Fifty to 90 percent of the surface is covered by a gravel pavement. The A1 horizon is strongly effervescent to violently effervescent and is 15 to 60 percent gravel ¼- to ¾-inch in diameter. The B2t horizon is very coarse sandy loam, coarse sandy loam, sandy clay loam, silt loam, or loam and is commonly stratified. It has an average clay content of less than 18 percent. There generally are 3 to 8 layers 2 to 6 inches thick. This horizon is generally massive but includes thin discontinuous layers that have very fine, granular or weak, very fine to medium, blocky structure. The C horizon is 40 to 90 percent gravel. Thin strata of loam and sandy loam are in the C horizon in most places.

ZN—Zaba-Nyserva association. This association of nearly level soils is in long, narrow areas on terraces and gravel bars. Zaba very gravelly loam, 0 to 8 percent slopes, makes up about 50 percent of the association, and Nyserva loam makes up about 30 percent. Included in mapping, and making up about 20 percent of the acreage, are Tipperary soils on the lower terraces and a soil that is similar to the Zaba soil but that has a gravelly loam subsoil.

The soils in this association have the profiles described as representative of their respective series. The Zaba soil is on the higher terraces and gravel bars and has a very gravelly sandy loam or sandy clay loam subsoil that is stratified with very gravelly loamy sand. The Nyserva soil is on the lower lake terraces and has a loam or clay loam subsoil.

On the Zaba soil runoff is very rapid, and the hazard of erosion is slight. On the Nyserva soil runoff is medium, and the hazard of erosion is slight. The Nyserva soil has a seasonal high water table at a depth of 7 to 10 feet.

These soils are not suited to irrigated crops. They are used mainly for limited range and wildlife habitat. Zaba part in capability subclass VIIs dryland, Nyserva soil in capability subclass VIIw dryland; range site NV 28–3 and NV 29–3, Sodic Flat.

Use and Management of the Soils

In this section, the use and management of the soils for crops is described. Next, the system of capability classification and the management of the soils by capability units is described. Estimated yields of commonly grown crops on the commonly formed soils are listed. Then, the use and management of the soils for range and wildlife habitat are discussed, and the use of the soils for engineering works and recreation are described.

Placement of the soils in interpretive groups can be found by referring to the "Guide to Mapping Units" at the back of the survey.

Use of the Soils for Crops

The aim of good land use is to produce the greatest amount of the most needed crops while protecting and improving the soils. The land must be protected according to its needs and used within its capabilities. Plants that are well suited to the soil should be used, and soil management practices that protect the soil and keep it in good physical condition should be applied.

In the following paragraphs the main soil management practices needed in the survey area 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 the cultivation of crops in combination with needed cultural and management measures. If soil-improving crops and practices more than offset soil-depleting crops and practices, then a good conservation cropping system is being used.

Soil-improving practices in a conservation cropping system include using rotations that contain grasses and legumes, returning crop residue to the soil, tilling at the right time, applying adequate fertilizer, controlling weeds and pests, and other good management practices.

Several cropping systems are used in the survey area. A typical one is alfalfa for about 6 to 8 years, small grain for 2 years, and then back to alfalfa with a protective nurse crop of oats. The crop residue from the small grain is returned to the soil, and only necessary tillage operations are carried out.

Crop residue management.—Crop residue management is the use of plant residue left in cultivated fields. It is needed on all soils in the survey area. The residue is incorporated into the soil or left on the surface when erosion is likely to occur. Plant residue adds organic matter, which helps develop and stabilize good soil structure and improves the general physical environment of the soil, which influences crop growth. Organic matter is most valuable as it decomposes; adding nitrogen fertilizer to the soil aids decomposition.

Organic matter should be continuously returned to the soil. The easiest and most common way is to return plant residue produced by a crop. Unless enough crop residue is returned to the soil, the physical condition of the soil deteriorates. The soil becomes compacted, and slow water infiltration and poorer aeration result.

Erosion control.—Erosion control prevents the excessive wearing away of the land surface by wind, running water, and other geological agents. The surface layer must be protected because it contains most of the organic matter and generally is more fertile than the subsoil. Erosion can be controlled by using cover crops to protect the surface during windy or stormy times of year, by leveling in spring and then seeding right away, by leveling to the proper grade, and by applying water at the proper rate. In this survey area soil blowing is a particular concern on such sandy soils as Tipperary, Koyen, and Belcher soils.

Addition of plant nutrients.—Most of the irrigated soils used for crops in this survey area respond well to liquid or solid fertilizer. The specific fertilizer needed depends on the kind of crop and the nutrient level in the soil. Applying a combination fertilizer that contains nitrogen and phosphate increases production of small grain and helps establish alfalfa. After that, alfalfa benefits from phosphate applied every 2 years for the life of the stand, except where the soil contains enough available phosphorous. Barnyard manure adds some nitrogen, phosphate, and potassium to the soil and promotes good tilth. Barnyard manure can be used with good results before planting small grain.

Irrigation water management.—Irrigation water management regulates applications of irrigation water or rates and amounts that insure high crop production and minimum soil and water losses. It is needed in all irrigated areas. Water is applied according to the crop needs and at rates and in amounts consistent with the characteristics of the soil.

First, efficient delivery of water to farms is needed. The distribution system should have enough capacity to meet the needs of the crops irrigated and should control seepage losses and carry the required flow safely.

Next, the water must be delivered to the individual fields. The water must be carried without excessive seepage and without causing erosion. Control structures are needed for handling water.

The design of an irrigation system depends on the method of irrigation to be used, the amount of land leveling needed, and the expected efficiency in applying water. In this survey area, two methods of irrigation are commonly used: border and furrow. *Border irrigation* is most common. Water is applied to strips of varying widths. These strips are separated by low dikes or border ridges. This method is suitable on fields planted to close-growing crops. It can be effectively used on all soils that can be leveled and that have a basic water-intake rate of not more than 3 inches per hour. *Furrow irrigation* consists of applying water downslope in small trenches 2 to 12 inches deep. The length and the spacing of furrows depends on soil texture and the kind of crop. Furrow irrigation is suitable on fields planted to row crops. It can be used on all soils except those that have a high intake rate and poor lateral movement of water.

To apply water efficiently, a farmer needs to know the capacity of the soil to hold water that plants can use, the rate that water enters and moves through the soil, and the amount of water the crop needs. 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. Forty-eight hours after irrigation, a soil check can be made to find out if the desired moisture was added.

Drainage.—This is not a serious concern in most of this survey area. The water table is generally far below the root zone. The Umberland, Orizaba, and Yobe soils are exceptions. Most soils in which drainage is a concern are somewhat poorly drained and poorly drained and are below springs. If soils are inadequately drained, available salts and alkali generally accumulate and retard or prevent crop growth. These soils have poor soil aeration, which reduces plant growth and increases susceptibility of plants to disease. Soils in the lower parts of the undrained basin are difficult to drain, but these soils could be improved by managing water in the spring and seep areas.

Managing saline-alkali soils.—Soils in arid and subarid regions such as this survey area generally contain at least small quantities of soluble salts and alkali. Rainfall is low and evaporation is high, so percolating rainfall is insufficient for leaching salts out of the root zone. In some soils, the salts and alkali are highly concentrated and limit or prevent plant growth.

Many low-lying areas also receive salty water as runoff or seepage. As this water evaporates, more soluble salts are left on the surface or in the soil. 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 dissolve easily in water and can move to any part of the soil profile.

A soil that contains excessive amounts of soluble salts but not alkali is called a saline soil. One that contains excessive absorbed sodium is called an alkali soil. A soil that contains both excess soluble salt and alkali is described as saline-alkali. Saline-alkali phases of several soils in the survey area 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. These classes are as follow:

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 content 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. The content of exchangeable sodium is 15 to 20 percent for moderately coarse textured, medium textured, moderately fine textured, and fine textured soils.

3. Strongly saline-alkali soils contain more than 0.65 percent salts or the conductivity of the saturated extract is greater than 15 millimhos per centimeter at 25° C. The content of exchangeable sodium is greater than 25 percent for moderately coarse textured, medium textured, moderately fine textured, and fine textured soils.

There is a distinct gap between the second class and the third, but an intermediate or moderate class is not needed in this survey area because a very small percentage of the samples analyzed was moderately saline-alkali.

Some soils classed slightly saline-alkali are free of excess salts and alkali in the upper 4 or 5 inches, but they contain slight or moderate concentrations just below the plow layer. Several soils classed strongly saline-alkali are only slightly affected in the plow layer.

Soils differ in the kinds of salts they contain, and practices needed for improvement are different. For this reason each soil needs individual treatment; however, some general guidelines that should be helpful can be given.

A good supply of irrigation water and adequate drainage must be provided to reclaim any soil in this area. Two methods of applying water are commonly used. One method is to level the areas to flat basins and then pond the water within these basins. The other method requires that the areas be leveled to a uniform grade and then flooded between the border dikes. If drainage is adequate and large amounts of water are used, either method is effective in leaching the soluble salts out of the root zone. If the soils contain an excessive amount of absorbed sodium, the process is more difficult. Other practices in addition to draining and leaching are needed to improve alkali soils.

Chemical amendments used for replacing 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 are faster to react than others. Cost and availability generally determine the choice. The amount of amendment needed to improve a soil is determined by laboratory analysis of soil samples which show the amount of sodium that must be replaced.

Because the amount of soluble salt and alkali can differ within short distances, the sampling shows only the average concentrations in a field. If some alkali spots are left after the first treatment, they can be corrected the following year. An estimate of the amount of amendments needed should not be based on an analysis of the most strongly alkali spots because the estimate will be two to five times greater than the amount actually needed. If an amendment other than gypsum or sulfur is desired for use, the relative amount needed can be determined from the following table:

Amendment	Tons equivalent to 1 ton of sulfur
Sulfur	1.00
Sulfuric acid	3.06
Gypsum ($CaSO_4 \cdot 2H_2O$)	5.38
Iron sulfate ($FeSO_4 \cdot 7H_2O$)	8.69
Aluminum sulfate ($Al_2SO_4 \cdot 318H_2O$)	6.94

Iron sulfate and aluminum sulfate act quickly, but high cost prohibits their general use.

To efficiently replace sodium, most of the soluble salts should be leached before chemical amendments are applied. If the soluble salts are removed, more calcium is available for replacing absorbed sodium. Leaching salts from saline-alkali soils generally decreases permeability, however, and decreased permeability can reduce the effectiveness of amendments in some soils. The resulting permeability determines whether amendments should be applied before or after soluble salts are removed.

Chemical amendments normally are broadcast and incorporated into the soil by light disking. Sulfur should be thoroughly mixed with the soil to insure rapid oxidation to sulfate. Some amendments can be added to the irrigation water. However, gypsum dissolves so slowly that the amount that can be applied in irrigation water is less than the amount needed by the soil.

Except where sulfur is used, saline-alkali soils should be leached immediately after the amendment is applied. Leaching dissolves the amendment and carries it downward, and it also removes the soluble salts that form as the absorbed sodium is replaced by calcium.

Where sulfur is applied, enough time should be allowed for the sulfur to oxidize and react with the lime to form gypsum before the soil is leached. The soil must be kept moist, however, because water is needed to oxidize the sulfur. Consequently, the most favorable season for applying sulfur is fall rather than spring.

An alternative to reclamation through use of large quantities of gypsum is to seed salt- and alkali-tolerant grasses. Such grasses as tall wheatgrass, western wheatgrass, and altai fescue (Gores fescue) are well suited. These grasses can grow in relatively strong concentrations of both soluble salts and alkali.

The greatest difficulty in using grass to improve an area is getting a satisfactory stand. High concentrations of salts delay germination and limit water absorption. Seeds may not germinate after the first

irrigation or even after the 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 to crust. When the surface is severely crusted, 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) helps to prevent crusting and allows seedlings to emerge.

Proper pasture management.—Proper pasture management means grazing a pasture at a rate that will maintain grasses and legumes of high quality. Stocking rates or season of use can be adjusted to favor maximum growth and survival.

A common method of pasture management is using several pastures in a rotation system that allows adequate regrowth in each. Livestock must be kept off of wet pastures. If livestock are allowed to graze when the pastures are wet, the soil is compacted, the intake rate is decreased, and the soil structure is destroyed.

The pastures should have proper irrigation water management, and drainage should be provided. Applying commercial fertilizer and barnyard manure, if it is available, increases yields. Droppings can be spread with a drag each spring. Weeds generally can be controlled by mowing.

Capability grouping

Capability grouping shows, in a general way, the suitability of soils for most kinds of field crops. The soils are grouped according to their limitations when they are used for field crops, the risk of damage when they are 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 take into consideration possible but unlikely major reclamation projects; and does not apply to horticultural crops or other crops requiring special management.

Those familiar with the capability classification system can infer from it much about the behavior of soils when used for other purposes. This classification, however, is not a substitute for interpretations designed to show suitability and limitation of groups of soil for range, wildlife suitability groups, or engineering.

In the capability system, the soils are grouped at three levels; the capability class, the subclass, and the 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 Big Smoky Valley Area)

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

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 or wildlife habitat. (None in the Big Smoky Valley Area)

Class VI soils have severe limitations that make them generally unsuited to cultivation and that limit their use largely to pasture, range, 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, or wildlife habitat.

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

CAPABILITY SUBCLASSES: are soil groups within one class; they are designated by adding a small letter, *e*, *w*, *s*, or *c*, to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *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, 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 designated by adding an Arabic numeral to the subclass symbol, for example IIe–20 or IIIe–26. Thus, in one symbol, the Roman numeral designates the capability class, or degree of limitation; the small letter indicates the subclass, or kind of limitations, as defined in the foregoing paragraph; and the Arabic numeral specifically identifies the capability unit within each subclass.

In the following pages, the capability units in Big Smoky Valley Area are described, and suggestions for the use and management of the soils are given.

Management by capability units

The capability classification of the soils in this survey area is based on the assumption that—

1. The production of cultivated crops is not feasible without irrigation to offset the arid climate.
2. An adequate quantity of high quality water is available for the soils placed in irrigated units.
3. The drainage of large areas of wet soils is not feasible because of soil characteristics and lack of suitable outlets.
4. Salt and alkali content can feasibly be reduced to the level described in the individual capability unit description.
5. Protection against overflow can feasibly be developed for the soils placed in an irrigated capability unit.
6. Stone removal is not feasible unless specifically stated in the description of the capability unit.

Many of the soils in the Big Smoky Valley Area have been placed in both an irrigated capability unit and a dryland capability subclass. A soil that has not been placed in an irrigated capability unit is not considered suitable for irrigation.

Soil complexes 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 for management decisions.

If a high level of production is to be sustained, all irrigated land must be used according to 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 him.

In the following pages each of the capability units 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 the Area. The capability classification of each soil is given in the "Guide to Mapping Units."

CAPABILITY UNIT IIe–20 IRRIGATED

This unit consists of very deep, well drained soils. The soils have a surface layer of fine sandy loam, very fine sandy loam, or gravelly fine sandy loam. The subsoil is fine sandy loam and coarse sandy loam, and the substratum is sandy loam, very fine sandy loam, fine sandy loam, and loamy sand that is gravelly in places. Slopes are 2 to 4 percent. Precipitation is 4 to 6 inches. The frost-free season is generally 100 to 130 days, but in some areas it may be slightly longer.

The soils have moderate to moderately rapid permeability. Runoff is medium, and the hazard of erosion is moderate. Available water capacity is moderate to high. Effective rooting depth is more than 60 inches.

The soils in this unit are suited to crops, pasture, and hay if irrigation water is available. They are used mainly for range and wildlife habitat.

Continuing or permanent limitations to use of these soils for irrigated crops, pasture, and hay are slope, which may cause erosion, and the short growing season.

Development of a dependable source of irrigation water, irrigation water management, control of erosion and soil blowing, conservation cropping systems, and pasture and hayland management are essential to good management. Windbreaks and other erosion control practices help reduce soil blowing on fields without protective cover and help protect homesteads.

CAPABILITY UNIT IIw–37 IRRIGATED

This unit consists of very deep, well drained soils that are subject to occasional flooding. The soils have a surface layer of loamy fine sand or loamy sand. The subsoil and substratum are loam, silt loam, clay loam, or silty clay loam. Slopes are 0 to 2 percent. Precipitation is 4 to 6 inches, and the frost-free season is 130 to 150 days.

The soils have moderately slow permeability. Runoff is slow, and the hazard of erosion is slight. Available water capacity is high. Effective rooting depth is more than 60 inches. A seasonal high water table is below a depth of 5 feet.

The soils in this unit are suited to irrigated crops if irrigation water becomes available. They are used mainly for range and wildlife habitat.

Continuing or permanent limitations to use of these soils for irrigated crops are flooding, coarse surface texture, and moderately slow permeability.

Development of a dependable source of irrigation water, control of flooding by structural measures, irrigation water management, and conservation cropping systems are essential to good management. Land leveling is needed to prepare this soil for irrigation.

CAPABILITY UNIT IIw–60 IRRIGATED

This unit consists of very deep, somewhat poorly drained and poorly drained soils. The soils have a surface layer of loam. The subsoil and substratum are silty clay loam, silty clay, clay, loam, and stratified loam and silty clay loam. Included in this unit are some spots of slightly saline-alkali affected soils. Slopes are 0 to 2 percent. Precipitation is 4 to 6 inches, and the frost-free season is 100 to 130 days.

The soils have moderately slow permeability. Runoff is slow to very slow, and the hazard of erosion is slight. Available water capacity is high. Effective rooting depth is more than 60 inches. A seasonal high water table is below a depth of 5 feet.

The soils in this unit are potentially suited to irrigated crops, hay, and pasture. They are used mainly for alfalfa, range, and wildlife habitat.

Continuing or permanent limitations to use of these soils for irrigated crops are poor drainage and toxic salts.

Irrigation water management, conservation cropping systems, and drainage are essential to good management.

CAPABILITY UNIT IIw–91 IRRIGATED

This unit consists of very deep, well drained soils that are subject to occasional flooding. The soils have a surface layer of silt loam and silty clay loam. The subsoil and substratum are loam, clay loam, and silty clay loam. The soils are slightly saline-alkali affected. Slopes are 0 to 2 percent. Precipitation is 4 to 6 inches. The frost-free season is generally 100 to 130 days, but in some areas it is as much as 150 days.

The soils have moderately slow permeability. Runoff is slow, and the hazard of erosion is slight. Available water capacity is high. Effective rooting depth is more than 60 inches. A seasonal high water table is below a depth of 5 feet.

The soils in this unit are potentially suited to irrigated crops, hayland, and pasture. They are used mainly for range and wildlife habitat.

Continuing or permanent limitations to use of these soils for irrigated crops are flooding, moderately slow permeability, and low infiltration rate.

Development of a dependable source of irrigation water, control of flooding by structural measures, irrigation water management, conservation cropping systems, and pasture and hayland management are essential to good management. Conditioning and reclamation practices help minimize the saline-alkali condition of the soils. Land leveling is needed to prepare these soils for irrigation.

CAPABILITY UNIT IIs–4 IRRIGATED

This unit consists of very deep, well drained soils. The soils have a surface layer of sand and a subsoil and substratum of fine sandy loam, very fine sandy loam, loam, and silt loam. Slopes are 0 to 2 percent. Precipitation is 4 to 6 inches, and the frost-free season is 100 to 150 days.

The soils have moderate to moderately rapid permeability. Runoff is slow to medium, and the hazard of erosion is slight. Available water capacity is high. Effective rooting depth is more than 60 inches.

The soils of this unit are potentially suited to irrigated crops, hay, and pasture. They are used mainly for range and wildlife habitat.

A continuing or permanent limitation to use of these soils for irrigated crops is coarse surface texture.

Development of a dependable source of irrigation water, irrigation water management, conservation cropping systems, and such soil blowing control practices as windbreaks and close growing cover crops are essential to good management. Tillage operations should be held to a minimum to decrease the effects of the wind.

CAPABILITY UNIT IIs–43 IRRIGATED

This unit consists of very deep, well drained soils. The soils have a surface layer of loamy sand and loamy fine sand. The subsoil and substratum are sandy clay loam and fine sandy loam. Slopes are 0 to 2 percent. Precipitation is 4 to 6 inches, and the frost-free season is 100 to 130 days.

The soils have moderate to moderately rapid permeability. Runoff is slow to medium, and the hazard of erosion is slight. Available water capacity is moderate to high. Effective rooting depth is more than 60 inches.

The soils in this unit are potentially suited to irrigated crops. They are used mainly for range.

A continuing or permanent limitation to use of these soils for irrigated crops is coarse surface texture.

Development of a dependable source of irrigation water, irrigation water management, such soil blowing control practices as close-growing crops and windbreaks in some areas, conservation cropping systems, and pasture and hayland management are essential to good management. Tillage operations should be held to a minimum to decrease the effects of wind.

CAPABILITY UNIT IIc–1 IRRIGATED

This unit consists of very deep, well drained soils. The soils have a surface layer of fine sandy loam, gravelly loam, or loam. The subsoil and substratum are fine sandy loam, loam, clay loam, or silty clay loam. Slopes are 0 to 2 percent. Precipitation is 4 to 6 inches. The frost-free season is generally 100 to 130 days, but in some places it may be slightly longer.

The soils have moderately rapid to moderately slow permeability. Runoff is slow to medium, and the hazard of erosion is slight. Available water capacity is moderate to high. Effective rooting depth is more than 60 inches.

The soils in this unit are potentially suited to irrigated crops, pasture, and hay. They are used mainly for range and wildlife habitat.

A continuing or permanent limitation to use of these soils for irrigated crops or pasture and hay is the short growing season.

Development of a dependable source of irrigation water, irrigation water management, conservation cropping systems, pasture and hayland management, and crop or windbreak plants to control erosion and soil blowing are essential to good management.

CAPABILITY UNIT IIIe–25 IRRIGATED

This unit consists of very deep, somewhat excessively drained soils. The soils have a surface layer of gravelly loam. The subsoil and substratum are very gravelly sandy loam. Slopes are 2 to 8 percent. Precipitation is 4 to 6 inches, and the frost-free season is 100 to 130 days.

The soils have moderately rapid permeability. Runoff is medium, and the hazard of erosion is moderate. Available water capacity is low. Effective rooting depth is more than 60 inches.

The soils in this unit are suited to irrigated crops, pasture, and hay. They are used mainly for range and wildlife habitat.

Continuing or permanent limitations to use of these soils for irrigated crops are low available water capacity and slope.

Development of a dependable source of irrigation water, conservation cropping systems, irrigation water management, windbreaks, and pasture and hayland planting and management are essential to good management.

CAPABILITY UNIT IIIe–26 IRRIGATED

This unit consists of moderately deep, well drained soils. The soils have a surface layer of gravelly loamy sand and sandy loam. The subsoil and substratum are sandy clay loam, gravelly loamy sand, and sandy loam. The substratum is weakly cemented in places. Slopes are 0 to 8 percent. Precipitation is 4 to 6 inches, and the frost-free season is 100 to 130 days.

The soils have moderately slow permeability. Runoff is medium, and the hazard of erosion is moderate. Available water capacity is moderate. Effective rooting depth is about 36 inches.

The soils in this unit are suited to irrigated crops, pasture, and hay. They are used mainly for range and wildlife habitat.

Continuing or permanent limitations to use of these soils for irrigated crops are coarse texture, slope, and moderate available water capacity.

Development of a dependable source of irrigation water, irrigation water management, conservation cropping systems, crop residue management, windbreaks, and pasture and hayland planting and management are essential to good management.

CAPABILITY UNIT IIIw–39 IRRIGATED

This unit consists of very deep, somewhat excessively drained soils that are subject to occasional flooding. The soils have a surface layer of gravelly fine sandy loam and coarse sandy loam. The subsoil and substratum are very gravelly sandy loam, stratified loamy sand, very gravelly sand, coarse sandy loam, and fine sandy loam. Slopes are 0 to 2 percent. Precipitation is 4 to 6 inches. The frost-free season is 130 to 150 days, but in some areas it is 100 to 130 days.

The soils have moderately rapid to rapid permeability. Runoff is medium and slow, and the hazard of erosion is slight. Available water capacity is low to moderate. Effective rooting depth is more than 60 inches.

The soils in this unit are suited to irrigated crops. They are used mainly for range and wildlife habitat.

Continuing or permanent limitations to use of these soils for irrigated crops are flooding and low available water capacity.

Development of a dependable source of irrigation water, structural measures to control flooding, conservation cropping systems, irrigation water management, and pasture and hayland planting and management are essential to good management.

CAPABILITY UNIT IIIw–60 IRRIGATED

This unit consists of very deep, poorly drained soils that are subject to occasional flooding. The soils have a surface layer of silt loam. The subsoil and substratum are silty clay, loam, clay loam, and sandy clay loam. Slopes are 0 to 2 percent. Precipitation is 4 to 6 inches, and the frost-free season is 100 to 130 days.

The soils have moderately slow permeability. Runoff is very slow or ponded, and the hazard of erosion is slight. Available water capacity is high. Effective rooting depth is more than 60 inches. A seasonal high water table is at a depth of 2 to 3.5 feet and is generally highest in winter and in spring.

The soils in this unit have limited suitability for irrigated crops. They are used mainly for pasture and meadow grass hay.

A continuing or permanent limitation to use of these soils for meadow hay is the fluctuating high water table.

Pasture and hayland planting and management and irrigation water management are essential to good management.

CAPABILITY UNIT IIIs–22 IRRIGATED

This unit consists of very deep, somewhat excessively drained soils. The soils have a surface layer of gravelly fine sand and loamy sand. The subsoil is gravelly and very gravelly fine sandy loam, loamy fine sand, and sand, and the substratum is very gravelly sand and loamy sand. Slopes are 0 to 8 percent. Precipitation is 4 to 6 inches. The frost-free season is 130 to 150 days, but in some areas it is shorter, and in others it is longer.

The soils have moderately rapid to rapid permeability. Runoff is very slow and slow, and the hazard of erosion is slight. The hazard of soil blowing is high on some soils. Available water capacity is low to moderate. Effective rooting depth is more than 60 inches.

The soils in this unit are suited to irrigated crops, pasture, and hay. They are used mainly for range and wildlife habitat.

Continuing or permanent limitations to use of these soils for irrigated crops are high irrigation water requirements, coarse texture, and low to moderate available water capacity.

Conservation cropping systems, windbreaks or other practices for control of soil blowing, irrigation systems (sprinklers), and pasture and hayland planting and management are essential to good management. Because the soils have a rapid intake rate and low to moderate available water capacity, irrigation water management is important. Tillage operations should be kept to a minimum, and large amounts of crop residue should be returned to the soil.

CAPABILITY UNIT IIIs–43 IRRIGATED

This unit consists of very deep, well drained soils. The soils have a surface layer of very gravelly loamy sand and coarse sandy loam. The subsoil and substratum are coarse sandy loam, loam, fine sandy loam, and silt loam. Slopes are 0 to 2 percent. Precipitation is 4 to 6 inches, and the frost-free season is 100 to 130 days.

The soils have moderate to moderately rapid permeability. Runoff is medium, and the hazard of erosion is slight. Available water capacity is moderate to high. Effective rooting depth is more than 60 inches.

The soils in this unit are suited to irrigated crops, pasture, and hay. They are used mainly for range and wildlife habitat.

A continuing or permanent limitation to use of the soils for irrigated crops is the very gravelly, very coarse textured and coarse textured surface layer.

Development of a dependable source of irrigation water, conservation cropping systems, irrigation

water management, pasture and hayland planting and management are essential to good management.

CAPABILITY UNIT IIIs–45 IRRIGATED

This unit consists of very deep, somewhat excessively drained soils. The soils have a surface layer of gravelly fine sandy loam and fine sandy loam. The subsoil and substratum are loamy fine sand and very gravelly loam and sandy loam. Slopes are 0 to 2 percent. Precipitation is 4 to 6 inches, and the frost-free season is 100 to 130 days.

The soils have moderately rapid to rapid permeability. Runoff is very slow and medium, and the hazard of erosion is slight. Available water capacity is low to moderate. Effective rooting depth is more than 60 inches.

The soils in this unit are suited to irrigated crops, hay, or pasture. They are used mainly for range and wildlife habitat.

A continuing or permanent limitation to use of the soils for irrigated crops is the low to moderate available water capacity.

Development of a dependable source of irrigation water, conservation cropping systems, irrigation water management, and pasture and hayland planting and management are essential to good management. Timing irrigation to meet crop needs and using a suitable type of irrigation system are especially important because of the rapid permeability of these soils.

CAPABILITY UNIT IVw–61 IRRIGATED

This unit consists of very deep, somewhat poorly drained, slightly saline-alkali affected soils. The soils have a surface layer of loam or silty clay loam. The subsoil and substratum are silty clay loam, sand, and stratified loam and silty clay loam. Slopes are 0 to 2 percent. Precipitation is 4 to 6 inches, and the frost-free season is 100 to 130 days.

The soils have moderately slow permeability. Runoff is slow, and the hazard of erosion is slight. Available water capacity is high. Effective rooting depth is more than 60 inches. A seasonal high water table is at a depth of 3 to 6 feet.

The soils in this unit have limited suitability for irrigated crops, hay, and pasture. They are used mainly for range and wildlife.

Continuing or permanent limitations to use of these soils for irrigated crops are drainage, the seasonal high water table, the hazard of flooding, and a saline-alkali condition.

Development of a dependable source of irrigation water, adequate drainage, irrigation water management, conservation cropping systems, protection from flooding, pasture and hayland planting and management, and toxic salt reduction are essential to good management.

CAPABILITY UNIT IVs–12 IRRIGATED

This unit consists of moderately deep, well drained soils. The soils have a surface layer of sand, gravelly sandy loam, and gravelly loamy coarse sand. The subsoil is fine sandy loam, sandy loam, and stratified gravelly coarse sandy loam, loamy sand, and sand. It is underlain by a strongly cemented hardpan at a depth of 20 to 30 inches. Slopes are 0 to 4 percent. Precipitation is 4 to 6 inches, and the frost-free season is 130 to 150 days.

The soils have moderately rapid permeability above the hardpan and very slow to slow permeability through it. Runoff is slow to medium, and the hazard of erosion is slight. Available water capacity is low. Effective rooting depth is 20 to 36 inches.

The soils in this unit have limited suitability for irrigated crops, hay, and pasture. They are used mainly for range and wildlife habitat.

Continuing or permanent limitations to use of these soils for irrigated crops are depth, coarse texture, and low available water capacity.

Development of a dependable source of irrigation water, deep chiseling and subsoiling, conservation cropping systems, irrigation water management, and pasture and hayland planting and management are essential to good management.

CAPABILITY UNIT IVs–50 IRRIGATED

This unit consists of shallow, well drained soils. The soils have a surface layer of gravelly loam and sandy loam. The subsoil is loam, sandy loam, and a thin, strongly cemented hardpan. It is underlain by gravelly sandy loam that extends to a depth of 60 inches or more. Slopes are 0 to 4 percent. Precipitation is 4 to 6 inches, and the frost-free season is 100 to 150 days.

The soils have moderately rapid permeability above the hardpan and very slow permeability through it. Runoff is slow to rapid, and the hazard of erosion is slight. Available water capacity is very low. Effective rooting depth is 10 to 20 inches.

The soils in this unit have limited suitability for irrigated crops, hay, and pasture. They are used mainly for range and wildlife habitat.

Continuing or permanent limitations to use of these soils for irrigated crops are slope, depth, moderately coarse texture, and very low available water capacity.

Development of a dependable source of irrigation water, chiseling and subsoiling, conservation cropping systems, irrigation water management, and pasture and hayland planting and management are essential to good management.

CAPABILITY SUBCLASS VIw DRYLAND

This subclass consists of very deep, somewhat poorly drained and poorly drained, slightly saline-alkali affected soils. Some of the soils are subject to occasional flooding. The soils have a surface layer of loam, silt loam, silty clay loam, and clay loam. The subsoil and substratum are loam, silty clay loam, and clay loam. Slopes are 0 to 2 percent. Precipitation is 4 to 6 inches, and the frost-free season is 100 to 130 days.

The soils have moderately slow and slow permeability. Runoff is slow to ponded, and the hazard of erosion is slight. Available water capacity is moderate to high. Effective rooting depth is more than 60 inches.

A seasonal high water table varies between depths of 2 and 7 feet.

The soils in this subclass are not suited to irrigated crops. They are used mainly for range and wildlife habitat.

Continuing or permanent limitations to use of these soils by livestock and wildlife are wetness, drainage, and the effects of salt and alkali.

Drainage, toxic salt reduction, proper grazing use, pasture management, and wildlife wetland management are essential to good management.

CAPABILITY SUBCLASS VIIw DRYLAND

This subclass consists of very deep, somewhat excessively drained to poorly drained, strongly saline-alkali soils that are occasionally flooded. The soils have a surface layer of fine sandy loam, loam, silt loam, silty clay loam, and clay loam. The subsoil and substratum are loam, silt loam, silty clay loam, and clay loam. Slopes are 0 to 2 percent. Precipitation is 4 to 6 inches, and the frost-free season is 100 to 150 days.

The soils have rapid to very slow permeability. Runoff is very slow to rapid, and the hazard of erosion is slight. Available water capacity is low to high. Effective rooting depth is more than 60 inches. A seasonal high water table varies between depths of 2.5 and 6 feet.

The soils in this subclass are not suited to irrigated crops. They are used mainly for range and wildlife habitat.

Continuing or permanent limitations to use of these soils by livestock and wildlife are susceptibility to occasional damage by flooding, strong saline-alkali conditions, and wetness.

Proper grazing use, deferred grazing, planned grazing systems, and toxic salt reduction are essential to good management.

CAPABILITY SUBCLASS VIIs DRYLAND

This subclass consists of shallow and very deep, well drained to excessively drained soils. The soils have a surface layer of sand, loamy sand, sandy loam, fine sandy loam, very fine sandy loam, and loam that is modified by gravel, stones, or cobbles. The subsoil and substratum are sand, loamy sand, sandy loam, fine sandy loam, loam, silty clay loam, or clay loam modified by gravel, stones, or cobbles. They are underlain by semiconsolidated lake-laid sediment, a weakly to strongly cemented hardpan, or bedrock. Slopes are 0 to 50 percent. Precipitation is 4 to 14 inches, and the frost-free season is 80 to 150 days.

The soils have very slow to very rapid permeability. Runoff is very slow to very rapid, and the hazard of erosion is slight to high. Available water capacity is very low to moderate. Effective rooting depth is 5 to 60 inches.

The soils in this subclass are not suited to irrigated crops. They are used mainly for range, wildlife habitat, and watershed purposes.

Continuing or permanent limitations to use of these soils by livestock and wildlife are the stony surface, low available water capacity, slope, and depth of soil. In some cases these limitations make the soils unsuitable for range seeding. Sparse rainfall also limits the use of the soil.

Planned grazing systems and proper grazing use are essential to good management. Good management is needed to maintain or improve existing native plant cover and to control erosion.

CAPABILITY SUBCLASS VIIe DRYLAND

This subclass consists of very deep, well drained soils. The soils have a surface layer of sandy loam, fine sandy loam, and sand. The subsoil and substratum are fine sandy loam, loam, or clay loam. Slopes are 0 to 8 percent. Precipitation is 4 to 6 inches, and the frost-free season is 100 to 150 days.

The soils have moderately slow to moderately rapid permeability. Runoff is slow to rapid, and the hazard of erosion is slight to moderate. Available water capacity is moderate to high. Effective rooting depth is more than 60 inches.

The soils in this subclass are not suited to irrigated crops. They are used mainly for range and wildlife habitat.

A continuing or permanent limitation to use of these soils by livestock and wildlife is the inadequate precipitation in the summer. This limitation makes the soils unsuitable for range seeding.

Planned grazing systems and proper grazing use are essential to good management. Good management is needed to maintain or improve existing native plant cover and to control erosion.

CAPABILITY SUBCLASS VIIIe DRYLAND

This subclass consists of Badland, a land type that is barren or nearly barren. Badland consists of highly variable soil-like material on lake terraces that have severely eroded faces. Slopes are steep to extremely steep, but rough broken lands generally have gentle slopes and severe gullying.

Runoff is very rapid, and the hazard of erosion is very severe. Drainage, permeability, available water capacity, and effective rooting depth are highly variable.

Badland is not suited to irrigated crops. It is used for wildlife. The surrounding soils have very limited use as range.

CAPABILITY SUBCLASS VIIIw DRYLAND

This subclass consists of Playas and also includes Slickens. Playas are a land type that is highly stratified, variably textured soil material. They are nearly level and slightly concave and are deep, poorly drained, saline-alkali affected, and subject to flooding.

Permeability is very slow. Runoff is ponded, and the hazard of erosion is slight. Playas are covered at times by an ephemeral lake caused by runoff in winter and in spring or by high-intensity storms in summer.

Slickens are finely ground rock material that has been chemically treated during milling operations. Such treatment is generally detrimental to plant growth.

Playas and Slickens are essentially barren except for a very few salt- and alkali-tolerant plants around their margins. They are not suited to irrigated crops,

range, or wildlife. They may have some value for recreation and esthetic purposes.

CAPABILITY SUBCLASS VIIIs DRYLAND

This subclass consists of Rock outcrop, but also includes Dune land and Mine dumps. Rock outcrop is a land type that is barren, colluvial slopes strewn with boulders, stones, and exposures of bedrock randomly mixed with shallow or very shallow soils over the bedrock. Slopes are moderately steep to extremely steep. The slopes are on hills, canyon faces, and mountainsides. Runoff is variable, and the erosion hazard is moderate to high.

Dune land consists of barren, unstabilized accumulations of loose sand that have been superimposed upon the valley floor. The dunes are 10 to 100 feet high and have steep slopes.

Mine dumps are barren, manmade mounds of rock left after mining and milling.

These land types are not suited to irrigated crops, range, or wildlife. They may have some recreational or esthetic value.

Estimated yields

Table 4 lists average annual yields per acre of the main crops on important cultivated soils in the Big Smoky Valley Area under average good management.

The estimates were prepared cooperatively by the Soil Conservation Service (*10*), the Nevada Agricultural Experiment Station, and the Nevada Cooperative Extension Service and reflects information provided by local farmers and ranchers.

Several important variable factors should be kept in mind when using Table 4. First, the yield figures are only estimates, but they are reliable enough to be valuable. Second, the estimates are for average yields that can be expected over a period of years. Yields may be above or below the average in any particular year. Third, there are variations in yield 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 farms has an influence on yields.

Farmers who obtain the sustained yields given in table 4 follow the practices recommended in their conservation plan, which includes practices suggested for each capability unit. Briefly this involves:

1. Conservation cropping systems.
2. Crop residue management.
3. Irrigation systems.
4. Irrigation water management.
5. Mulching.
6. Erosion control.
7. Addition of plant nutrients.
8. Insect and weed control.
9. Pasture and hayland planting.
10. Pasture and hayland management.
11. Management of saline-alkali soils.

In the table, the yields shown in the column headed alfalfa-grass (hay) can be expected to decrease slightly if alfalfa is grown alone. In places native pastures include some introduced species of grass or clover, or both. Pasture includes some stands of grass or clover, or both, that have been seeded. It can be grazed or cut for hay.

Range [2]

Range is land on which the climax, or natural potential, plant community is dominated by grasses, grasslike plants, forbs, and shrubs. Range is mainly grazed by domestic livestock and wild herbivores. Properly managed range, however, can also be used for wildlife habitat, recreation, watershed, groundwater recharge, historic and cultural sites, natural areas, esthetic beauty, and clean air and water.

There are approximately 525,000 acres of range in Big Smoky Valley. This range is public land administered by the Bureau of Land Management. Grazing on the public range is generally integrated during parts of the year with grazing on private irrigated pasture, cropland aftermath, and range.

The range vegetation in Big Smoky Valley reflects a long history of heavy grazing by domestic livestock. Most plant communities have deteriorated far below the potential for given soils and climate.

Most of the range in Big Smoky Valley is inherently low producing because of low precipitation compounded in some instances by poor plant-soil-moisture relationships. Production tends to increase as elevation increases significantly, mostly because precipitation increases. Certain areas that receive overflow or extra run-on water, and others influenced by a high water table, also have higher production potential.

Range sites and range condition

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 distrubance, 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

[2] By LELAND CAMPSEY, range conservationist, and DEAN CHAMRAD, range conservationist, Soil Conservation Service.

TABLE 4.—*Estimated average yields per acre of principal crops on important cultivated soils*

[Yields of irrigated crops are those obtained at the highest level of management considered feasible. Absence of a figure indicates crop is not commonly grown on the soil or crop is not economically suited to that soil (*10*). Information is based on data obtained at Tonopah, Nevada]

Soil name	Alfalfa (hay)	Barley (grain)	Wheat (grain)	Alfalfa grass (hay)	Grass (pasture)
	Tons	*Bu*	*Bu*	*Tons*	*AUM* [1]
Broe gravelly fine sand, 0 to 4 percent slopes	5	62	60	5	2.5
Broyles fine sandy loam, 0 to 2 percent slopes	6	90	75	6	16.0
Broyles fine sandy loam, 2 to 4 percent slopes	6	90	75	6	16.0
Caudle fine sandy loam	6	90	75	6	15.0
Domez sand	5	60	60	5	12.5
Domez fine sandy loam	7	100	100	7	17.5
Fivemile loam	6	90	75	6	15.0
Fivemile complex	6	90	75	6	15.0
Griffy loamy sand	5	60	60	5	12.5
Griffy gravelly loam	6	90	75	6	15.0
Jolan gravelly loamy coarse sand	5	60	60	5	12.5
Koyen sand, 0 to 2 percent slopes	5	60	60	5	12.5
Koyen fine sandy loam, 2 to 4 percent slopes	5	62	60	5	12.5
Koyen gravelly fine sandy loam, 0 to 2 percent slopes	7	100	100	7	17.5
Laxal gravelly fine sandy loam, 0 to 2 percent slopes	5	60	53	5	12.5
Laxal gravelly fine sandy loam, occasionally flooded, 0 to 2 percent slopes	5	60	53	5	12.5
Laxal gravelly loam, 2 to 4 percent slopes	5	60	53	5	12.5
Mazuma fine sandy loam, 0 to 2 percent slopes	6	90	75	6	15.0
Mazuma fine sandy loam, slightly wet, 0 to 2 percent slopes	6	90	75	6	15.0
Mazuma very fine sandy loam, 2 to 4 percent slopes	6	90	75	6	15.0
Noyson sand				4	10.0
Noyson gravelly sandy loam				4	10.0
Orizaba loam, drained	6	90	75	6	15.0
Orizaba loam, slightly saline-alkali					10.0
Orovada very gravelly loamy sand, 0 to 2 percent slopes	5	60	60	5	12.5
Orovada fine sandy loam, 0 to 2 percent slopes	6	90	75	6	15.0
Orovada gravelly fine sandy loam, 2 to 4 percent slopes	6	90	75	6	15.0
Quima coarse sandy loam, 0 to 2 percent slopes	5	62	60	5	12.5
Quima fine sandy loam, 2 to 4 percent slopes	5	62	60	5	12.5
Settlemeyer loam, drained	6	90	75	6	15.0
Settlemeyer silt loam					12.5
Stargo gravelly loamy sand	5	65	53	5	12.5
Stargo coarse sandy loam	5	60	53	5	12.5
Stumble loamy fine sand, 0 to 8 percent slopes	5	60	53	5	12.5
Stumble fine sandy loam, 0 to 2 percent slopes	5	62	60	5	12.5
Sundown fine sand	5	60	53	5	12.5
Timper sand, 0 to 2 percent slopes				4	10.0
Timper gravelly sandy loam, 0 to 4 percent slopes				4	10.0
Vigus gravelly loamy sand, 2 to 8 percent slopes	5	60	53	5	12.5
Yomba gravelly sand	5	60	53	5	12.5
Yomba gravelly fine sandy loam	5	60	53	5	12.5
Youngston loamy sand	6	60	60	5	12.5
Youngston fine sandy loam	6	90	75	6	12.5
Youngston silt loam	6	90	75	6	12.5

[1] Animal-unit-months. The number of mature animals (cows or horses) that can graze one acre during the irrigation season without damaging the pasture.

vegetation on a range site in relation to the native vegetation that could grow there.

A range is in *excellent condition* if 75 to 100 percent of the vegetation is of the same kind as that in the climax stand. It is in *good condition* if the percentage is 50 to 75; in *fair condition* if the percentage is 25 to 50; and in *poor condition* if the percentage is less than 25.

When changes occur in the climax plant community because of use by livestock or disturbance, some plant species increase and others decrease. Species increasing or decreasing depends upon 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 on the site.

The composition of climax and present plant communities together with other range site information provides the basis for selecting range management systems.

Management programs on range usually try to increase desirable plants and restore range to as near climax conditions as possible. Some programs are designed to create or maintain plant communities somewhat different from the climax community to fit specific needs in the grazing program, to provide for wildlife habitat, or for other benefits. Any manage-

ment objective should be compatible with conservation objectives.

In the following pages, the 13 range sites in Big Smoky Valley 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 good to excellent condition, unless otherwise identified, for favorable and unfavorable seasons. These yields are given as the normal high and low rather than the extremes. Total annual air-dry yield in pounds per acre includes the current year's growth of leaves, stems, twigs, and fruit of all plants on the site, but the entire growth is not all used by livestock. The soils in each site can be determined by referring to the "Guide to Mapping Units" at the back of this soil survey.

RANGE SITE NV 28–1 AND NV 29–1, DESERT LOAMY

This range site consists of nearly level to moderately sloping soils on alluvial fans and aprons. Slopes are 0 to 8 percent. Elevation is 5,500 to 6,000 feet. The mean annual precipitation is about 4 to 6 inches, which falls mainly during winter and spring. Some late-summer precipitation falls during normal years. The mean annual air temperature is 45° to 50° F, and the frost-free season is 100 to 130 days.

These soils are shallow to very deep and well drained to excessively drained. They have a gravelly coarse textured, moderately coarse textured, and medium textured surface layer and a moderately coarse textured to very gravelly coarse textured subsoil and substratum. They have very rapid to moderately slow permeability, and very low to high available water capacity. Runoff is very slow to medium, and the hazard of erosion is slight to moderate.

The potential plant community is dominantly shadscale, fourwing saltbrush, and Indian ricegrass. The approximate composition of plants, by weight, is 5 to 20 percent Indian ricegrass and squirreltail; 1 to 15 percent galleta, kings desertgrass, and sand dropseed; 1 to 5 percent globemallow and buckwheat; 1 to 5 percent annual grasses and forbes; 40 to 80 percent shadscale; 5 to 45 percent winterfat and bud sagebrush; 10 to 30 percent spiny hopsage and fourwing saltbush; and 2 to 10 percent littleleaf horsebrush, Nevada ephedra, and Douglas rabbitbrush.

As range condition deteriorates, shadscale and littleleaf horsebrush increase, and annuals invade.

This site is not suitable for range seeding or brush management because of low precipitation and poor plant-soil-moisture relationship.

When this site is in good to excellent condition, the total annual yield of air-dry herbage is about 400 pounds per acre in favorable years and 150 pounds per acre in unfavorable years.

RANGE SITE NV 28–2 AND NV 29–2, DESERT LOAMY SAL

This range site consists of soils on smooth and dissected alluvial fans and valley plains. Slopes are generally 0 to 8 percent but in places range to as much as 30 percent. The mean annual precipitation is about 4 to 8 inches, which falls mainly during the winter and spring. Some late-summer precipitation falls during normal years. The mean annual air temperature is 43° to 51° F, and the frost-free season is 100 to 150 days.

These soils are shallow to very deep and well drained to excessively drained. They have a coarse textured, moderately coarse textured, to medium textured surface layer that is stony, very stony, gravelly, or very gravelly in places. The subsoil and substratum are coarse textured to moderately fine textured and are stony, very stony, gravelly or very gravelly in places. The soils have very rapid to slow permeability above the hardpan and very slow permeability through it. They have very low to high available water capacity. Runoff is rapid to very slow, and the hazard of erosion is slight to moderate.

The potential plant community is dominantly Bailey greasewood and shadscale in association with several species of perennial desert grasses. The approximate composition of plants, by weight, is 10 to 20 percent Indian ricegrass and squirreltail; 10 to 25 percent galleta, kings desertgrass, three-awn, and sand dropseed; 2 to 15 percent needleandthread and desert needlegrass; 2 to 8 percent globemallow, buckwheat, princesplume, and aster; 1 to 5 percent annual grasses and forbs; 20 to 50 percent Bailey greasewood and shadscale; 5 to 15 percent bud sagebrush, black sagebrush, and winterfat; 10 to 20 percent spiny hopsage, kochia, and fourwing saltbush; and 5 to 15 percent Anderson wolfberry, Nevada ephedra, Douglas rabbitbrush, littleleaf horsebrush, spiny horsebrush, white burrobrush, and dalea.

As range condition deteriorates, Bailey greasewood and shadscale increase, and Russian-thistle may invade.

This site is not suitable for brush management or range seeding because of low precipitation and poor plant-soil-moisture relationships. The most practical management for this site is a system of grazing management designed to improve and maintain desirable range condition.

When this site is in good to excellent condition, the total annual yield of air-dry herbage is about 350 pounds per acre in favorable years and 100 pounds per acre in unfavorable years.

RANGE SITE NV 28–3 AND NV 29–3, SODIC FLAT

This range site consists of soils on smooth, low lake terraces above and near playas. The soils are generally nearly level, but in a few places slopes range to 8 percent. Elevation is 5,500 to 5,800 feet. The mean annual precipitation is 4 to 6 inches, which falls mainly during winter and spring. Some late-summer precipitation falls during normal years. The mean annual air temperature is 43° to 50° F, and the frost-free season is about 100 to 130 days.

These soils are very deep and poorly drained to well drained. A seasonal water table is generally at a depth of about 5 to 7 feet late in winter and in spring. The soils are strongly saline-alkali affected, and this tends to dominate the various other soil characteristics that normally affect plant growth. The soils have a medium textured to moderately fine textured surface layer that is very gravelly in places and a medium textured to fine textured subsoil. They have moderate or moder-

ately slow to very slow permeability and low to high available water capacity. Runoff is very slow to very rapid, and the hazard of erosion is slight.

The potential plant community is dominantly black greasewood in association with saltgrass, alkali sacaton, and basin wildrye. The approximate composition of plants, by weight, is 10 to 30 percent saltgrass, alkali sacaton, and basin wildrye; 1 to 5 percent Indian ricegrass and squirreltail; 1 to 5 percent alkali seepweed; 5 to 15 percent annual grasses and forbs; 20 to 50 percent black greasewood; and 10 to 20 percent shadscale, iodinebush, and quailbush.

As range condition deteriorates, black greasewood, shadscale, and alkali seepweed increase, and Russian thistle may invade.

This site is not suitable for range seeding or brush management because of saline and alkali conditions. The most practical management for this site is a system of grazing management designed to improve and maintain desirable range condition.

When this site is in good to excellent condition, the total annual yield of air-dry herbage is about 150 pounds per acre in favorable years and 50 pounds per acre in unfavorable years.

RANGE SITE NV 28–4, SALINE BOTTOM

This range site consists of nearly level soils on flood plains and terraces. Slopes are less than 2 percent. Elevation is about 4,600 feet. The mean annual precipitation is about 4 to 6 inches, which falls mainly during winter and spring. Some late-summer precipitation falls during normal years. The site receives some extra run-on water. The mean annual air temperature is 43° to 50° F, and the frost-free season is about 100 to 130 days.

These soils are very deep and somewhat poorly drained. They are slightly saline-alkali affected. They have a moderately coarse textured to moderately fine textured surface layer and a medium textured to fine textured substratum. They have moderately slow to slow permeability and high available water capacity. Runoff is slow, very slow, or ponded, and the hazard of erosion is slight.

The potential plant community is dominantly big sagebrush, black greasewood, and rubber rabbitbrush. The approximate composition of plants, by weight, is 5 to 20 percent saltgrass; 5 to 15 percent alkali sacaton; 15 to 35 percent basin wildrye; 5 to 10 percent carex, wiregrass, and rushes; 1 to 10 percent povertyweed, other annual forbs, and grasses; 5 to 15 percent big sagebrush; 15 to 30 percent black greasewood and rubber rabbitbrush; and 1 to 10 percent fourwing saltbush, shadscale, and buffaloberry.

As range condition deteriorates, big sagebrush, black greasewood, and rubber rabbitbrush increase.

This site is not suited for range seeding because of saline and alkali conditions, but brush management by chemical application can be used in places. The most practical management for this site is a system of grazing management designed to improve and maintain desirable range condition.

When this site is in good to excellent condition, the total annual yield of air-dry herbage is about 1,000 pounds per acre in favorable years and 500 pounds per acre in unfavorable years.

RANGE SITE NV 29–6, LOAMY BOTTOM

This range site consists of nearly level to gently sloping soils on alluvial fans and valley bottoms. Slopes are 0 to 4 percent. Elevation is 4,800 to 5,800 feet. The mean annual precipitation is about 4 to 6 inches, which falls mainly during winter and spring. Some late-summer precipitation falls during normal years. This site receives some extra run-on water. The mean annual air temperature is 43° to 51° F, and the frost-free season is 100 to 130 days.

These soils are very deep and well drained to excessively drained. They have a coarse textured, moderately coarse textured, to medium textured surface layer and a coarse, medium textured to moderately fine textured subsoil and substratum. They have very rapid to moderately slow permeability and low to high available water capacity. Runoff is slow to rapid, and the hazard of erosion is slight to moderate.

The potential plant community is dominantly big sagebrush, fourwing saltbush, and basin wildrye. The approximate composition of plants, by weight, is 15 to 40 percent basin wildrye; 5 to 35 percent Indian ricegrass, squirreltail, and galleta; 2 to 10 percent saltgrass and alkali sacaton; 1 to 5 percent globemallow; 1 to 5 percent annual forbs and grasses; 10 to 25 percent big sagebrush and fourwing saltbush; 5 to 10 percent black greasewood, rubber rabbitbrush, and Douglas rabbitbrush; and 5 to 25 percent shadscale, bud sagebrush, Anderson wolfberry, and spiny horsebrush.

As range condition deteriorates, rubber rabbitbrush, big sagebrush, and Bailey greasewood increase.

Brush management by chemical application is feasible on this site if any desirable plants are left. Essential management for this site is a system of grazing management designed to improve and maintain desirable range condition.

When this site is in good to excellent condition, the total annual yield of air-dry herbage is about 500 pounds per acre in favorable years and 250 pounds per acre in unfavorable years.

RANGE SITE NV 28–7 AND NV 29–7, UPLAND JUNIPER SLOPE

This site consists of gently sloping to steep soils on mountainsides. Slopes are 4 to 50 percent. Elevation is 6,500 to 8,500 feet. The mean annual precipitation is 10 to 14 inches, which falls mainly during winter and spring. Some late-summer precipitation falls during normal years. The mean annual air temperature is 40° to 43° F, and the frost-free season is 80 to 100 days.

These soils are shallow to very deep and well drained. They have an extremely stony to stony, medium textured surface layer and a very cobbly, medium textured substratum. They have moderately slow to moderate permeability and very low to moderate available water capacity. Runoff is medium to rapid, and the hazard of erosion is moderate.

The potential plant community is dominantly black sagebrush, some big sagebrush, and scattered juniper and pinyon trees. The approximate composition of

plants, by weight, is 10 to 40 percent Indian ricegrass, squirreltail, galleta, and Sandberg bluegrass; 15 to 40 percent Thurber needlegrass, desert needlegrass, and needleandthread; 5 to 10 percent buckwheat, phlox, gilia, locoweed, and rock cress; 1 to 5 percent annual forbs and grasses; 10 to 25 percent juniper and pinyon; 5 to 15 percent black sagebrush and big sagebrush; 5 to 20 percent bitterbrush, cliffrose, spiny hopsage, and little rabbitbrush; and 1 to 5 percent Nevada ephedra and cacti.

As range condition deteriorates, big sagebrush, juniper and pinyon, and annual forbs increase.

This site is not suitable for range seeding or mechanical treatment because of steep slopes and stoniness. The most practical management for this site is a system of grazing management designed to improve and maintain desirable range condition.

When this site is in good to excellent condition, the total annual yield of air-dry herbage is about 800 pounds in favorable years and 500 pounds per acre in unfavorable years.

RANGE SITE NV 28–9, WET MEADOW

This range site consists of soils on lake terraces and flood plains. Slopes are less than 2 percent. Elevation is 5,500 to 6,000 feet. The mean annual precipitation is 4 to 6 inches, but a water table overrides the effects of low precipitation. The mean annual air temperature is 43° to 47° F, and the frost-free season is 100 to 130 days.

These soils are very deep and poorly drained. They have a medium textured surface layer and a moderately fine textured substratum. They have moderately slow permeability and high available water capacity. Runoff is slow to very slow, and the hazard of erosion is slight.

The potential plant community is dominantly such wetland grasses as creeping wildrye, redtop, and such grasslike plants as carex. The approximate composition of plants, by weight, is 10 to 35 percent carex and rushes; 20 to 40 percent creeping wildrye, redtop, and tufted hairgrass; 10 to 30 percent alkali bluegrass, saltgrass, and Kentucky bluegrass; 2 to 12 percent wild iris, blue-eyegrass, and groundsel; 1 to 5 percent annual forbs and grasses; and 1 to 5 percent wild rose, buffaloberry, and willow.

As range condition deteriorates, carex and willows increase, and if the site is in poor condition they may dominate the plant community.

This site is not suitable for mechanical treatment or seeding because of wetness. The most practical management for this site is a system of grazing management designed to improve and maintain desirable range condition.

When this site is in excellent condition, the total annual yield of air-dry herbage is about 1,200 pounds per acre in favorable years and about 800 pounds per acre in unfavorable years.

RANGE SITE NV 29–10, SEMIDESERT LOAMY SLOPE

This range site consists of steep soils on low hills. Slopes are 30 to 50 percent. Elevation is 6,500 to 7,500 feet. The mean annual precipitation is about 8 to 10 inches, which falls mainly during winter and spring. Some late-summer precipitation falls during normal years. The mean annual air temperature is 43° to 47° F, and the frost-free season is about 100 to 115 days.

These soils are very deep and well drained. They have a stony, medium textured surface layer and a very stony, moderately coarse textured subsoil. They have moderate permeability and low to moderate available water capacity. Runoff is rapid, and the hazard of erosion is moderate.

The potential plant community is dominantly big sagebrush and black sagebrush. The approximate composition of plants, by weight, is 10 to 35 percent Indian ricegrass and galleta; 5 to 15 percent kings desertgrass, squirreltail, sand dropseed, and Sandberg bluegrass; 5 to 15 percent needleandthread; 1 to 10 percent phlox, aster, globemallow, and buckwheat; 1 to 5 percent annual forbs and grasses; 20 to 50 percent big sagebrush and black sagebrush; and 10 to 30 percent winterfat, bud sagebrush, spiny hopsage, and Nevada ephedra.

As range condition deteriorates, big sagebrush and black sagebrush increase.

This site is not suitable for range seeding or mechanical treatment because of steep slopes. The most practical management for this site is a system of grazing management designed to improve and maintain desirable range condition.

When this site is in good to excellent condition, the total annual yield of air-dry herbage is about 600 pounds per acre in favorable years and 300 pounds per acre in unfavorable years.

RANGE SITE NV 29-12, SEMIDESERT SHALLOW LOAMY

This range site consists of soils on rolling, low mountains and hills. Slopes range from 2 to 50 percent but are mostly 8 to 50 percent. Elevation is 5,800 to 8,500 feet. The mean annual precipitation is about 6 to 12 inches, which falls mainly during winter and spring. There are some late-summer storms during normal years. The mean annual air temperature is 40° to 47° F, and the frost-free season is about 80 to 120 days.

These soils are shallow and well drained. They have a moderately coarse textured to medium textured surface layer that is gravelly, very gravelly, stony, very stony, or shaly in places, and they have a very gravelly or very shaly, moderately coarse textured to moderately fine textured subsoil and substratum. They have moderately slow to moderately rapid permeability above the hardpan and very slow permeability through the hardpan. They have very low available water capacity. Runoff is medium to rapid, and the hazard of erosion is slight to high.

The potential plant community is dominantly black sagebrush. The approximate composition of plants, by weight, is 10 to 40 percent galleta, Indian ricegrass, and squirreltail; 2 to 5 percent slim tridens, sand dropseed, kings desertgrass, and Sandberg bluegrass; 1 to 5 percent needleandthread; 2 to 10 percent globemallow, buckwheat, gilia, Indian paintbrush, and aster; 1 to 5 percent annual forbs and grasses; 20 to 40 percent black sagebrush; 10 to 30 percent shadscale, bud sagebrush, fourwing saltbush, and winterfat; 5 to 20

percent spiny hopsage, cliffrose, and Nevada ephedra; and 2 to 10 percent spiny menodora and littleleaf horsebrush.

As range condition deteriorates, black sagebrush increases.

This site is not suited to range seeding or mechanical treatment because of steep slopes and shallow soils. The most practical management for this site is a system of grazing management designed to improve and maintain desirable range condition.

When this site is in good to excellent condition, the total annual yield of air-dry herbage is about 250 pounds per acre in favorable years and 150 pounds in unfavorable years.

RANGE SITE NV 28–13, SALINE MEADOW

This range site consists of nearly level soils on smooth lake terraces. Elevation is 5,500 to 5,800 feet. The mean annual precipitation is about 4 to 6 inches, which falls mainly during winter and spring. Some late-summer precipitation falls during normal years. The mean annual air temperature is 43° to 50° F, and the frost-free season is 100 to 130 days.

These soils are very deep and poorly drained to somewhat poorly drained. The water table is commonly at a depth of about 2.5 to 5 feet. The soils are strongly saline-alkali affected. They have a coarse textured to moderately fine textured surface layer and a moderately fine textured substratum. They have moderately slow to very slow permeability and high available water capacity. Runoff is very slow or ponded, and the hazard of erosion is slight.

The potential plant community is dominantly black greasewood and rubber rabbitbrush. The approximate composition of plants, by weight, is 20 to 25 percent saltgrass; 5 to 15 percent basin wildrye and common reedgrass; 10 to 30 percent alkali sacaton and alkali cordgrass; 2 to 5 percent miterwort and alkali seepweed; 15 to 35 percent annual forbs; 15 to 35 percent black greasewood, rubber rabbitbrush, and iodinebush; and 12 to 25 percent quailbush and buffaloberry.

As range condition deteriorates, black greasewood and rubber rabbitbrush increase.

This soil is not suitable for range seeding, but chemical control of rubber rabbitbrush can cause some improvement. The most practical management for this site is a system of grazing management designed to improve and maintain desirable range condition.

When this site is in good to excellent condition, the total annual yield of air-dry herbage is about 800 pounds per acre in favorable years and 200 pounds per acre in unfavorable years.

RANGE SITE NV 29–14, DESERT STONY HILL

This range site consists of soils on low hills. Slopes are 8 to 50 percent. Elevation is 5,200 to 6,500 feet. The mean annual precipitation is about 4 to 6 inches, which falls mainly during winter and spring. Some late-summer precipitation falls during normal years. The mean annual air temperature is 45° to 50° F, and the frost-free season is 100 to 130 days.

These soils are shallow to very deep and well drained. They have a very stony or very cobbly, moderately coarse textured surface layer and a very gravelly, moderately fine textured to moderately coarse textured subsoil and substratum. Some have a hardpan. The soils in this unit have moderately slow to moderately rapid permeability, but where a hardpan is present, permeability is very slow through it. Available water capacity is very low. Runoff is medium to very rapid, and the hazard of erosion is slight to moderate.

The potential plant community is dominantly spiny menodora. The approximate composition of plants, by weight, is 5 to 25 percent galleta, Indian ricegrass, and kings desertgrass; 1 to 15 percent kochia; 20 to 40 percent spiny menodora; 10 to 35 percent shadscale and bud sagebrush; and 15 to 30 percent Bailey greasewood, Anderson wolfberry, and Nevada ephedra.

As range condition deteriorates, spiny menodora, shadscale, and Bailey greasewood increase.

This site is not suitable for range seeding or brush management because of low precipitation and stoniness. The most practical management for this site is a system of grazing management designed to improve and maintain desirable range condition.

When this site is in good to excellent condition, the total annual yield of air-dry herbage is about 300 pounds per acre in favorable years and 150 pounds per acre in unfavorable years.

RANGE SITE NV 29–16, DESERT SAND

This range site consists of soils on smooth, broad alluvial fans and valley plains. Slopes are 0 to 8 percent. Elevation is 4,800 to 6,000 feet. The mean annual precipitation is about 4 to 6 inches, which falls mainly during winter and spring. Some late-summer precipitation falls during normal years. The mean annual air temperature is 47° to 51° F, and the frost-free season is 100 to 150 days.

These soils are shallow to very deep and well drained to somewhat excessively drained. They have a coarse textured surface layer and a coarse textured substratum that is gravelly in places. They have moderately rapid to rapid permeability and very low to moderate available water capacity. Runoff is slow to very slow, and the hazard of erosion is slight. The hazard of soil blowing is high.

The potential plant community is dominantly littleleaf horsebrush, fourwing saltbush, and sand dropseed. The approximate composition of plants, by weight, is 20 to 40 percent sand dropseed; 20 to 40 percent Indian ricegrass and galleta; 1 to 5 percent globemallow and the other perennial forbs; 2 to 10 percent annual forbs and grasses; 5 to 10 percent littleleaf horsebrush and dalea; 10 to 30 percent fourwing saltbush; and 5 to 40 percent shadscale, spiny hopsage, and winterfat.

As range condition deteriorates, littleleaf horsebrush and shadscale increase, and Russian thistle may invade.

This site is not suitable for range seeding because of low precipitation. The most practical management for this site is a system of grazing management

designed to improve and maintain desirable range condition.

When this site is in good to excellent condition, the total annual yield of air-dry herbage is about 400 pounds per acre in favorable years and 250 pounds per acre in unfavorable years.

RANGE SITE NV 28–18 AND NV 29–18, DESERT DUNE

This range site consists of soils on and around low, crescent shaped dunes that have steep leeward slopes. The dunes are superimposed on nearly level alluvial fans and playas that have side slopes ranging from 4 to 30 percent. Elevation is 5,000 to 5,600 feet. The mean annual precipitation is about 4 to 6 inches, which falls during winter and spring. Some late-summer precipitation falls during normal years. The mean annual air temperature is 47° to 51° F, and the frost-free season is 100 to 130 days.

These soils are deep to very deep and excessively drained. They have a coarse textured surface layer and substratum. They have rapid permeability and low available water capacity. Runoff is very slow, and the hazard of soil blowing is severe.

The potential plant community is dominantly fourwing saltbush, shadscale, and black greasewood. The approximate composition of plants, by weight, is 10 to 25 percent Indian ricegrass and sand dropseed; 5 to 15 percent needleandthread; 5 to 10 percent scurfpea and other perennial forbs; 5 to 10 percent annual forbs and grasses; 20 to 30 percent shadscale; 15 to 25 percent fourwing saltbush and spiny hopsage; 15 to 30 percent black greasewood; and 5 to 15 percent littleleaf horsebrush and hairy horsebrush.

As range condition deteriorates, black greasewood, shadscale, and the horsebrush increase, and Russian-thistle may invade. Extreme deterioration results in very sparse vegetation or total loss of vegetation, and unstabilized soil conditions.

When this site is in good to excellent condition, the total annual yield of air-dry herbage is about 400 pounds per acre in favorable years and 150 pounds per acre in unfavorable years.

Wildlife [3]

Soils directly influence kinds and amounts of vegetation and amounts of water available, and in this way indirectly influence the species of wildlife that inhabit an area. Proper manipulation of soil, water, and plants to produce suitable habitat is the most effective way to maintain and improve wildlife populations. Knowing the properties of named kinds of soils makes it possible to predict how soils will behave under various kinds of vegetation and water management.

Soil properties that affect the productivity of wildlife habitat are thickness of soil useful to plants, surface texture, available water capacity, water supplying capacity, wetness, surface stoniness or rockiness, hazard of flooding, slope, permeability of the soil to air and water, and salinity or alkalinity of the soil.

Soils are rated according to their suitability for plants useful to wildlife or their suitability for holding ponded 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 requires inspection at the site.

In table 5, the birds and mammals common to the Area are listed, and the kind of habitat they frequent are also listed. In table 6, the soils are rated according to their capacity to produce the plants that make up wildlife habitat and their capacity to produce habitat for different kinds of animals.

The ratings for openland, wetland, and rangeland habitat are based on the suitability of the soils for producing those habitat elements which are important components of each habitat type. Each soil in this survey area has been rated according to its suitability for improvement, maintenance, or creation of each of the habitat elements and each kind of wildlife habitat.

The elements of wildlife habitat for which the soils are rated in table 6 are:

Grain and seed crops.—Annual grain-producing plants such as wheat, barley, and oats.

Domestic grasses and legumes.—Perennial domestic grasses and legumes that are planted and that provide wildlife food and cover. Included in this group are alfalfa, clover, brome, intermediate wheatgrass, crested wheatgrass, and orchardgrass.

Wild herbaceous plants.—Native or naturally established grasses and forbs that provide food and cover

TABLE 5.—*Wildlife inhabiting Big Smoky Valley Area, Nevada*

[Numeral 1 indicates habitat type of major importance to this species. Numeral 2 indicates habitat type of minor importance to this species. Dashes indicate habitat type not applicable to this species]

Wildlife species	Openland habitat	Wetland habitat	Rangeland habitat
American peregrine falcon [1]	2	2	1
Badger	2		1
Bald eagle		2	1
Bobcat	2		1
Chukar partridge			1
Cottontail	1	2	1
Coyote	2		1
Golden eagle	2		1
Kit fox	2		1
Mountain lion			2
Mourning dove	1		2
Mule deer	2		1
Other rabbits	1	2	1
Reptiles	2		1
Rodents	1	1	1
Shorebirds	2	1	
Songbirds	1	2	1
Waterfowl	2	1	

[1] Rare or endangered species.

[3] By IVAN L. LINES, biologist (Nevada-Utah), Soil Conservation Service, Salt Lake City, Utah.

TABLE 6.—*Suitability of the*

[Ratings "good," "fair," "poor," and "very poor" are explained in text. The land types Badland, Duneland, Mine dumps,

Soil series and map symbols	Elements of wildlife habitat			
	Grain and seed crops	Domestic grasses and legumes	Wild herbaceous plants	Shrubs
Ardivey: AR	Very poor	Very poor	Very poor	Very poor
Basket: BC	Very poor	Very poor	Poor	Very poor
Belcher: BEB	Very poor	Very poor	Very poor	Very poor
Belted: BHC	Very poor	Very poor	Very poor	Very poor
Bluewing: BLC, BMB, BNC, BOB	Very poor	Very poor	Very poor	Very poor
Broe:				
BPB irrigated	Fair	Fair	Fair	Fair
BPB dryland	Very poor	Very poor	Very poor	Very poor
Broyles:				
BrA, BrB, Bt irrigated	Good	Good	Good	Good
BrA, BrB, Bt dryland	Very poor	Very poor	Very poor	Very poor
Caudle:				
Cf irrigated	Good	Good	Good	Good
Cf dryland	Very poor	Very poor	Very poor	Very poor
Cg	Very poor	Very poor	Very poor	Very poor
Charnock:				
Ch, Cm	Very poor	Very poor	Very poor	Very poor
Ck	Poor	Poor	Poor	Poor
Deerlodge variant: DEC	Very poor	Very poor	Very poor	Very poor
Dobel: DN	Very poor	Very poor	Very poor	Very poor
Domez:				
Do, Dr, Ds irrigated	Good	Good	Good	Good
Do, Dr, Ds dryland	Very poor	Very poor	Very poor	Very poor
Fivemile:				
Fa, Fb irrigated	Good	Good	Good	Good
Fa, Fb dryland	Very poor	Very poor	Very poor	Very poor
Gabbs: GA	Very poor	Very poor	Very poor	Very poor
Griffy:				
Gr, Gs irrigated	Good	Good	Good	Good
Gr, Gs dryland	Very poor	Very poor	Very poor	Very poor
Jolan:				
JO irrigated	Poor	Poor	Fair	Fair
JO dryland	Very poor	Very poor	Very poor	Very poor
Koyen:				
KoA, KrB, KsA irrigated	Good	Good	Good	Good
KoA, KrB, KsA dryland	Very poor	Very poor	Very poor	Very poor
Kyler: KT	Very poor	Very poor	Very poor	Very poor
Lahontan:				
La, Lb irrigated	Poor	Poor	Poor	Poor
La, Lb dryland	Very poor	Very poor	Very poor	Very poor
Lathrop: LCB, LF	Very poor	Very poor	Very poor	Very poor
Laxal:				
LmA, LnA, LRB irrigated	Fair	Fair	Fair	Fair
LmA, LnA, LRB dryland	Very poor	Very poor	Very poor	Very poor
LS	Very poor	Very poor	Very poor	Very poor
Lyda: LTC	Very poor	Very poor	Very poor	Very poor

See footnotes at end of table.

soils for wildlife habitat

Playas, Rock outcrop, and Slickens were not placed in wildlife suitability groups and were therefore not rated in this table]

Elements of wildlife habitat—Continued		Wildlife suitability group ratings			Wildlife suitability group
Wetland plants	Shallow water areas	Openland habitat	Wetland habitat	Rangeland habitat	
Very poor	Very poor	Very poor	Very poor	Very poor	4-44
Very poor	Very poor	Very poor	Very poor	Very poor	4-44
Poor	Very poor	Very poor	Very poor	Very poor	4-44
Poor	Very poor	Very poor	Very poor	Very poor	4-44
Very poor	Very poor	Very poor	Very poor	Very poor	4-44
Very poor	Very poor	Fair	Very poor	Fair	2-42I
Very poor	Very poor	Very poor	Very poor	Very poor	4-44
Poor	Very poor	Good	Very poor	Good	1-41I
Very poor	Very poor	Very poor	Very poor	Very poor	4-44
Poor	Very poor	Good	Very poor	Good	1-41I
Very poor	Very poor	Very poor	Very poor	Very poor	4-44
Very poor	Very poor	Very poor	Very poor	Very poor	4-44
Poor	Fair	Very poor	Fair	Very poor	4-34
Fair	Fair	Poor	Fair	Poor	3-23
Poor	Very poor	Very poor	Very poor	Very poor	4-44
Poor	Very poor	Very poor	Very poor	Very poor	4-44
Poor	Very poor	Good	Very poor	Good	1-41I
Poor	Very poor	Very poor	Very poor	Very poor	4-44
Good	Fair	Good	Fair	Good	1-21I
Fair	Very poor	Very poor	Very poor	Very poor	4-44
Very poor	Very poor	Very poor	Very poor	Very poor	4-44
Poor	Very poor	Good	Very poor	Good	1-41I
Poor	Very poor	Very poor	Very poor	Very poor	4-44
Good	Good	Poor	Good	Fair	3-12I
Poor	Very poor	Very poor	Very poor	Very poor	4-44
Poor	Very poor	Good	Very poor	Good	1-41I
Poor	Very poor	Very poor	Very poor	Very poor	4-44
Very poor	Very poor	Very poor	Very poor	Very poor	4-44
Fair	Fair	Poor	Fair	Poor	3-23
Very poor	Fair	Very poor	Poor	Very poor	4-34
Poor	Very poor	Very poor	Very poor	Very poor	4-44
Very poor	Very poor	Fair	Very poor	Fair	2-42I
Very poor	Very poor	Very poor	Very poor	Very poor	4-44
Very poor	Very poor	Very poor	Very poor	Very poor	4-44
Poor	Very poor	Very poor	Very poor	Very poor	4-44

TABLE 6.—*Suitability of the*

Soil series and map symbols	Elements of wildlife habitat			
	Grain and seed crops	Domestic grasses and legumes	Wild herbaceous plants	Shrubs
Maggie: MA	Very poor	Very poor	Very poor	Poor
Malpais: MB	Very poor	Very poor	Very poor	Very poor
Mazuma:				
McA, MdA, MeB, Mf irrigated	Good	Good	Good	Good
McA, MdA, MeB, Mf dryland	Very poor	Very poor	Very poor	Very poor
McA3	Very poor	Very poor	Very poor	Very poor
McCann	Very poor	Very poor	Poor	Poor
Mina	Very poor	Very poor	Very poor	Poor
Monte Cristo: MO	Very poor	Very poor	Very poor	Poor
Nevoyer	Very poor	Very poor	Very poor	Very poor
Noyson:				
No, Np irrigated	Poor	Poor	Fair	Fair
No, Np dryland	Very poor	Very poor	Very poor	Very poor
Nyserva: Ny	Very poor	Very poor	Very poor	Very poor
Old Camp: OA, OB, OC, OD	Very poor	Very poor	Very poor	Very poor
Orizaba:				
Oe irrigated	Good	Good	Good	Good
Oe dryland	Very poor	Very poor	Very poor	Very poor
Of	Poor	Poor	Poor	Poor
Og	Very poor	Very poor	Very poor	Very poor
Oh	Very poor	Very poor	Very poor	Very poor
Orovada:				
OmA, OnA, OpB irrigated	Good	Good	Good	Good
OmA, OnA, OpB dryland	Very poor	Very poor	Very poor	Very poor
Orphant: OR, OS	Very poor	Very poor	Very poor	Very poor
Osobb: OT	Very poor	Very poor	Very poor	Very poor
Parran: PA	Very poor	Very poor	Very poor	Very poor
Penelas variant: PD	Very poor	Very poor	Very poor	Very poor
Penelas PE, PF, PG	Very poor	Very poor	Very poor	Very poor
Pintwater: PH, PK, PM	Very poor	Very poor	Very poor	Very poor
Pumel: PR	Very poor	Very poor	Very poor	Very poor
Quima:				
QrA, QsB irrigated	Good	Good	Good	Good
QrA, QsB dryland	Very poor	Very poor	Very poor	Very poor
Roic: RO	Very poor	Very poor	Very poor	Very poor
Settlemeyer:				
Sb irrigated	Good	Good	Good	Good
Sb dryland	Very poor	Very poor	Very poor	Very poor
Se irrigated	Poor	Poor	Fair	Fair
Se dryland	Very poor	Very poor	Fair	Fair
SF	Very poor	Very poor	Fair	Fair
Silverbow: SH	Very poor	Very poor	Very poor	Very poor
Spanel: SP	Very poor	Very poor	Very poor	Very poor
Stargo:				
Sr, Ss irrigated	Fair	Fair	Fair	Fair

See footnotes at end of table.

soils for wildlife habitat—Continued

Elements of wildlife habitat—Continued		Wildlife suitability group ratings			Wildlife suitability group
Wetland plants	Shallow water areas	Openland habitat	Wetland habitat	Rangeland habitat	
Very poor	Very poor	Very poor	Very poor	Very poor	4-44
Very poor	Very poor	Very poor	Very poor	Very poor	4-44
Poor	Very poor	Good	Very poor	Good	1-41I
Poor	Very poor	Very poor	Very poor	Very poor	4-44
Poor	Very poor	Very poor	Very poor	Very poor	4-44
Very poor	Very poor	Very poor	Very poor	Poor	4-43
Very poor	Very poor	Very poor	Very poor	Poor	4-43
Very poor	Very poor	Very poor	Very poor	Very poor	4-44
Very poor	Very poor	Very poor	Very poor	Very poor	4-44
Poor	Very poor	Poor	Very poor	Fair	3-42I
Poor	Very poor	Very poor	Very poor	Very poor	4-44
Very poor	Poor	Very poor	Very poor	Very poor	4-44
Very poor	Very poor	Very poor	Very poor	Very poor	4-44
Poor	Very poor	Good	Very poor	Good	1-44I
Poor	Very poor	Very poor	Very poor	Very poor	4-44
Fair	Fair	Poor	Fair	Poor	3-23
Very poor	Fair	Very poor	Poor	Very poor	4-34
Poor	Very poor	Very poor	Very poor	Very poor	4-44
Poor	Very poor	Good	Very poor	Good	1-41I
Poor	Very poor	Very poor	Very poor	Very poor	4-44
Poor	Very poor	Very poor	Very poor	Very poor	4-44
Very poor	Very poor	Very poor	Very poor	Very poor	4-44
Very poor	Fair	Very poor	Poor	Very poor	4-34
Very poor	Very poor	Very poor	Very poor	Very poor	4-44
Very poor	Very poor	Very poor	Very poor	Very poor	4-44
Very poor	Very poor	Very poor	Very poor	Very poor	4-44
Very poor	Very poor	Very poor	Very poor	Very poor	4-44
Poor	Very poor	Good	Very poor	Good	1-41I
Very poor	Very poor	Very poor	Very poor	Very poor	4-44
Very poor	Very poor	Very poor	Very poor	Very poor	4-44
Fair	Fair	Good	Fair	Good	1-21I
Fair	Fair	Very poor	Fair	Good	4-24
Good	Good	Poor	Good	Fair	3-12I
Good	Good	Fair	Good	Fair	3-12
Good	Good	Fair	Good	Fair	3-12
Very poor	Very poor	Very poor	Very poor	Very poor	4-44
Poor	Very poor	Very poor	Very poor	Very poor	4-44
Very poor	Very poor	Fair	Very poor	Fair	2-42I

TABLE 6.—*Suitability of the*

Soil series and map symbols	Elements of wildlife habitat			
	Grain and seed crops	Domestic grasses and legumes	Wild herbaceous plants	Shrubs
Stargo—(Continued)				
Sr, Ss dryland	Very poor	Very poor	Very poor	Very poor
Stumble:				
STC, SuA irrigated	Fair	Fair	Fair	Fair
STC, SuA dryland	Very poor	Very poor	Very poor	Very poor
Sundown:				
Sw irrigated	Fair	Fair	Fair	Fair
Sw dryland	Very poor	Very poor	Very poor	Very poor
Timblin: TC [1]	Very poor	Very poor	Fair	Fair
Timper: TdA, TEB, TF	Very poor	Very poor	Very poor	Very poor
Tipperary: TGE, TH, TM	Very poor	Very poor	Very poor	Very poor
Tomel: TN	Very poor	Very poor	Very poor	Very poor
Tybo TOB[2], TR, TS	Very poor	Very poor	Very poor	Very poor
Umberland: UM, UN, UR	Very poor	Very poor	Very poor	Very poor
Unsel: UT	Very poor	Very poor	Very poor	Very poor
Vigus:				
VGC, VK irrigated	Good	Good	Good	Good
VGC, VK dryland	Very poor	Very poor	Very poor	Very poor
Vinini: VM, VN	Very poor	Very poor	Very poor	Very poor
Wardenot: WA	Very poor	Very poor	Very poor	Very poor
Wrango: WBB, WDC	Very poor	Very poor	Very poor	Very poor
Yobe: YB, YC, YD	Very poor	Very poor	Very poor	Very poor
Yomba:				
Ym, Yn irrigated	Fair	Fair	Fair	Fair
Ym, Yn dryland	Very poor	Very poor	Very poor	Very poor
YO	Very poor	Very poor	Very poor	Very poor
Youngston:				
Yp, Yr, Ys irrigated	Good	Good	Good	Good
Yp, Yr, Ys dryland	Very poor	Very poor	Very poor	Very poor
Zaba: ZN	Very poor	Very poor	Very poor	Very poor

[1] Extremely cobbly surface prevents cultivation.

for wildlife. Included are basin wildrye, cheatgrass, Nevada bluegrass, and Indian ricegrass.

Shrubs.—Shrubby plants that provide cover or produce buds, twigs, or foliage used as food by wildlife. Examples are mountainmahogany, bitterbrush, snowberry, sagebrush, Russian-olive, serviceberry, chokecherry, fourwing saltbush, shadscale, winterfat, and horsebrush.

Wetland plants.—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.—Areas of surface water with 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 for their suitability to produce habitat elements. Soil suitability is expressed by adjective rating.

Good means that there are few or no soil limitations. Wildlife habitat is easily improved, maintained, or created.

Fair means that there are moderate soil limitations.

soils for widlife habitat—Continued

Elements of wildlife habitat—Continued		Wildlife suitability group ratings			Wildlife suitability group
Wetland plants	Shallow water areas	Openland habitat	Wetland habitat	Rangeland habitat	
Very poor	Very poor	Very poor	Very poor	Very poor	4-44
Very poor	Very poor	Fair	Very poor	Fair	2-42I
Very poor	Very poor	Very poor	Very poor	Very poor	4-44
Very poor	Very poor	Fair	Very poor	Fair	2-42I
Very poor	Very poor	Very poor	Very poor	Very poor	4-44
Very poor	Very poor	Very poor	Very poor	Fair	4-42
Very poor	Very poor	Very poor	Very poor	Very poor	4-44
Very poor	Very poor	Very poor	Very poor	Very poor	4-44
Very poor	Very poor	Very poor	Very poor	Very poor	4-44
Very poor	Very poor	Very poor	Very poor	Very poor	4-44
Very poor	Fair	Very poor	Poor	Very poor	4-34
Very poor	Very poor	Very poor	Very poor	Very poor	4-44
Poor	Very poor	Good	Very poor	Good	1-41I
Very poor	Very poor	Very poor	Very poor	Very poor	4-44
Very poor	Very poor	Very poor	Very poor	Very poor	4-44
Very poor	Very poor	Very poor	Very poor	Very poor	4-44
Very poor	Very poor	Very poor	Very poor	Very poor	4-44
Very poor	Very poor	Very poor	Poor	Very poor	4-34
Very poor	Very poor	Fair	Very poor	Fair	2-42I
Very poor	Very poor	Very poor	Very poor	Very poor	4-44
Very poor	Very poor	Very poor	Very poor	Very poor	4-44
Good	Fair	Good	Fair	Good	1-21I
Very poor	Fair	Very poor	Very poor	Very poor	4-44
Very poor	Very poor	Very poor	Very poor	Very poor	4-44

[1] TOB in Wildlife suitability group 3-43I, irrigated.

Habitat can be improved, maintained, or created, but soil limitations affect habitat development or management.

Poor means that there are severe soil limitations. Wildlife habitat can be improved, maintained, or created, but habitat management can be difficult and expensive and requires intensive effort.

Very poor means that an attempt to improve, maintain, or create wildlife habitat is impractical. 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 considered. The potential for woodland habitat was not considered because the soils generally cannot support trees. Scattered pinyon-juniper clumps were included in the rating for rangeland habitat.

Openland habitat.—These areas are mainly 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 rabbit. Habitat elements that are important components of openland habitat are grain and seed crops, domestic grasses and legumes, wild herbaceous plants, and shrubs.

Wetland habitat.—These areas are swampy, marshy, or open water. Examples of birds and mammals common to these areas are ducks, geese, shorebirds, and muskrat. Habitat elements that are important

components of wetland habitat are wetland plants and shallow water areas.

Rangeland habitat.—These areas are natural or improved range. Examples of birds and mammals common to these areas are chukar, sage grouse, songbirds, deer, mountain lion, antelope, peregrine falcon, golden eagle, and bald eagle. Habitat elements that are important components of rangeland habitat are wild herbaceous plants and shrubs.

Wildlife suitability groups

A wildlife suitability group consists of soils that have similar ratings for each of the habitat elements and that have the same suitability to produce each of the four wildlife habitat types.

In Nevada, wildlife suitability groups are designated by a symbol representing the rating for each kind of wildlife habitat. The first numeral in the symbol is a rating for *Openland habitat;* the second numeral is for *Woodland habitat* (not rated in this survey area and indicated by a dash); 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 openland habitat, was 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 number symbol. The wildlife suitability group in which each soil has been placed is given in table 6.

The soils of this survey area have been placed into the following twelve wildlife suitability groups.

WILDLIFE SUITABILITY GROUP 1–21I

The soils in this group are very deep and well drained. They are on flood plains where they are occasionally flooded. They have a coarse textured, moderately coarse textured, and medium textured surface layer. They have moderately slow permeability and high available water capacity. The water table is at a depth of more than 6 feet.

Slopes are 0 to 2 percent. The mean annual precipitation is 4 to 6 inches. Mean annual air temperature is 43° to 51° F, and the frost-free season is 100 to 130 days.

Crops suited to these soils are alfalfa, an alfalfa-grass mixture for hay and pasture, barley, and wheat.

WILDLIFE SUITABILITY GROUP 1–41I

The soils in this group are very deep and moderately well drained to well drained. They have a nongravelly to gravelly, coarse textured to medium textured surface layer. They have moderately slow to moderately rapid permeability and moderately high to high available water capacity.

Slopes are 0 to 4 percent. The mean annual precipitation is 4 to 6 inches. Mean annual air temperature is 45° to 51° F, and the frost-free season is 100 to 150 days.

Crops suited to these soils are alfalfa, an alfalfa-grass mixture for hay and pasture, barley, and wheat.

WILDLIFE SUITABILITY GROUP 2–12I

The soils in this group are very deep and excessively drained and somewhat excessively drained. They have a coarse textured to medium textured surface layer that is gravelly in places. They have moderate to rapid permeability and low available water capacity.

Slopes are 0 to 8 percent. The mean annual precipitation is 4 to 6 inches. Mean annual air temperature is 47° to 52° F, and the frost-free season is 100 to 150 days.

Crops suited for these soils are alfalfa, an alfalfa-grass mixture for hay and pasture, barley, and wheat.

WILDLIFE SUITABILITY GROUP 3–12I

The soils in this group are deep and poorly drained. They have a medium textured surface layer. They have moderately slow permeability and high available water capacity. The water table is at a depth of 2 to 2.5 feet.

Slopes are 0 to 2 percent. Mean annual precipitation is 4 to 6 inches. Mean annual air temperature is 43° to 52° F, and the frost-free season is 100 to 150 days.

Crops suited to these soils are wheat, barley, and meadow grasses.

WILDLIFE SUITABILITY GROUP 3–12I

The soils in this group are moderately deep and well drained. They have a coarse textured to moderately coarse textured surface layer that is gravelly in places. They have moderately rapid permeability above the hardpan and very slow permeability through it. The available water capacity is low.

Slopes are 0 to 2 percent. The mean annual precipitation is 4 to 6 inches. Mean annual air temperature is 43° to 51° F, and the frost-free season is 130 to 150 days.

Crops suited to these soils are an alfalfa-grass mixture and pasture grasses.

WILDLIFE SUITABILITY GROUP 3–13I

The soil in this group is shallow and well drained. It has a coarse textured surface layer. It has moderately rapid permeability above the hardpan and very slow permeability through it.

Slopes are 2 to 4 percent. The mean annual precipitation is 4 to 6 inches. Mean annual air temperature is 45° to 50° F, and the frost-free season is 100 to 130 days.

Crops suited to this soil are those suited to restricted rooting depth.

WILDLIFE SUITABILITY GROUP 3–12

The soils of this group are very deep and poorly drained. They have a medium textured surface layer. They have moderately slow permeability and high available water capacity.

Slopes are 0 to 2 percent. The mean annual precipitation is 4 to 6 inches. Mean annual air temperature is 43° to 47° F, and the frost-free season is 100 to 130 days.

The native vegetation is meadow grasses and sedges.

WILDLIFE SUITABILITY GROUP 3–23

The soils in this group are very deep and somewhat poorly drained. They have a medium textured and moderately fine textured surface layer. They have slow to moderately slow permeability and moderate to high available water capacity. They are slightly saline-alkali affected.

Slopes are 0 to 2 percent. The mean annual precipitation is 4 to 6 inches. Mean annual air temperature is 45° to 50° F, and the frost-free season is 100 to 130 days.

The native vegetation is mainly saltgrass, black greasewood, and basin wildrye.

WILDLIFE SUITABILITY GROUP 4–24

The soil in this group is very deep and poorly drained. It has a medium textured surface layer. It has moderately slow permeability and high available water capacity.

Slopes are 0 to 2 percent. The mean annual precipitation is 4 to 6 inches. Mean annual air temperature is 43° to 47° F, and the frost-free season is 100 to 130 days.

Native vegetation is mainly big sagebrush.

WILDLIFE SUITABILITY GROUP 4–34

The soils in this group are very deep and somewhat poorly drained and very poorly drained. They have a moderately coarse textured to moderately fine textured surface layer. They have slow to moderately slow permeability and moderate to high available water capacity. They are very strongly saline-alkali affected.

Slopes are 0 to 2 percent. The mean annual precipitation is 4 to 6 inches. Mean annual air temperature is 43° to 50° F, and the frost-free season is 100 to 130 days.

The vegetation is mainly black greasewood, saltgrass, wiregrass, alkali cordgrass, alkali sacaton, buffaloberry, and basin wildrye.

WILDLIFE SUITABILITY GROUP 4–43

The soils in this group are very deep and well drained. They have a moderately coarse textured to medium textured surface layer that is very stony to extremely stony. They have moderately slow to moderate permeability and moderate available water capacity.

Slopes range from 8 to 50 percent. The mean annual precipitation is 8 to 14 inches. Mean annual air temperature is 40° to 47° F, and the frost-free season is 80 to 115 days.

The native vegetation is mainly big sagebrush, Indian ricegrass, squirreltail, Thurber needlegrass, and Sandberg bluegrass, and juniper trees at higher elevations.

WILDLIFE SUITABILITY GROUP 4–44

The soils in this group are shallow to very deep and excessively drained to well drained. They have a coarse textured to medium textured surface layer that is nongravelly to gravelly and nonstony to stony. They have very slow to very rapid permeability and very low to high available water capacity.

Slopes range from 0 to 50 percent. The mean annual precipitation is 4 to 8 inches. Mean annual air temperature is 40° to 51° F, and the frost-free season is 80 to 150 days.

The native vegetation is mainly Bailey greasewood, shadscale, bud sagebrush, Indian ricegrass, galleta, and some littleleaf horsebrush, fourwing saltbush, and winterfat.

Engineering

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. In various degrees and combinations, these properties 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, terraces, 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 7, 8, and 9. These tables delineate, respectively, several estimated soil properties significant in engineering; interpretations for various engineering uses; and results of engineering laboratory tests on soil samples.

This information, along with the soil map and other parts of this survey, can be used to make other useful maps to make interpretations in addition to those given in table 8.

This information, however, does not eliminate the need for further investigations at sites selected for engineering works. Further investigation is especially needed before 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 small ones, is needed because many delineated areas of a given soil

TABLE 7.—*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 soils, which may have symbol > means greater than;

Soil series and map symbols	Depth to—		Depth from surface	Dominant USDA texture	Classification		Coarse fraction greater than 3 inches
	Hardpan or bedrock	Seasonal high water table			Unified	AASHTO	
	Ft	*Ft*	*In*				
*Ardivey: AR	>5	>5	0–17	Very stony, cobbly, and gravelly clay loam.	GC	A–2	10–50
For Wardenot part of AR, see Wardenot series.			17–60	Very gravelly and cobbly loamy sand.	GP–GM	A–1	20–50
*Badland: BA, BB. Badland parts are too variable to be rated. For Belcher part of BA and Pintwater part of BB, see Belcher and Pintwater series, respectively.							
*Basket: BC	>5	>5	0–24	Very stony, cobbly, and gravelly clay loam.	GC	A–2	40–50
For Mina part of BC, see Mina series.			24–60	Very gravelly loam	GP–GC, GC	A–1, A–2	30–40
Belcher: BEB	[2]0.5–1.5	>5	0–7	Fine sandy loam	SM	A–4	0
			7–15	Silica-cemented hardpan.			
Belted: BHC	[2]0.5–1.5	>5	0–10	Gravelly loamy sand and loam.	[2]SM	[2]A–2	0–5
			10–20	Silica-cemented hardpan.			
			20–31	Sandy loam	SM	A–2	0–5
			31–60	Very gravelly sand	GP, GW	A–1	0–5
Bluewing: BLC, BMB, BNC, BOB	>5	>5	0–19	Very stony, cobbly, and gravelly loamy sand.	GP–GM	A–1	20–40
			19–60	Cobbly sand	GP, GP–GM	A–1	25–30
Broe: BPB	>5	>5	0–24	Fine sandy loam	SM	A–4	0
			24–60	Loamy sand and loamy fine sand.	SM	A–2	0
*Broyles: BrA, BrB, Bt	>5	>5	0–36	Fine sandy loam	SM	A–4	0
For Laxal part of Bt, see Laxal series.			36–60	Stratified loamy sand, sandy loam, and fine sandy loam.	[2]SM	[2]A–2	0
Caudle: Cf, Cg	>5	>5	0–14	Clay loam	CL	A–6	0
			14–39	Silt loam	ML	A–4	0
			39–60	Clay loam	CL	A–6	0
Charnock: Ch, Ck, Cm	>5	2.5–5.0	0–5	Fine sandy loam, clay loam.	SM–SC, SM, CL–ML, CL	A–4	0
			5–60	Stratified loam, silt loam, clay loam.	[2]ML	[2]A–4, A–6	0
*Deerlodge variant: DEC	1.7–2.7	>5	0–24	Very gravelly clay loam.	GC	A–2	0–5
For Bluewing part of DEC, see Bluewing series.			24–60	Strongly cemented silica hardpan.			

See footnotes at end of table.

significant in engineering

different properties. The reader should follow carefully the instructions for referring to another series in the first column of this table. The the symbol < means less than]

Percentage less than 3 inches passing sieve—				Liquid limit	Plasticity index	Permeability	Available water capacity	Reaction	Salinity	Shrink-swell potential	Frost action potential	Corrosivity (Untreated steel)
No. 4 (4.7 mm)	No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.074 mm)									
						In per hr	*In per in of soil*	*pH*	*Mmhos per cm at 25° C*			
40–50	30–40	25–35	20–30	20–30	10–20	0.2–0.6	0.07–0.10	6.6–8.4	2–4	Moderate	Moderate	High.
30–40	20–30	10–20	5–10	10–20	[1] NP	>20	0.04–0.05	8.5–9.0	2–4	Low	Low	High.
50–60	40–50	35–45	25–35	20–30	10–20	0.2–0.6	0.07–0.12	6.6–9.0	<2	Moderate	Moderate	High.
40–50	30–40	25–35	20–30	20–30	5–10	0.6–2.0	0.05–0.07	8.5–9.0	2–4	Low	Moderate	High.
95–100	95–100	65–75	40–50	20–30	[1] NP–5	2.0–6.0	0.10–0.12	>7.9	2–4	Low	High	High.
90–100	70–90	50–60	25–35	20–30	[1] NP–5	0.6–2.0	0.10–0.12	8.5–9.0	2–4	Low	Moderate	High.
90–100	90–95	55–65	25–35	15–25	[1] NP	2.0–6.0	0.08–0.10	>9.0	4–8	Low	Moderate	High.
30–40	25–35	10–20	2–5	10–20	[1] NP	>20	0.03–0.05	>8.5	2–4	Low	Low	High.
30–40	25–35	15–25	5–10	10–20	[1] NP	6.0–20.0	0.05–0.07	6.6–7.8	<2	Low	Low	Moderate.
40–50	35–45	20–30	2–10	10–20	[1] NP	>20.0	0.03–0.05	6.6–7.3	<2	Low	Low	Moderate.
95–100	95–100	70–80	40–50	25–35	[1] NP	2.0–6.0	0.10–0.13	>7.4	2–8	Low	High	High.
95–100	95–100	65–75	15–25	10–20	[1] NP	6.0–20.0	0.07–0.10	>9.0	2–8	Low	Low	High.
95–100	90–100	70–80	40–50	25–35	[1] NP	2.0–6.0	0.10–0.13	7.9–9.0	2–4	Low	High	High.
95–100	90–100	55–65	25–35	20–30	[1] NP	2.0–6.0	0.07–0.10	8.5–9.0	2–4	Low	High	High.
100	100	90–100	70–80	30–40	10–20	0.2–0.6	0.15–0.18	>8.5	>2	Moderate	High	High.
100	100	90–100	70–80	30–40	5–10	0.2–0.6	0.15–0.18	7.9–9.0	>8	Low	High	High.
100	100	90–100	70–80	30–40	10–20	0.2–0.6	0.15–0.18	7.9–8.4	>8	Moderate	High	High.
100	95–100	75–85	45–55	25–35	5–10	0.6–2.0	0.12–0.14	>9.0	>4	Moderate	High	High.
100	95–100	80–90	60–70	30–40	5–15	0.2–0.6	0.13–0.15	>8.5	>4	Moderate	High	High.
35–45	25–35	20–30	15–25	25–35	10–20	0.2–0.6	0.05–0.07	7.4–8.4	2–4	Moderate	Moderate	High.

TABLE 7.—*Estimated soil properties*

Soil series and map symbols	Depth to—		Depth from surface	Dominant USDA texture	Classification		Coarse fraction greater than 3 inches
	Hardpan or bedrock	Seasonal high water table			Unified	AASHTO	
*Dobel: DN For Bluewing part of DN, see Bluewing series.	0.5–1.2	>5	0–8 8–12 12–38 38–40 40–60	Gravelly clay loam Strongly cemented silica hardpan. Very gravelly sandy loam. Indurated hardpan. Very gravelly sandy loam.	GC, CL GM GM	A–6 A–1 A–1	0–3 0–5 0–5
Domez: Do, Dr, Ds Playas part of Ds is too variable to be rated.	>5	>5	0–6 6–60	Fine sandy loam Stratified very fine sandy loam, loam, and silt loam.	SM, ML [3] ML	A–4 [3] A–4	0 0
Dune land: DU	>5	>5	0–60	Fine sand	SM–SP, SM	A–3, A–2	0
Fivemile: Fa, Fb	>5	[4] >5	0–60	Stratified silty clay loam, silt loam.	[3] CL	[3] A–6	0
*Gabbs: GA For Old Camp part of GA, see Old Camp series.	1.7–2.7	>5	0–20 20–32	Cobbly and gravelly fine sandy loam. Indurated silica cemented hardpan.	SM, SM–SC	A–1, A–2	30–40
Griffy: Gr, Gs	>5	>5	0–12 12–60	Sandy clay loam, gravelly in places. Fine sandy loam	SC SM	A–2, A–6 A–2, A–4	0 0–10
Jolan: JO	1.7–2.7	>5	20–36	Fine sandy loam Indurated silica cemented hardpan.	SM	A–4	0–3
Koyen: KoA, KrB, KsA	>5	>5	0–37 37–60	Fine sandy loam Stratified very fine sandy loam, silt loam, loam, and fine sandy loam.	SM [3] SM, ML	A–4 [3] A–4	0–3 0–3
Kyler: KT Rock outcrop part of KT is too variable to be rated.	0.5–1.2	>5	0–7 7	Very gravelly very fine sandy loam. Hard limestone.	GM	A–1	5–15
Lahontan La, Lb	>5	3.5–7.0	0–60	Silty clay loam and clay.	CL, CH	A–7	0
*Lathrop: LCB, LF For Bluewing part of LF, see Bluewing series.	>5	>5	0–13 13–60	Gravelly sandy clay loam. Gravelly loamy sand and cobbly sand.	SC SP–SM	A–2 A–1	0–5 30–40
Laxal: LmA, LnA, LRB, LS Rock outcrop part of LS is too variable to be rated.	>5	[1] >5	0–10 10–60	Gravelly loam and very gravelly or gravelly fine sandy loam. Very gravelly sandy loam.	GM–GC, GC GM	A–2 A–1	0–3 0–5
Lyda: LTC	0.8–1.7	>5	0–4 4–12 12	Very fine sandy loam Cobbly and gravelly clay loam. Indurated silica cemented hardpan.	SM GM–GC, GC	A–4 A–2	10–20 20–30
*Maggie: MA For Bluewing and Pintwater parts of MA, see the Bluewing and Pintwater series, respectively.	0.8–1.5	>5	0–14 14–26 26	Very gravelly sandy clay loam and very gravelly sandy loam. Silica cemented hardpan. Hard rhyolite.	GC	A–2	3–5

See footnotes at end of table.

significant in engineering—Continued

Percentage less than 3 inches passing sieve—				Liquid limit	Plasticity index	Permeability	Available water capacity	Reaction	Salinity	Shrink-swell potential	Frost action potential	Corrosivity (Untreated steel)
No. 4 (4.7 mm)	No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.074 mm)									
65–75	60–70	55–65	45–55	20–30	10–15	0.2–0.6	0.12–0.14	>8.5	2–4	Moderate	Moderate	High.
55–65	40–50	30–35	15–20	15–25	[1] NP	2.0–6.0	0.05–0.06	8.5–9.0	2–4	Low	Low	High.
55–65	40–50	30–35	15–20	15–25	[1] NP	2.0–6.0	0.05–0.06	8.5–9.0	2–4	Low	Low	High.
100	90–100	70–80	45–55	20–30	[1] NP	2.0–6.0	0.12–0.14	8.5–9.0	2–4	Low	High	High.
100	90–100	80–90	55–65	30–40	5–10	0.6–2.0	0.14–0.16	7.9–8.4	4–8	Low	High	High.
100	100	60–70	5–15	10–20	[1] NP	6.0–20.0	0.06–0.08	>6.8	<2	Low	Low	Moderate.
100	100	90–100	85–95	30–40	10–20	0.2–0.6	0.15–0.17	8.5–9.0	2–4	Moderate	High	High.
60–70	55–65	40–50	20–30	15–25	[1] NP–5	2.0–6.0	0.05–0.07	7.4–8.4	<2	Low	Low	High.
85–95	75–85	65–75	30–40	25–35	10–20	0.6–2.0	0.14–0.16	7.4–8.4	2–4	Moderate	High	High.
70–80	65–85	50–60	30–40	15–25	[1] NP–5	0.6–2.0	0.13–0.15	8.5–9.0	2–4	Low	High	High.
90–100	80–90	65–75	40–50	20–30	[1] NP–5	2.0–6.0	0.13–0.15	8.5–9.0	2–4	Low	High	High.
90–100	80–90	65–75	35–45	15–25	[1] NP	2.0–6.0	0.13–0.15	7.9–9.0	2–4	Low	High	High.
90–100	80–90	70–80	45–55	20–35	[1] NP	0.6–2.0	0.14–0.16	8.5–9.0	>4	Low	High	High.
35–45	30–40	25–35	15–25	20–30	[1] NP–5	0.6–2.0	0.05–0.07	7.9–9.0	<2	Low	Low	High.
100	100	95–100	85–95	45–55	30–40	0.06–0.2	0.15–0.17	>7.9	>4	High	Moderate	High.
70–80	60–70	45–55	25–35	20–30	10–20	0.2–0.6	0.12–0.15	8.5–9.0	2–4	Moderate	Moderate	High.
60–70	55–65	30–40	5–10	10–15	[1] NP	6.0–20.0	0.05–0.06	>8.5	2–4	Low	Low	High.
40–50	30–40	25–35	20–30	20–30	5–10	2.0–6.0	0.05–0.07	8.5–9.0	2–4	Low	Low	High.
35–45	25–35	15–25	10–15	15–25	[1] NP	2.0–6.0	0.05–0.07	8.5–9.0	2–4	Low	Low	High.
85–95	75–85	60–75	40–50	20–30	[1] NP–5	0.6–2.0	0.06–0.07	>8.5	2–4	Low	Moderate	High.
45–55	35–45	30–40	25–35	20–30	5–15	0.06–0.2	0.06–0.08	>8.5	2–4	Moderate	Moderate	High.
35–45	25–35	20–30	10–15	20–30	10–15	0.2–0.6	0.05–0.07	8.5–9.0	2–4	Low	Low	High.

TABLE 7.—*Estimated soil properties*

Soil series and map symbols	Depth to—		Depth from surface	Dominant USDA texture	Classification		Coarse fraction greater than 3 inches
	Hardpan or bedrock	Seasonal high water table			Unified	AASHTO	
Malpais: MB Rock outcrop part of MB is too variable to be rated.	>5	>5	0–60	Stony and very stony fine sandy loam.	GM	A–1	10–20
Mazuma: McA, McA3, MdA, MeB, Mf.	>5	>5	0–60	Very fine sandy loam, stratified in places with sandy and gravelly material.	SM	A–4	0–3
McCann Mapped only in association with Timblin soils.	>5	>5	0–60	Extremely stony and very cobbly loam and fine sandy loam.	[1] SM	[1] A–2, A–4	50–60
Mina Mapped only in association with Basket, Old Camp, and Vinini soils.	>5	>5	0–60	Extremely stony and very stony fine sandy loam and loam.	[1] SM	[1] A–2	30–40
Mine dumps: MG. Too variable to be rated.							
Monte Cristo: MO Playas part of MO is too variable to be rated.	[2] 0.7–1.5	>5	0–10	Loam and clay loam Silica cemented hardpan.	[1] ML, CL–ML	[1] A–4, A–6	0
			17–32	Fine sandy loam	SM	A–4	0
			32–60	Clay loam	CL	A–6	0
Nevoyer Mapped only in association with Vinini soils.	0.7–1.5	>5	0–11	Very stony and cobbly very fine sandy loam.	SM	A–4	40–50
			11–18	Indurated silica cemented hardpan.			
			18	Basalt.			
Noyson: No, Np	1.7–3.0	>5	0–21	Sandy loam	SM, SM–SC	A–2	0–3
			21–31	Stratified gravelly sandy loam, loamy sand and sand.	[1] SM	[1] A–1, A–2	0–3
			31–46	Strongly cemented silica hardpan.			
*Nyserva: Ny For Tipperary part of Ny, see Tipperary series.	>5	7–10	0–5	Loam	ML	A–4	0
			5–19	Clay loam	CL	A–6	0
			19–60	Stratified sand and loam.	[1] SM	[1] A–1	0–3
*Old Camp: OA, OB, OC, OD For Mina, Osobb, and Pintwater parts of OA, OB, and OC, see the Mina, Osobb, and Pintwater series, respectively. Rock outcrop part of OD is too variable to be rated.	0.8–1.7	>5	0–10	Very gravelly loam	GM–GC, GC	A–2	5–15
			10–17	Fractured metavolcanic rock.			
Orizaba: Oe, Of, Og, Oh	>5	[3] 2.5–6.0	0–60	Silty clay loam, stratified with loam and sand in places.	CL	A–6	0
Orovada:							
OmA	>5	>5	0–12	Very gravelly loamy sand.	GP–GM	A–1	0–5
			12–20	Fine sandy loam	SM	A–4	0–3
			20–60	Stratified gravelly sandy loam, loam, and fine sandy loam.	[1] SM	[1] A–2, A–4	0–3
OnA, OpB	>5	>5	0–21	Fine sandy loam	SM	A–2, A–4	0–3
			21–60	Very fine sandy loam	SM, ML	A–4	0–3

See footnotes at end of table.

significant in engineering—Continued

Percentage less than 3 inches passing sieve—				Liquid limit	Plasticity index	Permeability	Available water capacity	Reaction	Salinity	Shrink-swell potential	Frost action potential	Corrosivity (Untreated steel)
No. 4 (4.7 mm)	No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.074 mm)									
40–50	35–45	25–35	15–25	15–25	[1] NP	2.0–6.0	0.05–0.07	7.9–8.4	2	Low	Moderate	High.
70–90	60–70	55–65	35–45	20–30	[1] NP–5	2.0–6.0	0.10–0.15	7.9–9.0	2–4	Low	High	High.
70–80	65–75	55–65	30–40	20–30	[1] NP–5	0.6–2.0	0.07–0.12	6.6–7.8	<2	Low	Moderate	High.
65–75	60–75	45–55	25–35	20–30	[1] NP–5	0.6–2.0	0.07–0.10	7.4–8.4	<2	Low	Moderate	High.
95–100	85–95	75–85	55–65	25–35	5–15	0.2–0.6	0.15–0.17	7.9–9.0	4–8	Moderate	High	High.
90–100	85–95	70–80	40–50	20–30	[1] NP	0.6–2.0	0.12–0.15	7.9–8.4	>4	Low	High	High.
95–100	95–100	85–95	65–75	25–35	10–20	0.2–0.6	0.15–0.17	7.9–8.4	>4	Moderate	High	High.
75–85	65–75	55–65	35–45	20–30	[1] NP–5	0.6–2.0	0.07–0.08	6.6–8.4	<2	Low	Moderate	High.
80–95	75–85	50–60	25–35	15–25	[1] NP–5	2.0–6.0	0.08–0.11	7.9–9.0	2–4	Low	Moderate	High.
80–95	75–85	45–55	15–25	10–20	[1] NP	2.0–6.0	0.07–0.08	7.9–9.0	2–4	Low	Moderate	High.
100	90–100	75–85	50–60	20–30	3–5	0.6–2.0	0.14–0.17	>9.0	>16	Low	High	High.
100	90–100	85–95	65–75	25–35	20–30	0.2–0.6	0.14–0.17	>9.0	>16	Moderate	High	High.
75–85	65–75	40–50	10–20	10–20	[1] NP–5	0.2–0.6	0.07–0.13	>9.0	>16	Low	Low	High.
30–40	25–35	20–30	15–20	20–30	5–10	0.6–2.0	0.05–0.07	6.6–7.3	<2	Low	Low	High.
100	90–100	85–95	80–90	30–40	15–25	0.2–0.6	0.14–0.17	8.5–9.0	>4	Moderate	High	High.
40–50	25–35	15–25	5–10	10–15	[1] NP	6.0–20.0	0.05–0.07	7.9–8.4	<2	Low	Low	High.
85–95	75–85	60–70	35–45	20–30	[1] NP	2.0–6.0	0.12–0.14	7.4–8.4	2–4	Low	High	High.
75–85	70–80	45–55	30–40	10–20	[1] NP	0.6–2.0	0.12–0.13	7.9–8.4	2–4	Low	High	High.
75–85	75–85	55–65	35–45	20–30	[1] NP	2.0–6.0	0.12–0.13	7.4–8.4	2–4	Low	High	High.
80–95	75–85	65–75	45–55	25–35	[1] NP	0.6–2.0	0.15–0.17	7.9–8.4	2–4	Low	High	High.

TABLE 7.—*Estimated soil properties*

Soil series and map symbols	Depth to—		Depth from surface	Dominant USDA texture	Classification		Coarse fraction greater than 3 inches
	Hardpan or bedrock	Seasonal high water table			Unified	AASHTO	
*Orphant: OR, OS. For Bluewing part of OS, see Bluewing series.	[2] 0.6–1.6	>5	0–4	Fine sandy loam, very gravelly in places.	SM	A–2	2–3
			4–15	Loam	ML	A–4	0–3
			15–22	Strongly cemented silica hardpan.			
			22–41	Loamy sand	SM	A–1	2–3
			41–60	Strongly cemented silica hardpan.			
*Osobb: OT. For Gabbs part of OT, see Gabbs series.	0.7–1.5	>5	0–8	Very gravelly loam and gravelly clay loam.	GM–GC, GC	A–2	5–20
			8–10	Indurated silica cemented hardpan.			
			10	Metavolcanic rock.			
Parran: PA	>5	5–7	0–5	Silty clay loam	CL	A–6, A–7	0
			5–60	Clay	CH	A–7	0
*Penelas, variant: PD. For Penelas part of PD, see Penelas series.	[2] 1.0–1.7	>5	0–17	Very shaly loam	GM	A–1, A–2	5–10
			17–18	Indurated silica cemented hardpan.			
			18	Shale.[3]			
*Penelas: PE, PF, PG. For Kyler and Laxal parts of PE and PF, see Kyler and Laxal series, respectively. Rock outcrop part of PG too variable to be rated.	[2] 0.4–1.2	>5	0–5	Very shaly silty clay loam.	GC	A–2	0–5
			5–10	Shale.[3]			
*Pintwater: PH, PK, PM. For Bluewing part of PH, see Bluewing series. Rock outcrop parts of PK and PM too variable to be rated.	0.8–1.7	>5	0–17	Very gravelly and cobbly fine sandy loam.	GM	A–1	25–35
			17	Rhyolite.			
*Playas: PN, PO. Playas are too variable to be rated. For Parran part of PO, see Parran series.							
Pumel: PR. Rock outcrop part of PR is too variable to be rated.	[2] 0.3–1.3	>5	0–5	Very gravelly sandy loam.	GP–GM, SP–SM	A–1	1–5
			5–23	Weathered granodiorite.			
			23	Hard granodiorite.			
Quima: QrA, QsB	>5	>5	0–60	Coarse sandy loam	SM	A–1, A–2	0–3
Rock outcrop. Too variable to be rated.							
*Roic: RO. For Dobel part of RO, see Dobel series.	[2] 0.3–1.5	>5	0–5	Very gravelly fine sandy loam.	GM, GM–GC	A–1	0–3
			5–60	Semiconsolidated lake sediment.			
*Settlemeyer: Sb, Se, SF. For Yobe part of SF, see Yobe series.	>5	[1] 2–3.5	0–5	Silt loam	ML, CL–ML	A–4	0
			5–16	Silty clay	CL, CH	A–7	0
			16–60	Stratified clay loam, loam, and sandy clay loam.	[3] CL	[3] A–6	0

See footnotes at end of table.

significant in engineering—Continued

Percentage less than 3 inches passing sieve—				Liquid limit	Plasticity index	Permeability	Available water capacity	Reaction	Salinity	Shrink-swell potential	Frost action potential	Corrosivity (Untreated steel)
No. 4 (4.7 mm)	No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.074 mm)									
85–95	70–80	50–60	25–35	15–25	[1] NP	2.0–6.0	0.10–0.13	6.6–7.8	2–4	Low	Moderate	High.
85–95	80–90	70–80	50–60	20–30	0–5	0.6–2.0	0.14–0.16	>7.9	2–4	Low	High	High.
70–80	65–75	35–45	10–20	10–20	[1] NP	2.0–6.0	0.07–0.10	8.5–9.0	2–4	Low	Low	High.
35–45	30–40	25–35	15–25	20–30	5–10	0.6–2.0	0.05–0.07	7.9–8.4	2–4	Low	Moderate	High.
100	95–100	95–100	85–95	35–45	25–35	0.06–0.2	0.15–0.17	>9.0	>16	Moderate	High	High.
100	95–100	95–100	85–95	55–65	35–45	<0.06	0.14–0.17	>9.0	>16	High	Moderate	High.
40–50	30–40	25–35	20–30	20–30	[1] NP–5	0.6–2.0	0.05–0.07	7.4–9.0	<2	Low	Moderate	High.
30–40	25–35	25–30	20–25	25–35	10–20	0.2–0.6	0.05–0.07	7.4–8.4	<2	Moderate	Moderate	High.
35–45	30–40	25–35	10–20	15–25	[1] NP	2.0–6.0	0.05–0.07	8.5–9.0	<2	Low	Moderate	High.
50–60	15–25	10–20	5–10	10–20	[1] NP	2.0–6.0	0.05–0.07	8.5–9.0	<2	Low	Low	High.
75–85	60–70	35–45	20–30	15–25	[1] NP	2.0–6.0	0.11–0.13	7.9–9.0	<2	Low	Moderate	High.
40–50	30–40	25–35	10–20	15–25	[1] NP–5	2.0–6.0	0.05–0.07	7.9–9.0	<2	Low	Low	High.
100	90–100	85–95	65–75	25–35	5–10	0.6–2.0	0.17–0.19	7.9–8.4	<2	Low	High	High.
100	90–100	85–95	80–90	45–55	30–40	0.2–0.6	0.15–0.17	6.6–7.3	<2	High	Moderate	High.
100	90–100	80–90	65–75	30–40	15–25	0.2–0.6	0.17–0.20	6.6–8.4	<2	Moderate	High	High.

TABLE 7.—*Estimated soil properties*

Soil series and map symbols	Depth to—		Depth from surface	Dominant USDA texture	Classification		Coarse fraction greater than 3 inches
	Hardpan or bedrock	Seasonal high water table			Unified	AASHTO	
Silverbow: SH	[2] 0.8–1.5	>5	0–4	Very gravelly and very stony fine sandy loam.	GM	A–1	5–15
Rock outcrop part of SH, is too variable to be rated.			4–12	Very gravelly clay loam.	GC	A–2	5–10
			12–28	Silica cemented hardpan.			
			28–40	Stony sand	GP	A–1	5–10
Slickens: SK. Too variable to be rated.							
Spanel: SP	[2] 0.8–1.4	>5	0–6	Fine sandy loam, gravelly in upper part.	SM	A–2, A–4	0–5
			6–14	Clay loam and loam	[3] SC, CL	[3] A–6	0–5
			14–23	Silica cemented hardpan.			
			23–60	Very gravelly sand	GP, GP–GM	A–1	1–5
Stargo: Sr, Ss	>5	[4] >5	0–5	Coarse sandy loam	SM	A–2	0
			5–13	Clay loam	CL	A–6	0
			13–43	Stratified fine sand, loamy fine sand, sand, very gravelly sand, and fine sandy loam.	[3] SM	[3] A–1	0–3
			43–70	Very fine sandy loam	SM	A–4	0
Stumble: STC, SuA	>5	>5	0–60	Loamy fine sand	SM	A–2	0–5
Sundown: Sw	>5	>5	0–60	Loamy fine sand	SM	A–1	0–3
*Timblin: TC	1.7–3.3	>5	0–4	Very cobbly and stony fine sandy loam and silt loam.	[3] SM, SM–SC	[3] A–4	20–65
For McCann part of TC, see McCann series.			4–39	Stony clay loam	CL	A–6, A–7	1–5
			39–41	Strongly cemented silica hardpan.			
Timper: TdA, TEB, TF	[2] 1.0–1.7	>5	0–12	Sandy loam and loam.	[3] SM, ML	[3] A–4	0–3
Playas part of TF is too variable to be rated.			12–15	Strongly cemented silica hardpan.			
			15–60	Gravelly sandy loam	SM	A–1, A–2	0–3
*Tipperary: TGE, TH, TM	>5	>5	0–60	Fine sand	SM	A–2	0
For Fivemile part of TH, see Fivemile series. Playas part of TM is too variable to be rated.							
*Tomel: TN	0.8–1.7	>5	0–12	Gravelly clay loam, very gravelly sandy loam in the upper part.	GC	A–6	0–3
For Laxal part of TN, see Laxal series.			12–27	Indurated silica cemented hardpan.			
			27–60	Very gravelly sand	SW, SP	A–1	2–5
*Tybo: TOB, TR, TS	0.7–1.4	>5	0–11	Fine sandy loam	SM, SM–SC	A–2	0–3
For Bluewing and Stumble parts of TR and TS, see Bluewing and Stumble series, respectively.			11–34	Indurated silica cemented hardpan.			

See footnotes at end of table.

significant in engineering—Continued

Percentage less than 3 inches passing sieve—				Liquid limit	Plasticity index	Permeability	Available water capacity	Reaction	Salinity	Shrink-swell potential	Frost action potential	Corrosivity (Untreated steel)
No. 4 (4.7 mm)	No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.074 mm)									
30–40	25–35	20–30	10–20	15–25	[1] NP	2.0–6.0	0.05–0.06	8.5–9.0	2–4	Low	Low	High.
40–50	35–45	30–40	20–30	20–30	10–15	0.2–0.6	0.05–0.07	>9.0	2–4	Moderate	High	High.
30–40	25–35	10–20	2–5	10–15	[1] NP	>20.0	0.04–0.05	8.5–9.0	4–8	Low	Low	High.
85–95	75–85	50–60	30–40	15–25	[1] NP–5	2.0–6.0	0.12–0.14	7.9–9.0	<2	Low	High	High.
85–95	65–75	60–70	45–55	20–30	10–15	0.2–0.6	0.15–0.17	8.5–9.0	2–4	Moderate	High	High.
30–40	20–30	10–20	2–5	10–15	[1] NP	>20.0	0.04–0.05	9.0	2–4	Low	Low	High.
90–100	75–85	45–55	20–30	15–25	[1] NP	2.0–6.0	0.10–0.12	8.5–9.0	<2	Low	Moderate	High.
95–100	85–95	75–85	65–75	20–30	10–15	0.6–2.0	0.17–0.19	8.5–9.0	2–4	Moderate	High	High.
80–90	70–80	35–45	10–20	10–15	[1] NP	6.0–20.0	0.07–0.10	7.9–9.0	2–4	Low	Low	High.
90–100	85–95	75–85	35–45	20–30	[1] NP	2.0–6.0	0.14–0.16	7.9–8.4	2–4	Low	High	High.
95–100	95–100	60–70	15–25	10–20	[1] NP	6.0–20.0	0.08–0.11	6.6–8.4	<2	Low	Low	Moderate.
85–95	75–85	40–50	10–20	10–15	[1] NP	6.0–20.0	0.08–0.11	7.9–9.0	2–4	Low	Low	Moderate.
75–85	60–70	50–60	35–45	15–25	[1] NP–5	0.6–2.0	0.12–0.15	6.6–7.3	<2	Low	Moderate	High.
85–95	75–85	70–80	55–65	35–45	20–30	0.06–0.2	0.16–0.18	6.6–9.0	2–4	High	Moderate	High.
85–95	75–85	65–75	45–55	15–25	[1] NP–5	2.0–6.0	0.12–0.14	8.5–9.0	2–4	Low	Moderate	High.
75–85	65–75	40–50	20–30	15–25	[1] NP	2.0–6.0	0.08–0.11	8.5–9.0	4–8	Low	Moderate	High.
100	100	65–80	20–30	10–15	[1] NP	>20.0	0.07–0.08	8.5–9.0	<2	Low	Low	Moderate.
60–70	50–60	45–55	35–45	20–30	10–15	0.2–0.6	0.10–0.13	7.9–9.0	2–4	Moderate	High	High.
40–50	25–35	15–25	2–5	10–15	[1] NP	>20.0	0.04–0.06	8.5–9.0	4–8	Low	Low	High.
75–85	70–80	50–60	25–35	15–25	[1] NP–5	2.0–6.0	0.08–0.10	>8.5	2–4	Low	Moderate	High.

TABLE 7.—*Estimated soil properties*

Soil series and map symbols	Depth to—		Depth from surface	Dominant USDA texture	Classification		Coarse fraction greater than 3 inches
	Hardpan or bedrock	Seasonal high water table			Unified	AASHTO	
*Umberland:							
UM, UN. For Parran part of UN, see Parran series.	>5	1.5–5	0–60	Silty clay and silty clay loam.	CL, CH	A–7	0
UR. For Tipperary part of UR, see Tipperary series. Playas part of UR is too variable to be rated.	>5	1.5–5	0–10 10–60	Sand Silty clay and silty clay loam.	CL, CH	A–7	0
*Unsel UT. For Bluewing part of UT, see Bluewing series.	>5	>5	0–10 10–31 31–60	Gravelly clay loam Gravelly sandy loam Very gravelly sand	GC SM GP	A–6 A–1 A–1	0–3 0–3 0–3
*Vigus: VGC, VK. For Koyen part of VK, see Koyen series.	>5	>5	0–7 7–13 13–44	Fine sandy loam, gravelly in the upper part. Sandy clay loam Gravelly loamy sand and sandy loam.	SM SC [3] SM	A–4 A–6 [3] A–2, A–1	0 0 0
*Vinini: VM, VN. For Mina and Nevoyer parts of VM and VN, see Mina and Nevoyer series, respectively.	0.8–1.7	>5	0–3 3–13 13–30	Very stony fine sandy loam and very fine sandy loam. Very gravelly and extremely stony clay loam. Indurated silica cemented hardpan.	SM GC	A–2, A–4 A–2	20–30 40–60
Wardenot: WA	>5	>5	0–5 5–25 25–60	Gravelly fine sandy loam. Very gravelly fine sandy loam. Very gravelly loamy sand.	SM GM GP–GM	A–2 A–1 A–1	0–3 0–3 1–5
Wrango: WBB, WDC	>5	>5	0–10 10–60	Stony and gravelly fine sandy loam. Very gravelly loamy sand and very gravelly sand.	GM [3] GP–GM	A–2, A–4 [3] A–1	20–30 20–30
*Yobe: YB, YC, YD. For Tipperary and Umberland parts of YC and YD, see Tipperary and Umberland series, respectively.	>5	3.0–6.0	0–24 24–60	Silt loam Silty clay loam	ML CL	A–4 A–6	0 0
*Yomba: Ym, Yn, YO. For Playas part of YO is too variable to be rated.	>5	[4] >5	0–14 14–60	Fine sandy loam and loam, gravelly in the upper 2 inches. Gravelly coarse sandy loam and very gravelly sand.	[3] SM [3] SP–SM, SM	[3] A–2, A–4 [3] A–1	0–3 0–3
Youngston: Yp, Yr, Ys	>5	[4] >5	0–8 8–15 15–60	Silt loam and sandy loam. Sandy clay loam Silt loam and loam	[3] CL–ML, CL SC, CL [3] CL–ML, ML	[3] A–4 A–6 [3] A–4	0 0 0

See footnotes at end of table.

significant in engineering—Continued

Percentage less than 3 inches passing sieve—				Liquid limit	Plasticity index	Permeability	Available water capacity	Reaction	Salinity	Shrink-swell potential	Frost action potential	Corrosivity (Untreated steel)
No. 4 (4.7 mm)	No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.074 mm)									
100	100	95–100	85–95	45–55	20–30	<0.06	0.15–0.17	>8.5	>16	High	High	High.
100	100	95–100	85–95	45–55	20–30	<0.06	0.15–0.17	>8.5	>16	High	High	High.
65–75	55–65	50–60	40–50	20–30	10–15	0.2–0.6	0.10–0.13	7.4–9.0	2–4	Moderate	High	High.
60–70	50–60	30–40	15–25	15–25	[1] NP	2.0–6.0	0.07–0.08	8.5–9.0	2–4	Low	Moderate	High.
30–40	25–35	10–20	2–5	10–15	[1] NP	>20.0	0.04–0.05	8.5–9.0	<2	Low	Low	High.
90–100	85–95	65–75	40–50	20–30	[1] NP	2.0–6.0	0.12–0.14	6.6–7.8	<2	Low	High	High.
90–100	85–95	75–85	40–50	20–30	10–15	0.2–0.6	0.14–0.16	8.5–9.0	2–4	Moderate	High	High.
70–80	65–75	40–50	20–30	15–25	[1] NP	0.2–0.6	0.08–0.12	7.9–9.0	4–8	Low	Moderate	High.
80–90	75–85	50–60	30–40	20–30	[1] NP–5	2.0–6.0	0.12–0.14	7.4–8.4	<2	Low	High	High.
40–50	35–45	30–40	25–35	20–30	10–15	0.2–0.6	0.07–0.10	7.9–8.4	2–4	Moderate	Moderate	High.
75–85	65–75	45–55	25–35	15–25	[1] NP	2.0–6.0	0.08–0.10	7.9–8.4	<2	Low	Moderate	High.
40–50	30–40	20–30	10–20	15–25	[1] NP	6.0–20.0	0.05–0.07	8.5–9.0	2–4	Low	Low	High.
30–40	25–35	10–20	5–10	10–15	[1] NP	6.0–20.0	0.04–0.06	8.5–9.0	2–4	Low	Low	High.
50–60	65–75	50–60	30–40	15–25	[1] NP	2.0–6.0	0.07–0.09	7.4–8.4	<2	Low	Moderate	Moderate.
30–40	20–30	10–20	5–10	10–15	[1] NP	>20.0	0.04–0.06	7.9–8.4	<2	Low	Low	Moderate.
100	100	90–100	70–80	25–35	[1] NP	0.6–2.0	0.17–0.18	7.4	>16	Low	High	High.
100	100	90–100	80–90	25–35	10–20	0.2–0.6	0.18–0.20	7.4–7.8	>8	Moderate	High	High.
80–90	70–80	50–60	30–40	15–25	[1] NP	0.6–2.0	0.11–0.13	6.6–8.4	2–4	Low	High	High.
60–70	40–50	20–30	5–15	10–20	[1] NP	2.0–6.0	0.05–0.07	7.4–8.4	4–8	Low	Low	High.
100	85–95	70–80	55–65	20–30	5–10	0.6–2.0	0.13–0.15	>9.0	2–4	Low	High	High.
100	95–100	75–85	40–55	20–30	10–20	0.2–0.6	0.15–0.17	8.5–9.0	4–8	Moderate	High	High.
100	100	90–100	70–80	25–35	5–10	0.6–2.0	0.15–0.17	7.9–9.0	4–8	Low	High	High.

TABLE 7.—*Estimated soil properties*

Soil series and map symbols	Depth to—		Depth from surface	Dominant USDA texture	Classification		Coarse fraction greater than 3 inches
	Hardpan or bedrock	Seasonal high water table			Unified	AASHTO	
*Zaba: ZN	>5	>5	0–4	Very gravelly loam	GM	A–1, A–2	0–5
			4–21	Gravelly coarse sandy loam.	GM–GC, GC	A–2, A–1	0–5
			21–60	Very gravelly sand	GP	A–1	0–5
For Nyserva part of ZN, see Nyserva series.							

[1] Nonplastic.
[2] Rippable.
[3] Classification is for mixture of stratified layers.
[4] Fb, Ss, Yn, Yp, and Ys are subject to occasional overflow.

mapping unit may contain small areas of other kinds of soil that have strongly contrasting properties and different suitabilities or limitations for soil engineering.

Since some of the terms used in this soil survey have specialized meaning to soil scientists but are not known to all engineers, a Glossary has been provided to define and clarify many of these terms 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 the Soil Conservation Service engineers, 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. 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 placed in one of seven basic groups. The range of these groups, based on grain-size distribution, liquid limit, and plasticity index, is from A–1 through A–7. In group A–1 are gravelly soils of high bearing strength, or the best soils for subgrade (foundation). At the other extreme, in group A–7, are clay soils that have low strength when wet and that are the poorest soils for subgrade. The estimated classification is given in Table 7 for all soils mapped in the survey area.

USDA texture is determined by the relative proportions of sand, silt, and clay in soil material that is less than 2.0 millimeters in diameter. "Sand," "silt," "clay," and some of the other terms used in the USDA textural classification are defined in the Glossary.

Estimated engineering properties

Several estimated soil properties significant in engineering are given in table 7. These estimates are made for typical soil profiles, by layers sufficiently unique 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 in other counties. Following are explanations of some of the columns in table 7.

Depth to hardpan or bedrock is the distance from the surface of the soil to the upper surface of the hardpan 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, 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.

The Unified and AASHTO columns are explained in the section "Engineering soil classification systems."

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 a semisolid to a 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

significant in engineering—Continued

Percentage less than 3 inches passing sieve—				Liquid limit	Plasticity index	Permeability	Available water capacity	Reaction	Salinity	Shrink-swell potential	Frost action potential	Corrosivity (Untreated steel)
No. 4 (4.7 mm)	No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.074 mm)									
40–50	30–40	25–35	20–30	20–30	2–5	0.6–2.0	0.05–0.08	>9.0	>8	Low	Moderate	High.
50–60	40–50	25–35	10–20	15–25	5–10	0.6–2.0	0.08–0.10	>9.0	>8	Low	Low	High.
40–50	25–35	10–20	2–5	10–15	[f] NP	>20.0	0.04–0.06	>9.0	>4	Low	Low	High.

[a] LnA is occasionally flooded.
[e] Seasonal high water table in Oe is below a depth of 6 feet. Of, Os, and Oh are subject to occasional flooding.
[f] Weathered granodiorite is at a depth of 0.3 to 1.3 feet. Hard granodiorite is at a depth of 1.7 to 3.3 feet.
[g] Water table in Sb is at a depth of 5 to 7 feet.

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 7.

Permeability is that quality of a soil that enables it to transmit water or air. It is estimated on the basis of those soil characteristics observed in the field, particularly 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.

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 corrosiveness 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 with material having this rating.

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 by the content of sodium or magnesium sulfate, soil texture, and acidity. Installations of uncoated steel that intersect soil boundaries or soil horizons are more suscpetible 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 a high probability of damage warranting protective measures for steel and use of more resistant concrete.

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

The estimated interpretations in table 8 are based on the engineering properties of soils shown in table 7 and on the experience of engineers and soil scientists with the soils of the Big Smoky Valley Area. In table 8 ratings are used to summarize limitation or suitability of the soils for all listed purposes, except pond reservoir areas; embankments, dikes, and levees; irrigation; and drainage for crops and pasture. For these particular uses, table 8 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 are generally favorable for the rated use and have 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 are so unfavorable and so difficult to correct or overcome that major soil reclamation, special designs, or intensive maintenance is required.

Soil suitability is rated by the terms *good*, *fair*, and *poor*, which have, respectively, meanings approxi-

TABLE 8.—*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, which may

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)	Local roads and streets
*Ardivey: AR. For Wardenot part of AR, see Wardenot series.	Moderate where slope is 4 to 15 percent; large and small stones. Severe where slope is 15 to 30 percent.	Severe: seepage.	Severe: large and small stones; cutbanks cave.	Moderate where slope is 4 to 15 percent; large stones. Severe where slope is 15 to 30 percent.	Moderate where slope is 4 to 15 percent; large stones. Severe where slope is 15 to 30 percent.	Severe: large and small stones; too sandy.	Slight where slope is 4 to 8 percent. Moderate where slope is 8 to 15 percent. Severe where slope is 15 to 30 percent.
*Badland: BA, BB. Badland parts are too variable to be rated. For Belcher part of BA and Pintwater part of BB, see Belcher and Pintwater series respectively.							
*Basket: BC. For Mina part of BC, see Mina series.	Severe: slope.	Severe: slope.	Severe: slope, small and large stones.	Severe: slope.	Severe: slope.	Severe: small and large stones; slope is as much as 50 percent in places.	Severe: slope.
Belcher: BEB	Severe: cemented pan.	Severe: cemented pan.	Moderate: cemented pan.	Moderate: cemented pan.	Moderate: cemented pan.	Severe: cemented pan.	Moderate: cemented pan.
Belted: BHC	Slight	Severe: cemented pan.	Severe: small stones; cutbanks cave.	Moderate: cemented pan.	Moderate: cemented pan.	Severe: small stones.	Moderate: cemented pan.
Bluewing: BLC, BMB, BNC, BOB.	Slight	Severe: seepage.	Severe: small stones; cutbanks cave; large stones.	Moderate: large stones.	Moderate: large stones.	Severe: small stones; large stones.	Slight
Broe: BPB	Slight	Severe: seepage.	Severe: cutbanks cave.	Slight	Slight	Moderate: too sandy.	Slight
*Broyles: BrA, BrB, Bt. For Laxal part of Bt, see Laxal series.	Slight	Severe: seepage.	Slight	Slight	Slight	Slight	Slight

See footnotes at end of table.

TABLE 8.—*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)	Local roads and streets
Caudle:							
Cf	Moderate: percs slowly.	Slight	Moderate: too clayey.	Moderate: shrink-swell; low strength.	Moderate: shrink-swell; low strength.	Moderate: too clayey.	Severe: shrink-swell; low strength.
Cg	Moderate: percs slowly.	Slight	Moderate: clayey.	Moderate: shrink-swell; low strength.	Moderate: shrink-swell; low strength.	Moderate: too clayey.	Severe: shrink-swell; low strength.
Charnock:							
Ch, Cm	Severe: wet.	Severe: wet	Severe: wet.	Moderate: low strength; shrink-swell.	Moderate: wet; low strength; shrink-swell.	Severe: wet.	Moderate: wet; shrink-swell; low strength.
Ck	Severe: wet.	Severe: wet.	Moderate: wet; too clayey.	Moderate: low strength; shrink-swell.	Moderate: wet; low strength; shrink-swell.	Severe: wet.	Moderate: wet; shrink-swell; low strength.
*Deerlodge variant: DEC. For Bluewing part of DEC, see Bluewing series.	Severe: cemented pan.	Moderate: slope.	Severe: cemented pan; small stones.	Moderate: cemented pan; shrink-swell.	Severe: cemented pan.	Severe: cemented pan.	Moderate: cemented pan; shrink-swell.
*Dobel: DN For Bluewing part of DN, see Bluewing series.	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.
Domez:							
Do, Dr	Slight	Severe: seepage.	Slight	Moderate: low strength.	Moderate: low strength.	Slight	Moderate: low strength.
Ds Playas part of Ds is too variable to be rated.	Slight	Severe: seepage.	Slight	Moderate: low strength.	Moderate: low strength.	Slight	Moderate: low strength.
Dune land: DU.							
Fivemile:							
Fa	Moderate: percs slowly.	Slight	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Slight	Moderate: shrink-swell.
Fb	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: shrink-swell; floods.
*Gabbs: GA For Old Camp part of GA, see Old Camp series.	Severe: slope; cemented pan.	Severe: slope; cemented pan.	Severe: slope; cemented pan.	Severe: slope.	Severe: slope.	Severe: cemented pan. Slope is as much as 50 percent in places.	Severe. slope.
Griffy:							
Gr	Slight	Severe: seepage.	Slight	Slight	Slight	Slight	Slight

See footnotes at end of table.

engineering properties—Continued

Suitability as source of—				Soil features affecting—				Hydrologic group
Road fill	Sand	Gravel	Topsoil	Pond reservoir areas	Embankments, dikes, and levees	Irrigation	Drainage for crops and pasture	
Poor: shrink-swell; low strength.	Unsuitable	Unsuitable	Fair: too clayey.	Favorable	Piping; low strength; compressible.	Favorable	Perc slowly	B
Poor: shrink-swell; low strength.	Unsuitable	Unsuitable	Fair: too clayey.	Favorable	Piping; low strength; compressible.	Not suited	Not needed	B
Fair: shrink-swell; wet; low strength.	Unsuitable	Unsuitable	Poor: excess salt	Favorable	Compressible; low strength; piping.	Not suited	Not needed	C
Fair: shrink-swell; wet; low strength.	Unsuitable	Unsuitable	Poor: excess salt.	Favorable	Compressible; low strength; piping.	Not suited	Not needed	C
Poor: thin layer.	Unsuitable	Unsuitable	Poor: small stones; thin layer.	Slope; cemented pan.	Thin layer	Not suited	Not needed	C
Poor: thin layer.	Unsuitable	Good [1]	Poor: small stones; thin layer.	Slope; cemented pan.	Thin layer	Not suited	Not needed	D
Fair: low strength.	Unsuitable	Unsuitable	Good	Seepage	Compressible; low strength; piping.	Favorable	Favorable	C
Fair: low strength.	Unsuitable	Unsuitable	Good	Seepage	Compressible; low strength; piping.	Not suited	Not needed	C
Fair: shrink-swell.	Unsuitable	Unsuitable	Good	Favorable	Compressible; low strength.	Favorable	Favorable	B
Fair: shrink-swell.	Unsuitable	Unsuitable	Fair: too clayey.	Favorable	Compressible; low strength.	Floods	Floods	B
Poor: thin layer; slope is as much as 50 percent in places.	Poor: small stones; excess fines.	Unsuitable	Poor: small stones; slope.	Slope; cemented pan.	Seepage: thin layer.	Not suited	Not needed	D
Good	Poor: excess fines.	Unsuitable	Good [2]	Seepage	Seepage: medium strength; piping.	Soil blowing	Favorable	B

TABLE 8.—*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)	Local roads and streets
Griffy—(Continued) Gs	Slight	Severe: seepage.	Slight	Slight	Slight	Slight	Slight
Jolan: JO	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Moderate cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Moderate: cemented pan.
Koyen: KoA	Slight	Moderate: seepage.	Slight	Slight	Slight	Slight	Moderate: low strength.
KrB	Slight	Moderate: seepage.	Slight	Slight	Slight	Slight	Moderate: low strength.
KsA	Slight	Moderate: seepage.	Slight	Slight	Slight	Slight	Moderate: low strength.
Kyler: KT Rock outcrop part of KT is too variable to be 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; depth to rock.
Lahontan: La, Lb	Severe: percs slowly.	Slight	Severe: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: too clayey.	Severe: shrink-swell.
*Lathrop: LCB, LF For Bluewing part of LF, see Bluewing series.	Slight	Severe: seepage.	Severe: cut-banks cave; small stones.	Slight	Slight	Severe: small stones; too sandy.	Slight
Laxal: LmA	Slight	Severe: seepage.	Severe: small stones.	Slight	Slight	Severe: small stones.	Slight
LnA	Severe: floods.	Severe: floods; seepage.	Severe: small stones.	Severe: floods.	Severe: floods.	Severe: floods; small stones.	Severe: floods.
LRB	Slight	Severe: seepage.	Severe: small stones.	Slight	Slight	Severe: small stones.	Slight
LS Rock outcrop part of LS is too variable to be rated.	Slight	Severe: seepage.	Severe: small stones.	Slight	Slight	Severe: small stones.	Slight
Lyda: LTC	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.
*Maggie: MA For Bluewing and Pintwater parts of MA, see Bluewing and Pintwater series, respectively.	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.

See footnotes at end of table.

engineering properties—Continued

Suitability as source of—				Soil features affecting—				Hydrologic group
Road fill	Sand	Gravel	Topsoil	Pond reservoir areas	Embankments, dikes, and levees	Irrigation	Drainage for crops and pasture	
Good	Poor: excess fines.	Unsuitable	Good [2]	Seepage	Seepage: medium strength; piping.	Favorable	Favorable	B
Poor: thin layer.	Poor: excess fines. thin layer.	Unsuitable	Good	Cemented pan.	Medium strength; thin layer.	Rooting depth.	Favorable	B
Fair: low strength.	Poor: excess fines.	Unsuitable	Good	Seepage	Medium strength; piping.	Soil blowing.	Favorable	C
Fair: low strength.	Poor: excess fines.	Unsuitable	Good	Seepage	Medium strength; piping.	Slope	Slope	B
Fair: low strength.	Poor: excess fines.	Unsuitable	Good	Seepage	Medium strength; piping.	Favorable	Favorable	B
Poor: slope; thin layer.	Unsuitable	Unsuitable	Poor: slope; thin layer.	Slope; depth to rock.	Thin layer	Not suited	Not needed	D
Poor: shrink-swell.	Unsuitable	Unsuitable	Poor: too clayey; excess salt.	Favorable	Shrink-swell; hard to pack.	Not suited	Not needed	D
Good	Fair: excess fines.	Unsuitable	Poor: small stones; thin layer.	Seepage	Seepage	Not suited	Not needed	C
Good	Unsuitable	Poor: excess fines.	Poor: small stones.	Seepage	Seepage	Droughty	Favorable	B
Good	Unsuitable	Poor: excess fines.	Poor: small stones.	Seepage	Seepage	Floods; droughty.	Favorable	B
Good	Unsuitable	Poor: excess fines.	Poor: small stones.	Slope; sepeage.	Seepage	Slope; droughty.	Favorable	B
Good	Unsuitable	Poor: excess fines.	Poor: small stones.	Slope; seepage.	Seepage	Not suited	Not needed	B
Poor: thin layer.	Unsuitable	Unsuitable	Poor: thin layer.	Slope; cemented pan.	Thin layer	Not suited	Not needed	D
Poor: thin layer.	Unsuitable	Unsuitable	Poor: thin layer; small stones.	Slope; cemented pan.	Thin layer	Not suited	Not needed	D

TABLE 8.—*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)	Local roads and streets
Malpais: MB. Rock outcrop part of MB is too variable to be rated.	Severe: slope.	Severe: slope; seepage.	Severe: slope; large stones.	Severe: slope.	Severe: slope.	Severe: large stones; slope is as much as 50 percent in places.	Severe: slope
Mazuma:							
McA	Slight	Severe: seepage.	Slight	Slight	Slight	Slight	Moderate: low strength.
McA3	Slight	Severe: seepage.	Slight	Slight	Slight	Slight	Moderate: low strength.
MdA	Moderate: wet.	Severe: wet; seepage.	Moderate: wet.	Slight	Moderate: wet.	Severe: wet.	Moderate: low strength.
MeB	Slight	Severe: seepage.	Slight	Slight	Slight	Slight	Moderate: low strength.
Mf	Slight	Severe: seepage.	Slight	Slight	Slight	Slight	Moderate low strength.
McCann. Mapped only in association with Timblin soils.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe large stones; slope is as much as 50 percent in places.	Severe: slope.
Mina. Mapped only in association with Basket, Old Camp, and Vinini soils.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Mine dumps: MG. Too variable to be rated.							
Monte Cristo: MO. Playas part of MO is too variable to be rated.	Moderate: percs slowly.	Severe; seepage; cemented pan.	Moderate: cemented pan.	Moderate: cemented pan; shrink-swell.	Moderate: cemented pan; shrink-swell.	Moderate: cemented pan;	Moderate: cemented pan; shrink-swell.
Nevoyer. Mapped only as component in association with Vinini soils.	Severe: slope; cemented pan.	Severe: slope; cemented pan.	Severe: slope; cemented pan.	Severe: slope; cemented pan.	Severe: slope; cemented pan.	Severe: cemented pan. slope is as much as 30 percent in places.	Severe: slope; cemented pan.
Noyson: No, Np	Severe: cemented pan.	Severe: seepage; cemented pan.	Severe: cemented pan.	Moderate: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Moderate: cemented pan.

See footnotes at end of table.

engineering properties—Continued

Suitability as source of—				Soil features affecting—				Hydrologic group
Road fill	Sand	Gravel	Topsoil	Pond reservoir areas	Embankments, dikes, and levees	Irrigation	Drainage for crops and pasture	
Fair where slope is 15 to 25 percent. Poor where slope is 25 to 50 percent.	Unsuitable	Poor: excess fines.	Poor: slope; large stones.	Slope	Large stones	Not suited	Not needed	C
Fair: low strength.	Poor: excess fines.	Unsuitable	Good	Seepage	Medium strength; medium to high piping.	Favorable	Favorable	C
Fair: low strength.	Poor: excess fines.	Unsuitable	Good	Seepage	Medium strength; medium to high piping.	Not suited	Not needed	C
Fair: low strength.	Poor: excess fines.	Unsuitable	Good	Seepage	Medium strength; medium to high piping.	Favorable	Favorable	C
Fair: low strength.	Poor: excess fines.	Unsuitable	Good	Seepage	Medium strength; medium to high piping.	Slope	Favorable	C
Fair: low strength.	Poor: excess fines.	Unsuitable	Good	Seepage	Medium strength; medium to high piping.	Soil blowing.	Favorable	C
Poor: large stones.	Poor: excess fines.	Unsuitable	Poor: slope; large stones.	Slope; seepage.	Large stones	Not suited	Not needed	C
Poor: slope; large stones.	Poor: excess fines; large stones.	Unsuitable	Poor: large stones; slope.	Slope	Large stones	Not suited	Not needed	C
Fair: shrink-swell.	Unsuitable	Unsuitable	Poor: excess salt; thin layer.	Cemented pan.	Shrink-swell; piping.	Not suited	Not needed	D
Poor: thin layer; large stones; slope is as much as 50 percent in places.	Unsuitable	Unsuitable	Poor: large stones; thin layer.	Slope; cemented pan.	Thin layer; large stones.	Not suited	Not needed	D
Poor: thin layer.	Poor: thin layer; excess fines.	Unsuitable	Fair: small stones.	Seepage	Medium strength; medium to high piping.	Rooting depth; droughty.	Favorable	C

TABLE 8.—*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)	Local roads and streets
*Nyserva: Ny. For Tipperary part of Ny, see Tipperary series.	Slight	Moderate: seepage.	Slight	Moderate: shrink-swell; low strength.	Moderate: shrink-swell; low strength.	Slight	Moderate: shrink-swell; low strength.
*Old Camp: OA, OB, OC, OD. For Mina, Osobb, and Pintwater parts of OA, OB, and OC, see respective series. Rock outcrop part of OD is to variable to be 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 ro k.	Severe: slope; depth to rock.
Orizaba: Oe	Moderate: percs slowly.	Slight	Moderate: too clayey.	Moderate: shrink-swell; low strength.	Moderate: shrink-swell; low strength.	Moderate: too clayey.	Severe: low strength.
Of	Severe: floods; wet.	Severe: floods; wet.	Severe: floods; wet.	Severe: floods; wet.	Severe: floods; wet.	Severe: floods; wet.	Severe: floods; wet.
Og, Oh	Severe: floods; wet.	Severe: floods; wet.	Severe: floods; wet.	Severe: floods; wet.	Severe: floods; wet.	Severe: floods; wet.	Severe: floods; wet.
Orovada: OmA	Slight	Moderate: seepage.	Slight	Slight	Slight	Slight	Moderate: low strength.
OnA	Slight	Moderate: seepage.	Slight	Slight	Slight	Slight	Moderate: low strength.
OpB	Slight	Moderate: seepage.	Slight	Slight	Slight	Slight	Moderate: low strength.
*Orphant: OR	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Moderate: cemented pan.	Moderate: cemented pan.	Severe: cemented pan.	Moderate: cemented pan.
OS. For Bluewing part of OS, see Bluewing series.	Sever : cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Moderate: cemented pan.	Moderate: cemented pan.	Severe: cemented pan.	Moderate: cemented pan.
*Osobb: OT. For Gabbs part of OT, see Gabbs series.	Severe: depth to rock; cemented pan; slope is as much as 30 percent in places.	Severe: depth to rock; cemented pan; slope is as much as 30 percent in places.	Severe: depth to rock; cemented pan; slope is as much as 30 percent in places.	Severe: depth to rock; cemented pan; slope is as much as 30 percent in places.	Severe: depth to rock; cemented pan; slope is as much as 30 percent in places.	Severe: depth to rock; cemented pan; slope is as much as 30 percent in places.	Severe: depth to rock; cemented pan; slope is as much as 30 percent in places.
Parran: PA	Severe: percs slowly.	Slight	Severe: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: too clayey; wet.	Severe: shrink-swell.
*Penelas variant: PD. For Penelas part of PD, see Penelas series.	Severe: depth to rock; slope.	Severe: depth to rock; slope.	Severe: slope; depth to rock.	Severe: slope.	Severe: slope.	Severe: depth to rock; slope is as much as 50 percent in places.	Severe: slope.

See footnotes at end of table.

engineering properties—Continued

Suitability as source of—				Soil features affecting—				Hydrologic group
Road fill	Sand	Gravel	Topsoil	Pond reservoir areas	Embankments, dikes, and levees	Irrigation	Drainage for crops and pasture	
Fair: low strength; shrink-swell.	Poor: excess fines.	Unsuitable	Poor: excess salts.	Seepage	Low strength; medium to high piping.	Not suited	Not needed	C
Poor: slope; thin layer.	Unsuitable	Unsuitable	Poor: slope; thin layer.	Slope; depth to rock.	Thin layer	Not suited	Not needed	D
Poor: low strength.	Unsuitable	Unsuitable	Poor: excess salt.	Favorable	Low strength; shrink-swell.	Favorable	Favorable	C
Poor: wet	Unsuitable	Unsuitable	Poor: excess salt.	Favorable	Low strength; shrink-swell.	Wet; floods	Wet; floods	C
Poor: wet	Unsuitable	Unsuitable	Poor: excess salt.	Favorable	Low strength; shrink-swell.	Not suited	Not needed	C
Fair: low strength.	Poor: excess fines.	Unsuitable	Poor: small stones.	Seepage	Low strength; piping.	Fast intake	Favorable	B
Fair: low strength.	Poor: excess fines.	Unsuitable	Good	Seepage	Low strength; piping.	Favorable	Favorable	B
Fair: low strength.	Poor: excess fines.	Unsuitable	Good	Seepage	Low strength; piping.	Slope	Favorable	B
Poor: thin layer.	Poor: thin layer.	Unsuitable	Fair: thin layer.	Cemented pan.	Seepage; thin layer.	Not suited	Not needed	D
Poor: thin layer.	Poor: thin layer.	Unsuitable	Poor: small stones.	Cemented pan; slope.	Seepage; thin layer.	Not suited	Not needed	D
Poor: thin layer; slope is as much as 30 percent in places.	Unsuitable	Unsuitable	Poor: thin layer; small stones; slope is as much as 30 percent in places.	Depth to rock; cemented pan; slope.	Thin layer	Not suited	Not needed	D
Poor: shrink-swell.	Unsuitable	Unsuitable	Poor: too clayey; excess salt.	Favorable	Shrink-swell	Not suited	Not needed	D
Poor: thin layer; slope is as much as 50 percent in places.	Unsuitable	Unsuitable	Poor: thin layer; small stones.	Slope; depth to rock.	Thin layer	Not suited	Not needed	D

TABLE 8.—*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)	Local roads and streets
*Penelas: PE, PF, PG. For Kyler and Laxal parts of PE and PF, see the Kyler and Laxal series, respectively. Rock outcrop part of PG is too variable to be rated.	Severe: depth to rock; slope is as much as 30 percent in places.	Severe: depth to rock; slope is as much as 30 percent in places.	Severe: depth to rock; slope is as much as 30 percent in places.	Severe: depth to rock; slope is as much as 30 percent in places.	Severe: depth to rock; slope is as much as 30 percent in places.	Severe: depth to rock; slope is as much as 30 percent in places.	Severe: depth to rock; slope is as much as 30 percent in places.
*Pintwater: PH, PK, PM. For Bluewing part of PH, see Bluewing series. Rock outcrop part of PK and PM are too variable to be rated.	Severe: depth to rock; slope is as much as 50 percent in places.	Severe: depth to rock; slope is as much as 50 percent in places.	Severe: depth to rock; slope is as much as 50 percent in places.	Severe: depth to rock slope is as much as 50 percent in places.	Severe: depth to rock; slope is as much as 50 percent in places.	Severe: depth to rock; slope is as much as 50 percent in places.	Severe: depth to rock; slope is as much as 50 percent in places.
*Playas: PN, PO. Playas are too variable to be rated. For Parran part of PO, see Parran series.							
Pumel: PR. Rock outcrop part of PR is too variable to be rated.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Moderate: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Moderate: depth to rock.
Quima:							
QrA	Slight	Severe: seepage.	Slight	Slight	Slight	Slight	Slight
QsB	Slight	Severe: seepage.	Slight	Slight	Slight	Slight	Slight
Rock outcrop. Too variabe to be rated.							
*Roic: RO. For Dobel part of RO, see Dobel series.	Severe: depth to rock.	Severe: depth to rock; slope is as much as 15 percent in places.	Severe: small stones; depth to rock.	Moderate: depth to rock.	Moderate: depth to rock.	Severe: depth to rock.	Moderate: depth to rock.
*Settlemeyer:							
Sb	Severe: percs slowly.	Slight	Slight	Severe: wet; frost action.	Severe: wet; frost action.	Severe: wet.	Severe: wet; frost action.
Se	Severe: percs slowly.	Severe: wet.	Severe: wet.	Severe: wet; frost action.	Severe: wet; frost action.	Severe: wet.	Severe: wet; frost action.
SF. For Yobe part of SF, see Yobe series.	Severe: percs slowly.	Severe: wet.	Severe: wet.	Severe: wet; frost action.	Severe: wet; frost action.	Severe: wet.	Severe: wet; frost action.

See footnotes at end of table.

engineering properties—Continued

Suitability as source of—				Soil features affecting—				Hydrologic group
Road fill	Sand	Gravel	Topsoil	Pond reservoir areas	Embankments, dikes, and levees	Irrigation	Drainage for crops and pasture	
Poor: depth to rock; slope is as much as 30 percent in places.	Unsuitable	Unsuitable	Poor: thin layer; small stones; slope is as much as 30 percent in places.	Slope; depth to rock.	Thin layer	Not suited	Not needed	D
Poor: depth to rock; slope is as much as 50 percent in places.	Unsuitable	Unsuitable	Poor: thin layer; small stones; large stones; slope is 50 percent in places.	Slope; depth to rock.	Thin layer	Not suited	Not needed	D
Poor: thin layer.	Poor: thin layer.	Poor: thin layer.	Poor: too sandy; small stones.	Slope; depth to rock.	Seepage; thin layer.	Not suited	Not needed	C
Good	Poor: excess fines.	Unsuitable	Good	Seepage	Piping; seepage.	Favorable	Favorable	B
Good	Poor: excess fines.	Unsuitable	Good	Seepage; slope.	Piping; seepage.	Slope	Favorable	B
Poor: thin layer.	Unsuitable	Unsuitable	Poor: thin layer; small stones.	Slope; depth to rock.	Thin layer	Not suited	Not needed	D
Poor: low strength frost action.	Unsuitable	Unsuitable	Fair: too clayey.	Favorable	Low strength; compressible.	Percs slowly.	Percs slowly.	D
Poor: low strength; frost action.	Unsuitable	Unsuitable	Poor: wet	Favorable	Low strength; compressible.	Wet, percs slowly.	Wet, percs slowly.	D
Poor: low strength; frost action.	Unsuitable	Unsuitable	Poor: wet	Favorable	Low strength; compressible.	Not suited	Not needed	D

TABLE 8.—*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)	Local roads and streets
Silverbow: SH Rock outcrop part of SH is too variable to be rated.	Severe: cemented pan; slope is as much as 30 percent in places.	Severe: slope; cemented pan.	Severe: cemented pan; cutbanks cave; large stones; slope is as much as 30 percent in places.	Moderate where slope is 8 to 15 percent; cemented pan. Severe where slope is 15 to 30 percent.	Moderate where slope is 8 to 15 percent; cemented pan. Severe where slope is 15 to 30 percent in places.	Severe: large and small stones; slope is as much as 30 percent in places.	Moderate where slope is 8 to 15 percent; cemented pan. Severe where slope is 15 to 30 percent.
Slickens: SK. Too variable to be rated.							
Spanel: SP	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan; cutbanks cave.	Moderate: cemented pan.	Moderate: cemented pan.	Severe: small stones; too sandy.	Moderate: cemented pan.
Stargo: Sr	Slight	Severe: seepage.	Moderate: small stones.	Slight	Slight	Slight	Moderate: low strength.
Ss	Severe: floods.	Severe: seepage; floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.
Stumble: STC	Slight	Severe: seepage; slope is as much as 8 percent in places.	Severe: cutbanks cave.	Slight	Slight	Severe: too sandy.	Slight
SuA	Slight	Severe: seepage.	Severe: cutbanks cave.	Slight	Slight	Severe: too sandy.	Slight
Sundown: Sw	Slight	Severe: seepage.	Severe: cutbanks cave.	Slight	Slight	Severe: too sandy.	Slight
*Timblin: TC For McCann part of TC see McCann series.	Severe: cemented pan; percs slowly.	Severe: cemented pan.	Severe: cemented pan.	Severe: shrink-swell.	Severe: cemented pan; shrink-swell.	Severe: cemented pan.	Severe: low strength; shrink-swell.
Timper: TdA	Slight [3]	Severe: [3] seepage.	Moderate: [3] cemented pan.	Slight [3]	Slight [3]	Slight [3]	Slight [3]
TEB	Slight [3]	Severe: [3] seepage.	Moderate: [3] cemented pan.	Slight [3]	Slight [3]	Slight [3]	Slight [3]
TF Playas part of TF is too variable to be rated.	Slight [3]	Severe: [3] seepage.	Moderate: [3] cemented pan.	Slight [3]	Slight [3]	Slight [3]	Slight [3]

See footnotes at end of table.

engineering properties—Continued

Suitability as source of—				Soil features affecting—				Hydrologic group
Road fill	Sand	Gravel	Topsoil	Pond reservoir areas	Embankments, dikes, and levees	Irrigation	Drainage for crops and pasture	
Good where slope is 8 to 15 percent. Fair where slope is 15 to 25 percent. Poor where slope is 25 to 30 percent.	Unsuitable	Fair: excess fines.	Poor: small stones; large stones; slope is as much as 30 percent in places.	Cemented pan; slope.	Seepage; large stones.	Not suited	Not needed	D
Slight	Unsuitable	Fair: excess fines.	Fair: thin layer.	Cemented pan.	Seepage	Not suited	Not needed	D
Fair: low strength.	Unsuitable	Unsuitable	Poor: thin layer; small stones.	Seepage	Low strength; piping.	Droughty; soil blowing.	Favorable	B
Fair: low strength.	Unsuitable	Unsuitable	Poor: thin layer.	Seepage	Low strength; piping.	Floods	Favorable	B
Good	Poor: excess fines.	Unsuitable	Poor: too sandy.	Seepage; slope.	Seepage; low strength; piping.	Droughty; soil blowing; fast intake.	Favorable	A
Good	Poor: excess fines.	Unsuitable	Poor: thin layer.	Seepage	Seepage: low strength; piping.	Droughty; soil blowing; fast intake.	Favorable	A
Good	Poor: excess fines.	Unsuitable	Too sandy	Seepage	Seepage; low strength; piping.	Droughty; soil blowing.	Favorable	B
Poor: low strength; shrink-swell.	Unsuitable	Unsuitable	Poor: thin layer; small stones; large stones.	Slope; cemented pan.	Shrink-swell; low strength; compressible.	Not suited	Not needed	D
Good	Unsuitable	Unsuitable	Poor: thin layer; too sandy.	Cemented pan; seepage.	Seepage: low strength.	Droughty: complex slope.[3]	Favorable	D
Good	Unsuitable	Unsuitable	Fair: thin layer; small stones.	Cemented pan; seepage.	Seepage; low strength.	Droughty: complex slope.[3]	Favorable	D
Good	Unsuitable	Unsuitable	Fair: thin layer; small stones.	Cemented pan; seepage.	Seepage; low strength.	Not suited	Not needed	D

TABLE 8.—*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)	Local roads and streets
*Tipperary: TGE, TH, TM. For Fivemile part of TH, see Fivemile series. Playas part of TM is too variable to be rated.	Slight where slope is 4 8 percent. Moderate where slope is 8 to 15 percent. Severe where slope is 15 to 30 percent.	Severe: seepage.	Severe: cutbanks cave.	Slight where slope is 4 to 8 percent. Moderate where slope is 8 to 15 percent. Severe where slope is 15 to 30 percent.	Slight where slope is 4 to 8 percent. Moderate where slope is 8 to 15 percent. Severe where slope is 15 to 30 percent.	Severe: too sandy.	Slight where slope is 4 to 8 percent. Moderate where slope is 8 to 15 percent. Severe where slope is 15 to 30 percent.
*Tomel: TN. For Laxal part of TN, see Laxal series.	Severe: cemented pan.	Severe: cemented pan; slope is as much as 8 percent in places.	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.
*Tybo: TOB	Severe: cemented pan.	Severe: cemented pan; slope is as much as 8 percent in places.	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.
TR, TS. For Bluewing and Stumble parts of TR and TS, see Bluewing and Stumble series, respectively.	Severe: cemented pan.	Severe: cemented pan; slope is as much as 8 percent in places.	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.
*Umberland: UM, UN, UR. For Parran part UN and Tipperary part of UR, see Parran and Tipperary series, respectively. Playas part of UN is too variable to be rated.	Severe: percs slowly; wet.	Slight	Severe: too clayey.	Severe: shrink-swell.	Severe: shrink-swell; wet.	Severe: too clayey; wet.	Severe: shrink-swell.
*Unsel: UT. For Bluewing part of UT, see Bluewing series.	Slight	Severe: seepage; slope is as much as 8 percent in places.	Severe: cutbanks cave.	Slight	Slight	Slight	Slight
*Vigus: VGC, VK. For Koyen part of VK, see Koyen series.	Moderate: percs slowly.	Moderate: seepage; slope is as much as 8 percent in places.	Slight	Slight	Slight	Slight	Slight
*Vinini: VM, VN. For Mina and Nevoyer parts of VM and VN, see Mina and Nevoyer series, respectively.	Severe: cemented pan; slope is as much as 30 percent in places.	Severe: slope; cemented pan.	Severe: cemented pan; slope is as much as 30 percent in places.	Severe: cemented pan; slope is as much as 30 percent in places.	Severe: cemented pan; slope is as much as 30 percent in places.	Severe: cemented pan; slope is as much as 30 percent in places.	Severe: cemented pan; slope is as much as 30 percent in places.

engineering properties—Continued

Suitability as source of—				Soil features affecting—				Hydrologic group
Road fill	Sand	Gravel	Topsoil	Pond reservoir areas	Embankments, dikes, and levees	Irrigation	Drainage for crops and pasture	
Good where slope is 4 to 15 percent. Fair where slope is 15 to 25 percent. Poor where slope is 25 to 30 percent.	Poor: excess fines.	Unsuitable	Poor: too sandy.	Slope; seepage.	Seepage piping.	Not suited	Not needed	A
Poor: thin layer.	Unsuitable	Good	Poor: small stones.	Slope; cemented pan.	Thin layer	Not suited	Not needed	D
Poor: thin layer.	Unsuitable	Unsuitable	Poor: too sandy.	Slope; cemented pan.	Thin layer	Not suited	Not needed	D
Poor: thin layer.	Unsuitable	Unsuitable	Fair: thin layer.	Slope; cemented pan.	Thin layer	Not suited	Not needed	D
Poor: shrink-swell.	Unsuitable	Unsuitable	Fair: too clayey.	Favorable	Shrink-swell; compressible; low strength.	Not suited	Not needed	D
Good	Unsuitable	Good	Poor: small stones.	Seepage; slope.	Seepage	Not suited	Not needed	C
Good	Unsuitable	Unsuitable	Poor: thin layer.	Seepage; slope.	Seepage	Slope; droughty; seepage.	Slope; perces slowly.	C
Poor: thin layer; slope is as much as 30 percent in places.	Unsuitable	Unsuitable	Poor: thin large; large stones; slope is as much as 30 percent in places.	Slope; cemented pan.	Thin layer	Not suited	Not needed	D

TABLE 8.—*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)	Local roads and streets
Wardenot: WA	Slight	Severe: seepage; slope is as much as 8 percent in places.	Severe: small stones.	Slight	Slight	Severe: small stones.	Slight
Wrango: WBB, WDC	Slight	Severe: seepage; slope is as much as 8 percent in places.	Severe: small stones; large stones.	Slight	Slight	Severe: small stones; large stones.	Slight
*Yobe: YB, YC, YD. For Tipperary and Umberland parts of YC and YD, see Tipperary and Umberland series, respectively.	Severe: wet; percs slowly.	Moderate: seepage; wet.	Moderate: too clayey; wet.	Severe: frost action.	Severe: frost action.	Severe wet.	Severe: low strength; frost action.
Yomba:							
Ym	Slight	Severe: seepage.	Severe: small stones; cutbanks cave.	Slight	Slight	Severe: small stones.	Slight
Yn	Severe: floods.	Severe: seepage; floods.	Severe: cutbanks cave; small stones; floods.	Severe: floods.	Severe: floods.	Severe: floods; small stones.	Severe: floods.
YO. Playas part of YO is too variable to be rated	Slight	Severe: seepage.	Severe: small stones; cutbanks cave.	Slight	Slight	Severe: small stones.	Slight
Youngston:							
Yp	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.
Yr	Slight	Moderate: seepage.	Slight	Moderate: low strength.	Moderate: low strength.	Slight	Moderate: low strength.
Ys	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.
*Zaba: ZN. For Nyserva part of ZN, see Nyserva series.	Slight	Severe: seepage; slope is as much as 8 percent in places.	Severe: small stones; cutbanks cave.	Slight	Slight	Severe: small stones.	Slight

[1]Good material observed in lower part of soil profile.
[2] Ratings refer to, or include subsoil layers.

mately parallel to the terms slight, moderate, and severe.

Following are explanations of some of the columns in table 8.

Septic tank absorption fields are subsurface systems of tile or perforated pipe that distribute effluent from a septic tank into natural soil. The soil material between depths of 18 inches and 6 feet is evaluated. Ratings are based on depth of tile at 2 feet. 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 to 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

engineering properties—Continued

Suitability as source of—				Soil features affecting—				Hydrologic group
Road fill	Sand	Gravel	Topsoil	Pond reservoir areas	Embankments, dikes, and levees	Irrigation	Drainage for crops and pasture	
Good	Unsuitable	Fair: excess fines.	Poor: thin layer; small stones.	Seepage; slope.	Seepage	Not suited	Not needed	B
Good	Unsuitable	Fair: excess fines.	Poor: thin layer; large stones; small stones.	Seepage; slope.	Seepage	Not suited	Not needed	B
Poor: low strength; frost action.	Unsuitable	Unsuitable	Poor: excess salt.	Favorable	Low strength; compressible.	Not suited	Not needed	C
Good	Fair: excess fines.	Unsuitable	Fair: thin layer.	Seepage	Seepage	Droughty; seepage.	Poor outlets.	C
Good	Fair: excess fines.	Unsuitable	Fair: thin layer.	Seepage	Seepage	Droughty; floods; seepage.	Poor outlets; floods.	C
Good	Fair: excess fines.	Unsuitable	Fair: thin layer.	Seepage	Seepage	Not suited	Not needed	C
Poor: low strength.	Unsuitable	Unsuitable	Poor: too sandy; thin layer.	Seepage	Low strength; piping; compressible.	Floods	Floods	B
Poor: low strength.	Unsuitable	Unsuitable	Fair: thin layer.	Seepage	Low strength; piping; compressible.	Favorable	Favorable	B
Poor: low strength.	Unsuitable	Unsuitable	Fair: thin layer.	Seepage	Low strength; piping; compressible.	Floods	Floods	B
Good	Fair: excess fines.	Good	Poor: small stones.	Seepage: slope.	Seepage	Not suited	Not needed	C

[1] Based on easy ripping of shallow, thin cemented hardpan.

moderate because of the arid and semiarid climate.

Sewage lagoons are shallow ponds constructed to hold sewage within a depth of 2 to 5 feet long enough for bacteria to decompose the solids. A lagoon has a nearly level floor, and sides, or embankments, of compacted soil material. The assumption is made that the embankment is compacted to medium density and the pond is protected from flooding. Properties that affect the pond floor and the embankment are considered. Those that affect the pond floor are permeability, organic matter, and slope, and if the floor needs to be leveled, depth to bedrock is important. The soil properties that affect the embankment are the engineering properties of the embankment material as interpreted from the Unified soil classification, and the amounts of stones, if any, that influence the ease of excavation and compaction of the embankment material.

Shallow excavations are those that require digging

TABLE 9.—*Engineering*

[Tests performed by Nevada

Soil name and location	Parent material	Depth	Horizon	Mechanical analysis [1]		
				Percentage passing sieve—		
				3 inches	1½ inches	¾ inch
		Inches				
Bluewing very stony loamy sand: 790 feet south and 1,320 feet west of northeast corner sec. 6, T. 5 N., R. 42 E., 2 miles north of abandoned Liberty Mine and 500 feet west of road paralleling San Antonio Mountains.	Volcanic alluvium.	3–8	C1	100	81	67
		19–60	C3	100	95	87
Dobel very gravelly sandy loam: 528 feet east and 1,320 feet north of southwest corner sec. 3, T. 4 N., R. 42 E., 5 miles north of Tonopah.	Mixed alluvium, volcanic rocks, and shale.	4½–8	B2t	100	95	91
		12–38	C2ca	100	94	89
Spanel gravelly loamy sand: 2,375 feet west and 200 feet north of southeast corner sec. 15, T. 8 N., R. 42 E., 2 miles east of Peavine Ranch.	Volcanic alluvium.	6–10	B2t	100	99	98
		10–14	B3ca	100	95	91
		23–40	IIC2ca	100	77	65
Timper gravelly sandy loam: 300 feet south of northwest corner sec. 9, T. 5 N., R. 41 E., 21 miles north of Tonopah, 50 feet east of old Austin-Tonopah road.	Volcanic alluvium.	1–12	A12, C1, C2sica	----------	----------	100
		15–60	C4sica, C5	----------	100	96
Yomba gravelly sand: 1,000 feet east and 1,000 feet south of northwest corner sec. 25, T. 5 N., R. 40 E., 19 miles northwest of Tonopah and 2 miles west of State Route 89.	Mixed alluvium.	2–9	A12, C1	----------	----------	100
		14–20	C3sica	----------	100	98
		20–40	IIC4	----------	100	99

[1] Mechanical analyses according to the AASHTO Designation T 88. Results by this procedure frequently may differ somewhat from results that would have been obtained by the soil survey procedure of the Soil Conservation Service (SCS). In the AASHTO procedure, the fine material is analyzed by the hydrometer method and the various grain-sized fractions are calculated on the basis of all the material, including that coarser than 2 millimeters in diameter. In the SCS soil survey procedure, the fine material is analyzed by the pipette method and the material coarser than 2 millimeters in diameter is excluded from calculations of grain-sized fractions. The mechanical analyses used in this table are not suitable for use in naming textural classes for soil.

or trenching to a depth of less than 6 feet, for example, excavations for pipelines, sewer lines, phone 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 big stones, and freedom from flooding or a high water table.

Dwellings, as rated in table 8, are not more than three stories high and are supported by foundation footings placed at a minimum depth of 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 except on wet soils. For slab structures see the ratings for frost action potential in table 7.

Sanitary landfill is a method of disposing of refuse in dug trenches. The waste is spread in thin layers, compacted, and covered with soil throughout the disposal period. Landfill areas are subject to heavy vehicular traffic. Some soil properties that affect suitability for landfill are ease of excavation, hazard of polluting ground water, and trafficability. The best soils withstand heavy traffic and are friable and easy to excavate. Permeability is not considered in the ratings 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. Nevertheless, every site should be investigated before it is selected.

Local roads and streets have an all-weather surface

test data

Department of Highways]

Mechanical analysis [1]—Continued				Liquid limit	Plasticity index	Classification	
Percentage passing sieve—Continued							
No. 4 (4.7 mm)	No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.074 mm)			AASHTO [2]	Unified [3]
40	32	23	8	22	[4] NP	A-1-a(0)	GW-GM
46	27	14	5	23	NP	A-1-a(0)	GP-GM
85	80	70	42	26	7	A-4(1)	SM-SC
74	58	32	11	30	NP	A-1-b(0)	SP-SM
94	91	79	47	20	4	A-4(2)	SM-SC
85	80	67	35	24	4	A-2-4(0)	SM-SC
35	23	5	1	23	NP	A-1-a(0)	GP
97	92	69	19	27	NP	A-2-4(0)	SM
86	78	43	4	25	NP	A-1-b(0)	SP
98	94	75	22	18	NP	A-2-4(0)	SM
79	67	42	8	24	NP	A-1-b(0)	SP-SM
75	63	32	1	23	NP	A-1-b(0)	SP

[2] Based on Standard Specifications for Highway Materials and Methods of Sampling and Testing (Pt. 1, Ed. 8): The Classification of Soils and Soil-Aggregate Mixtures for Highway Construction Purposes, AASHTO Designation M 145-49.
[3] Unified Soil Classification System.
[4] NP means nonplastic.

expected to carry automobile traffic all year. They have a subgrade of underlying soil material; a base consisting of gravel, crushed rock, or soil material stabilized with lime or cement; and a flexible or rigid surface, commonly asphalt or concrete. These roads are graded to shed water and have ordinary provisions for drainage. They are built mainly from soil at hand, and most cuts and fills are less than 6 feet deep. In the ratings it is assumed that the surface 12 inches of soil material has been removed. Frost action is not considered.

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.

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. In the ratings frost action is not considered. If fill is to be used on wet soils, see the ratings for frost action potential in table 7.

Sand and gravel are used in great quantities in many kinds of construction. The ratings in table 8 provide guidance about where to look for probable sources. A soil rated as a *good* or *fair* source of sand or gravel generally has a layer at least 3 feet thick, the top of which is within a depth of 6 feet. The ratings do not take into account thickness of overburden, location of the water table, or other factors that affect

mining of the materials, and neither do they indicate quality of the deposit.

Topsoil is used for topdressing areas where vegetation is to be established and maintained. Suitability is affected mainly by the ease of working and spreading the soil material, as for preparing a seedbed; natural fertility of the material, or the response of plants when fertilizer is applied; and absence of substances toxic to plants. Texture of the soil material and its content of stone fragments are characteristics that affect suitability, but also considered in the ratings is the damage that will result at the area from which topsoil is taken.

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.

Embankments, dikes, and levees require soil material resistant to seepage and piping, and of favorable stability, shrink-swell potential, shear strength, and compactibility. Presence of stones or organic material in a soil are among unfavorable factors.

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 hardpans or other layers that restrict movement of water, amount of water held available to plants, and need for drainage, or depth to water table or bedrock.

Drainage for crops and pasture is affected by such soil properties as permeability, texture, and structure; depth to claypan, hardpan, rock, or other layers that influence rate of water movement; depth to the water table; slope, stability in ditchbanks; susceptibility to stream overflow; salinity or alkalinity; and availability of outlets for drainage.

Hydrologic groups measure the runoff potential of the soils.

Information about runoff is essential to flood-control planning. In an engineering handbook (*9*) 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 the soils' intake of water at the end of long duration storms, after prior wetting and opportunity for swelling, and they consider protective effects of vegetation. The criteria for the four groups are as follows:

Group A.—Soils having high infiltration rates even when thoroughly wetted. These are mainly deep, well drained to excessively drained sands or gravel, or both. These soils have a high rate of water transmission and a low runoff potential.

Group B.—Soils having moderate infiltration rates when thoroughly wetted. These are mainly moderately deep to deep, moderately well drained to well drained soils that have moderately fine to moderately coarse textures. These soils have a moderate rate of water transmission.

Group C.—Soils having slow infiltration rates when thoroughly wetted. These are mainly soils that have a layer that impedes the downward movement of water, or soils that have moderately fine to fine texture and slow infiltration rate. These soils have a slow rate of water transmission.

Group D.—Soils having very slow infiltration rates when thoroughly wetted. These 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 materials. These soils have a very slow rate of water transmission.

Engineering test data

Table 9 contains the results of engineering tests performed by the Nevada State Highway Department on several important soils in the area. The table shows the specific location where samples were taken, the depth to which sampling was done and the results of tests to determine particle-size distribution and other properties significant in soil engineering.

Maximum dry density is the maximum dry unit weight of the soil when it has been compacted with optimum moisture by the prescribed method of compaction. The moisture content which gives the highest dry unit weight is called the optimum moisture content for the specific method of compaction.

Mechanical analysis shows the percentages by weight of soil particles that would pass sieves of a specified size. Sand and other coarser materials do not pass through the No. 200 sieve. Silt and clay pass through the No. 200 sieve. Percentage fractions smaller than openings in the No. 200 sieve were determined by the hydrometer method, rather than the pipette method that most soil scientists use in determining the clay content in the soil sample.

Liquid limit and plasticity index indicate the effects 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 solid 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 passes from solid to plastic. The liquid limit is the moisture content at which soil material changes from plastic to liquid. 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 is plastic.

The AASHTO and Unified classifications have been explained earlier in the engineering section.

Recreation

Knowledge of soils is necessary in planning, developing, and maintaining areas used for recreation. In table 10, the soils of the Big Smoky Valley Area are rated according to limitations that affect their suitability for camp areas, paths and trails, picnic areas, and playgrounds. The ratings are based on such restrictive soil features as flooding, wetness, slope, and texture of the surface layer. Not considered in these

ratings, but important in evaluating a site, are size and shape of the area and its scenic quality, the ability of the soil to support vegetation, access to water, and either access to public sewer lines or capacity of the soil to absorb septic tank effluent. Soils subject to flooding are limited in varying degree for recreational use by the duration of flooding and the season when it occurs. Onsite assessment of height, duration, and frequency of flooding is essential in planning recreation facilities.

In table 10, the limitations of soils are rated as slight, moderate, or severe. *Slight* means that the soil properties are generally favorable and that the limitations are minor and easily overcome. *Moderate* means that the limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, or by a combination of these measures.

Information in table 10 can be supplemented by additional data in other parts of this survey. Especially helpful are interpretations for septic tank absorption fields, given in table 8, and interpretations for dwellings without basements and for local roads and streets, also given in table 8.

Camp areas require such site preparation as shaping and leveling areas for tents, small trailers, and parking; stabilizing roads and intensively used areas; and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils for this use have mild slopes and are not wet or subject to flooding during the period of use. The surface is free of stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of leveling a site.

The design and layout of paths and trails for travel on foot or horseback should require little or no cutting and filling. The best soils for this use are those that are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once during the period of use. They should have moderate slopes and have few or no stones or boulders on the surface.

Picnic areas are subject to heavy foot traffic, but most vehicular traffic is confined to access roads. The best soils for use as picnic areas are firm when wet but not dusty when dry, are not subject to flooding during the period of use, and do not have slopes, stones, or boulders that will increase the cost of shaping and leveling sites or of building access roads and parking lots.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and not wet or subject to flooding during the season of use. The surface is free of stones or boulders, is firm after rains, and is not dusty when dry. If leveling is required to obtain a uniform grade, the depth of the soil over rock should be sufficient to allow necessary grading.

Formation and Classification of the Soils

In this section, the factors that influence soil formation and the effects of soil formation on soil morphology are discussed. Then the soils in Big Smoky Valley Area are classified.

Formation

Soil is the natural medium for the growth of land plants and for material used in construction. It is a mixture of rock fragments, minerals, organic matter, air, water, and living matter, all in varying proportions. Its properties vary with gradation of its particles, moisture content, vertical position in relation to the surface of the ground, and the geological location. Mineral soils have three arbitrary size separates: sand, silt, and clay.

In soil survey work the smallest volume that can be called "soil" is termed a pedon. A pedon is the smallest volume of soil that permits study of continuation of properties that are unique to a certain kind of soil. The shape of a pedon is roughly polygonal. It is 1 to 10 square meters in size, depending on the variability of the horizons, and its lower limit is the vague and sometimes arbitrary limit between soil and not soil. More than one pedon is a polypedon (*8*).

Soil formation results in distinctive layers called genetic horizons. These horizons are the products of environmental forces acting upon materials that were deposited or accumulated by geological processes or that have weathered in place. A genetic horizon, a layer approximately parallel to the land surface, has distinctive properties and is unlike layers immediately above or below it. It is differentiated from those horizons above and below by characteristics that commonly can be seen or measured in the field. Laboratory measurements may be required to supplement field observations.

Certain genetic horizons are termed diagnostic horizons in "Soil Taxonomy." The diagnostic horizons as they occur in the survey area are described in general terms. Any horizon may be at the surface of a truncated soil, but the genetic horizons are thought to be formed in relatively stable materials.

Horizons formed at the surface are termed epipedons (epi means over, and pedon means soil). Ochric and mollic epipedons developed in the soils in this survey area.

The ochric epipedon is the most common surface horizon in the soils of the survey area. It is light colored because very little organic matter has accumulated in it. It extends to the top of an underlying diagnostic illuvial horizon or to the base of a plow layer or an equivalent depth in soils that have not been plowed. It is usually less than 6 inches thick in the survey area.

The mollic epipedon is a relatively thick, dark colored, humus-rich surface horizon that developed in an environment that had enough precipitation to assure

TABLE 10.—*Limitations of the soils for recreational development*

Soil series and map symbol	Camp areas	Paths and trails	Picnic areas	Playgrounds
Ardivey: AR For Wardenot part of AR, see Wardenot series.	Severe: coarse fragments on surface.	Severe: coarse fragments on surface.	Severe: coarse fragments on surface.	Severe: coarse fragments on surface.
Badland: BA, BB. Badland parts are too variable to be rated. For Belcher part of BA, and Pintwater part of BB, see Belcher and Pintwater series respectively.				
Basket: BC For Mina part of BC, see Mina series.	Severe: slope	Moderate if slope is 15 to 25 percent. Severe if slope is more than 25 percent.	Severe: slope	Severe: slope.
Belcher: BEB	Severe: dusty; too sandy.	Severe: dusty; too sandy.	Moderate: dusty	Severe: dusty; too sandy; less than 20 inches deep.
Belted: BHC	Moderate: dusty	Slight	Slight	Severe: less than 20 inches deep; slopes of as much as 8 percent.
Bluewing:				
BLC	Moderate: very gravelly surface.	Moderate: very gravelly surface.	Moderate: very gravelly surface.	Moderate: very gravelly surface; slopes mostly 2 to 6 percent.
BM8, BOB	Slight	Slight	Slight	Moderate: slopes mostly 2 to 4 percent.
BNC	Moderate: large stones on surface.	Severe: large stones on surface.	Severe: large stones on surface.	Severe: large stones on surface.
Broe: BPB	Moderate: dusty	Slight	Moderate: dusty	Moderate: dusty.
Broyles:				
BrA, Bt For Laxal part of Bt, see Laxal series.	Moderate: dusty	Moderate: dusty	Moderate: dusty	Moderate: dusty.
BrB	Moderate: dusty	Moderate: dusty	Moderate: dusty	Moderate: dusty; slopes 2 to 4 percent.
Caudle: Cf, Cg	Moderate: dusty	Moderate: dusty	Moderate: dusty	Moderate: dusty.
Charnock:				
Ch	Moderate: percs slowly.	Slight	Slight	Moderate: percs slowly.
Ck, Cm	Moderate: percs slowly; dusty.	Moderate: percs slowly; dusty.	Moderate: percs slowly; dusty.	Moderate: percs slowly; dusty.
Deerlodge variant: DEC	Moderate: percs slowly; coarse fragments on surface.	Moderate: coarse fragments on surface.	Moderate: coarse fragments on surface.	Severe: coarse fragments on surface.
Dobel: DN For Bluewing part of DN, see Bluewing series.	Moderate: dusty; percs slowly; many small pebbles on surface.	Moderate: dusty; many small pebbles on surface.	Moderate: dusty, many small pebbles on surface.	Severe: percs slowly; dusty; many small pebbles on surface; less than 20 inches deep.
Domez:				
Do	Severe: too sandy	Severe: too sandy	Severe: too sandy	Severe: too sandy.
Dr, Ds Playas part of Ds is too variable to be rated.	Moderate: dusty	Moderate: dusty	Moderate: dusty	Moderate: dusty.
Dune land: DU. Too variable to be rated.				

TABLE 10.—*Limitations of the soils for recreational development*—Continued

Soil series and map symbol	Camp areas	Paths and trails	Picnic areas	Playgrounds
Fivemile:				
Fa	Moderate: dusty; percs slowly.	Moderate: dusty	Moderate: dusty	Moderate: dusty; percs slowly.
Fb	Moderate: dusty; percs slowly; occasional flooding.	Moderate: dusty; occasional flooding.	Moderate: dusty; occasional flooding.	Moderate: dusty; percs slowly; occasional flooding.
Gabbs: GA For Old Camp part of GA, see Old Camp series.	Severe: slope; cobbly surface.	Severe: slope; cobbly surface.	Severe: slope; cobbly surface.	Severe: slope; cobbly surface; less than 20 inches deep.
Griffy: Gr, Gs	Moderate: dusty	Moderate: dusty	Moderate: dusty	Moderate: dusty.
Jolan: JO	Severe: too sandy; dusty.	Severe: too sandy; dusty.	Severe: too sandy; dusty.	Severe: too sandy; dusty; less than 20 inches deep.
Koyen:				
KoA	Severe: too sandy	Severe: too sandy	Severe: too sandy	Severe: too sandy.
KrB, KsA	Moderate: dusty	Moderate: dusty	Moderate: dusty	Moderate: dusty.
Kyler: KT Rock outcrop part of KT is too variable to be rated.	Severe: slope; coarse fragments on surface.	Severe: slope; coarse fragments on surface.	Severe: slope; coarse fragments on surface.	Severe: slope; coarse fragments on surface; less than 20 inches deep.
Lahontan: La, Lb	Moderate: percs slowly; runoff very slow or ponded; dusty when dry.	Moderate: runoff very slow or ponded; dusty when dry.	Moderate: runoff very slow or ponded; dusty when dry.	Moderate: percs slowly; runoff very slow or ponded; dusty when dry.
Lathrop:				
LCB	Moderate: dusty when dry.	Moderate: too sandy; dusty when dry.	Moderate: too sandy; dusty when dry.	Moderate: too sandy; dusty when dry.
LF For Bluewing part of LF, see Bluewing series.	Moderate: dusty when dry; few small pebbles on surface.	Moderate: dusty when dry; few small pebbles on surface.	Moderate: dusty when dry; few small pebbles on surface.	Moderate: dusty when dry; slopes 0 to 4 percent.
Laxal:				
LmA, LRB	Slight	Slight	Slight	Moderate: few small pebbles on surface.
LnA	Severe: may flood during season of use.	Slight	Moderate: may flood during season of use.	Moderate: may flood during season of use.
LS Rock outcrop part of LS is too variable to be rated.	Slight	Slight	Slight	Moderate where slope is 2 to 6 percent. Severe where slope is more than 6 percent.
Lyda: LTC	Moderate: percs slowly; many small pebbles on surface.	Moderate: many small pebbles on surface.	Moderate: dusty when dry; many small pebbles on surface.	Severe: many small pebbles on surface; less than 20 inches deep; slopes of as much as 8 percent.
Maggie: MA For Pintwater and Bluewing parts of MA, see Pintwater and Bluewing series, respectively.	Moderate: percs slowly; very gravelly surface.	Moderate: very gravelly surface.	Moderate: very gravelly surface.	Severe: very gravelly surface; less than 20 inches deep; slopes of as much as 8 percent.

TABLE 10.—*Limitations of the soils for recreational development*—Continued

Soil series and map symbol	Camp areas	Paths and trails	Picnic areas	Playgrounds
Malpais: MB Rock outcrop part of MB is too variable to be rated.	Severe: slope	Severe: slope	Severe: slope	Severe: slope.
Mazuma: McA, McA3, MdA, MeB, Mf	Moderate: dusty	Moderate: dusty	Moderate: dusty	Moderate: dusty.
McCann Mapped only in association with Timblin soils.	Severe: slope; large stones.	Severe: large stones; slopes as much as 50 percent in places.	Severe: slope; large stones.	Severe: slope.
Mina Mapped only in association with Basket, Old Camp, and Vinini soils.	Severe: slope; large stones.	Severe: slope; large stones.	Severe: slope; large stones.	Severe: slope; large stones.
Mine dumps: MG. Too variable to be rated.				
Monte Cristo: MO Playas part of MO is too variable to be rated.	Moderate: percs slowly; dusty when dry.	Moderate: dusty when dry.	Moderate: dusty when dry.	Severe: less than 20 inches deep.
Nevoyer Mapped only in association with Vinini soils.	Severe: slope; very stony surface.	Severe: very stony surface; slopes as much as 50 percent in places.	Severe: slope; very stony surface.	Severe: slope; very stony surface; less than 20 inches deep.
Noyson: No Np	Severe: too sandy Moderate: dusty	Severe: too sandy Moderate: dusty	Severe: too sandy Moderate: dusty	Severe: too sandy. Moderate: dusty.
Nyserva: Ny For Tipperary part of Ny, see Tipperary series.	Moderate: percs slowly; dusty when dry.	Moderate: dusty when dry.	Moderate: dusty when dry.	Moderate: dusty when dry; percs slowly.
Old Camp: OA, OB, OC, OD For Mina part of OA, Osobb part of OB, and Pintwater part of OC, see Mina, Osobb, and Pintwater series, respectively. Rock outcrop part of OD is too variable to be rated.	Severe: slope	Severe: slope	Severe: slope	Severe: slope; less than 20 inches.
Orizaba: Oe Of, Os, Oh	Moderate: percs slowly; dusty when dry. Severe: wet	Moderate: dusty when dry. Moderate: occasional flooding; dusty; wet.	Moderate: dusty when dry. Moderate: occasional flooding; dusty; wet.	Moderate: percs slowly; dusty when dry. Severe: occasional flooding; wet.
Orovada: OmA, OpB OnA	Severe: coarse fragments on surface; dusty. Moderate: dusty	Severe: coarse fragments on surface; dusty. Moderate: dusty	Severe: coarse fragments on surface; dusty. Slight	Severe: coarse fragments on surface; dusty. Moderate: dusty.
Orphant: OR OS For Bluewing part of OS, see Bluewing series.	Moderate: dusty Severe: coarse fragments on surface.	Moderate: dusty Severe: coarse fragments on surface.	Moderate: dusty Severe: coarse fragments on surface.	Severe: less than 20 inches deep; dusty. Severe: coarse fragments on surface; less than 20 inches deep.
Osobb: OT For Gabbs part of OT, see Gabbs series.	Moderate if slope is 4 to 15 percent; dusty. Severe if slope is more than 15 percent.	Moderate if slope is 4 to 15 percent; dusty. Severe if slope is more than 15 percent.	Moderate if slope is 4 to 15 percent; dusty. Severe if slope is more than 15 percent.	Severe: less than 20 inches deep; slopes as much as 30 percent in places.

TABLE 10.—*Limitations of the soils for recreational development*—Continued

Soil series and map symbol	Camp areas	Paths and trails	Picnic areas	Playgrounds
Parran: PA	Severe: percs slowly.	Moderate: wet	Moderate: wet	Severe: percs slowly; wet.
Penelas variant: PD	Severe: slope	Moderate if slope is 15 to 25 percent. Severe if slope is more than 25 percent.	Severe: slope	Severe: slope; less than 20 inches deep; coarse fragments on surface.
Penelas:				
PE, PG. For Kyler part of PE, see Kyler series. Rock outcrop part of PG is too variable to be rated.	Severe: coarse fragments on surface; slopes as much as 30 percent in places.	Severe: coarse fragments on surface; slopes as much as 30 percent in places.	Severe: coarse fragments on surface; slopes as much as 30 percent in places.	Severe: slope; coarse fragments on surface.
PF. For Laxal part of PF, see Laxal series.	Moderate: dusty when dry.	Moderate: dusty when dry.	Moderate: dusty when dry.	Moderate: dusty when dry; slopes mostly less than 6 percent.
Pintwater: PH, PK, PM. For Bluewing part of PH, see Bluewing series. Rock outcrop parts of PK and PM are too variable to be rated.	Severe: coarse fragments and stones on surface; slopes as much as 50 percent in places.	Severe: coarse fragments and stones on surface; slopes as much as 50 percent in places.	Severe: coarse fragments and stones on surface; slopes as much as 50 percent in places.	Severe: less than 20 inches deep; slopes mostly more than 6 percent; coarse fragments and stones on surface.
Playas: PN, PO. Too variable to be rated. For Parran part of PO, see Parran series.				
Pumel: PR. Rock outcrop part of PR is too variable to be rated.	Moderate: dusty when dry; slopes as much as 15 percent in places.	Moderate: dusty when dry.	Moderate: dusty when dry; slopes as much as 15 percent in places.	Moderate if slope is 2 to 6 percent; dusty when dry. Severe if slope is more than 6 percent.
Quima: QrA, QsB	Slight	Slight	Slight	Slight.
Rock outcrop. Too variable to be rated.				
Roic: RO. For Dobel part of RO, see Dobel series.	Moderate: coarse fragments on surface; slopes as much as 15 percent in places.	Moderate: coarse fragments on surface.	Moderate: coarse fragments on surface; slopes as much as 15 percent in places.	Severe: coarse fragments on surface; slopes as much as 15 percent in places.
Settlemeyer:				
Sb	Moderate: percs slowly.	Slight	Slight	Moderate: percs slowly.
Se, SF. For Yobe part of SF, see Yobe series.	Moderate: percs slowly; wet; water table at a depth of 2 to 3½ feet.	Moderate: wet; water table at a depth of 2 to 3½ feet.	Moderate: wet; water table at a depth of 2 to 3½ feet.	Moderate: percs slowly; wet; water table at a depth of 2 to 3½ feet.
Silverbow: SH. Rock outcrop part of SH is too variable to be rated.	Severe: coarse fragments and stones on surface; slopes as much as 50 percent in places.	Severe: coarse fragments and stones on surface; slopes as much as 50 percent in places.	Severe: coarse fragments and stones on surface; slopes as much as 50 percent in places.	Severe: slope; coarse fragments and stones on surface; less than 20 inches deep.
Slickens: SK. Too variable to be rated.				
Spanel: SP	Moderate: percs slowly; dusty when dry.	Moderate: dusty when dry.	Moderate: dusty when dry.	Moderate: percs slowly; dusty when dry; less than 20 inches deep.

TABLE 10.—*Limitations of the soils for recreational development*—Continued

Soil series and map symbol	Camp areas	Paths and trails	Picnic areas	Playgrounds
Stargo: Sr	Moderate: dusty when dry.	Moderate: dusty when dry.	Moderate: dusty when dry.	Moderate: dusty when dry.
Ss	Severe: floods at times during season of use.	Moderate: dusty when dry; floods at times during season of use.	Moderate: dusty when dry; floods at times during season of use.	Severe: floods at times during season of use.
Stumble: STC	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.
SuA	Moderate: dusty when dry.	Moderate: dusty when dry.	Moderate: dusty when dry.	Moderate: dusty when dry.
Sundown: Sw	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.
Timblin: TC For McCann part of TC, see McCann series.	Severe: very cobbly surface.	Severe: very cobbly surface.	Severe: very cobbly surface.	Severe: slopes mostly more than 6 percent; very cobbly surface.
Timper: TdA	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.
TEB, TF Playas part of TF is too variable to be rated.	Moderate: dusty when dry.	Moderate: dusty when dry.	Moderate: dusty when dry.	Moderate: dusty when dry.
Tipperary: TGE, TH, TM For Fivemile part of TH, see Fivemile series. Playas part of TM is too variable to be rated.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.
Tomel: TN For Laxal part of TN, see Laxal series.	Severe: coarse fragments on surface.	Severe: coarse fragments on surface.	Severe: coarse fragments on surface.	Severe: coarse fragments on surface; less than 20 inches deep.
Tybo: TOB, TR, TS For Bluewing part of TR and Stumble part of TS, see Bluewing and Stumble series, respectively.	Moderate: dusty when dry.	Moderate: dusty when dry.	Moderate: dusty when dry.	Severe: less than 20 inches deep.
Umberland: UM, UN For Parran part of UN, see Parran series.	Severe: percs slowly.	Moderate: too clayey; dusty when dry.	Moderate: too clayey; dusty when dry.	Severe: percs slowly.
UR For Tipperary part of UR, see Tipperary series. Playas part of UR is too variable to be rated.	Severe: too sandy; percs slowly.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy; percs slowly.
Unsel: UT For Bluewing part of UT, see Bluewing series.	Slight	Slight	Slight	Moderate: slopes mostly less than 6 percent.
Vigus: VGC, VK For Koyen part of VK, see Koyen series.	Moderate: percs slowly; dusty when dry.	Slight	Slight	Moderate: percs slowly, slopes mostly less than 6 percent; dusty when dry.
Vinini: VM, VN For Mina part of VM and Nevoyer part of VN, see Mina and Nevoyer series, respectively.	Severe: stones on surface; slopes as much as 30 percent in places.	Severe: stones on surface; slopes as much as 30 percent in places.	Severe: stones on surface; slopes as much as 30 percent in places.	Severe: less than 20 inches deep; slope; stones on surface.
Wardenot: WA	Moderate: dusty when dry.	Moderate: dusty when dry.	Moderate: dusty when dry.	Moderate: gravelly surface; dusty when dry.
Wrango: WBB	Moderate: dusty when dry.	Slight	Moderate: dusty when dry.	Moderate: dusty when dry.

TABLE 10.—*Limitations of the soils for recreational development*—Continued

Soil series and map symbol	Camp areas	Paths and trails	Picnic areas	Playgrounds
Wrango—(Continued) WDC	Severe: coarse fragments and stones on surface.	Severe: coarse fragments and stones on surface.	Severe: coarse fragments and stones on surface.	Severe: coarse fragments and stones on surface.
Yobe: YB, YC, YD. For Tipperary part of YC and Umberland part of YD, see Tipperary and Umberland series, respectively.	Moderate: percs slowly; dusty when dry.	Moderate: dusty when dry.	Moderate: dusty when dry.	Moderate: percs slowly; dusty when dry.
Yomba:				
Y_m, YO. Playas part of YO is too variable to be rated.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.
Y_n	Moderate: occasional flooding; dusty when dry.	Slight	Moderate: occasional flooding; dusty when dry.	Moderate: occasional flooding; dusty when dry.
Youngston:				
Y_p, Y_s	Moderate: percs slowly; occasional flooding.	Moderate: occasional flooding.	Moderate: occasional flooding.	Moderate: percs slowly; occasional flooding.
Y_r	Moderate: percs slowly; dusty when dry.	Moderate: dusty when dry.	Moderate: dusty when dry.	Moderate: percs slowly; dusty when dry.
Zaba: ZN	Severe: coarse fragments on surface.	Severe: coarse fragments on surface.	Severe: coarse fragments on surface.	Severe: coarse fragments on surface.

fair to luxuriant plant growth in most years. It is thought to be formed mainly by underground accumulation of organic residue in the presence of bivalent cations such as calcium. This horizon ranges from 7 to about 20 inches in thickness.

Other diagnostic horizons in the soils in the survey area are albic, cambic, argillic, and natric horizons.

The albic horizon is an eluvial surface or subsurface horizon that developed as a result of leaching of organic matter and silicate clays or soluble silica, or both. In the survey area it is light colored, generally 1 to 2 inches thick, and when moist is characteristically dull gray.

The cambic horizon is an altered subsurface horizon that is immediately below one of the diagnostic epipedons. Its base is generally at least 10 inches below the surface. However, a cambic horizon is at the surface of some truncated soils. Fine stratification of alluvial deposits has been destroyed and the horizon has been leached of lime to some extent. A cambic horizon may have a few clay films but not enough clay illuviation to qualify as an argillic horizon. It occurs in relatively young soils.

The argillic horizon is a subsoil horizon that developed as a result of illuviation of silicate clay minerals. It is in soils that have been in place for at least a few thousand years and that do not have the pronounced disturbance caused by shrinking and swelling, frost heaving, and plants and animals.

The natric horizon is a special kind of argillic horizon that contains more than 15 percent exchangeable sodium in some part and generally has columnar or prismatic structure. It may develop in comparatively young soils that have critical amounts of sodium. Sodium tends to disperse soil particles, thus facilitating the translocation of clay from the surface layer into the subsoil or within the subsoil. Continued leaching removes some of the exchangeable sodium, so the soil colloids flocculate. Natric horizons probably develop at a more rapid rate in soils that have large amounts of sodium than in the argillic horizon of soils that do not have appreciable amounts of sodium.

Cementing by silica and calcium carbonate is common in many of the soils in the survey area. Cementing by silica occurs in areas where the soil is seasonally dry, volcanism is prominent, and parent materials are rich in pyroclastic material, which is volcanic ash that fell from local cones or from craters many miles away. Silica-cemented material is in two forms, durinodes and duripans, and grades from one to the other and to noncemented earthy materials. A durinode is a weakly cemented to indurated nodule. It is firm or very firm, brittle when wet, discontinuous, and ranges upward in size from about 1 centimeter. A duripan is platy or massive, continuous, and weakly cemented to indurated. The plates are roughly 1 to 15 centimeters thick. A duripan has very firm or extremely firm consistence when moist and is brittle when wet. The surface of a duripan commonly has thin opal coatings, and coatings or pendants are on the undersides of coarse fragments in many of the soils. Cemented areas are generally in the substratum, but where precipitation is very limited, they may be in the lower part of the subsoil.

A salic horizon is a subsurface horizon that contains more than 2 percent salts and is at least 15 centimeters thick. It is in soils that have a water table, and the net water movement is upward. It generally has granular structure immediately below a surface crust.

Calcium carbonate may be in the surface layer because of recent deposits of calcareous dust or in the subsoil or substratum because of incomplete leaching. It is either disseminated or is soft concretions, pendants on the undersides of coarse fragments, or with silica as a cementing agent in durinodes and duripans.

Nearly all of the soils in the survey area have one or more genetic horizons. The exceptions are soils formed in recent eolian, alluvial, or colluvial materials. Horizon differentiation, the forming of pedogenic horizons, is caused by the physical and chemical weathering of the parent material, translocation and accumulation of weathered products, chemical changes, and erosion. The evidence for each soil-forming process varies because the soil-forming factors influence one another. The soil-forming factors vary in intensity from one landform to another and from one elevation to another. Factors that determine the characteristics of any soil (a set of genetically developed horizons) are determined by the interaction of five environmental forces: parent material, relief and drainage, climate, biological forces, and time. Man has influenced the characteristics of some soils in many ways, such as by fertilizing, leveling, compacting, and plowing. Sedimentation has also determined the characteristics of some of the soils.

Parent material

The parent materials for the soils in the survey area were derived mainly from volcanic rocks and related clastic and alluvial materials. Other sources of parent material include shale, limestone, and granite.

The volcanic rocks of the Toiyabe and Toquima Ranges are dominantly Tertiary basalt and rhyolite. Pliocene quartz-latite of the Toiyabe Formation crops out extensively in the higher elevations of the Toiyabe Range. The Palmetto Formation of the Ordovician Period consists of dark slate, chert, and minor amounts of interbedded quartzite and limestone in the upper part and dark slate, in part schistose, and dark limestone in the lower part. It is extensive south of Manhattan Canyon, south of Broad Creek to Jett Canyon, and from Pablo Canyon to Antelope Canyon. The Pliocene Oddie Formation consists of rhyolite and quartz-latite and extends from near Mariposa Canyon to near Manhattan. Outcrops of granitic and porphyritic rocks are extensive from Bowman's Ranch south to near Summit Canyon, from Ophir Canyon to north of Twin River Canyon, and from Jefferson Canyon to near Mariposa Canyon. Tuff and rhyolite are extensive between Peavine Canyon and Cottonwood Canyon.

The San Antonio Mountains are dominantly Tertiary basalt and rhyolite but include considerable clastic material and a variety of lithological units. There are other lithologies, but they have little effect on soil genesis and morphology.

The volcanic rocks and related clastic materials and volcanic ash, glass, and tuff weather rapidly because they are fine grained and contain relatively large amounts of weatherable minerals. Weathering of these materials produces soluble silica. Therefore, soils formed mainly from these materials have high base saturation, dominantly montmorillonitic clays, and significant amounts of silica for cementation of durinodes or duripans. The complexity of parent rocks as a factor in soil genesis is compounded by additions of volcanic ash and eolian materials, including carbonates.

Soils formed in material weathered from volcanic rocks are in the Lyda, Timblin, Dobel, Unsel, Vigus, and Ardivey series. These soils have ochric epipedons, argillic horizons, and a duripan or durinodes in a subsurface horizon.

Shale weathers almost directly to silt-size particles. Therefore, the fine-earth fraction of the soil is dominantly silty and has silt loam or silty clay loam textures. The silt particles have low cohesive forces and low stability, and they have eroded at about the same rate as the shale. This results in shallow soils. The shale has variable hardness, and all of it does not weather at the same rate. Weathering has also proceeded faster along fracture planes, crevices, and cracks in the bedrock. The fractures have resulted in large amounts of shale fragments of gravel size and larger in the soil. Penelas soils formed in material weathered from shale. Weathered volcanic ash that settled on shale facilitated the development of the silica-cemented hardpan in the Penelas variant.

The parent material of Tomel and Laxal soils was very gravelly alluvium derived mainly from shale and a mixture of other rocks and volcanic ash. Pedogenic processes produced an ochric epipedon, an argillic horizon, and a duripan in Tomel soils. Laxal soils have an ochric epipedon and weak, discontinuous cementing of the gravel. The silica that cements the gravel was derived mainly from tuff in the parent material.

Kyler soils formed in materials weathered from limestone. These soils have only an ochric epipedon. Calcium carbonate effectively inhibits the movement of clay through a part of the soil profile by keeping the soil colloids flocculated.

The calcium carbonate in the lower part of the argillic horizon in the Vinini soils is derived from the weathering and leaching of fragments of a lime-silica cemented hardpan and dust. The weathering and leaching processes have moved the calcium carbonate from the surface into the lower subsurface layers and into the lower part of the argillic horizon. This redistribution of calcium carbonate is believed to have taken place after the argillic horizon and duripan were formed.

Alluvium derived from granitic and prophyritic rocks was the parent material of Lathrop and Quima soils. The weathered products of these rocks include coarse-sand-sized particles and mica in large amounts. Lathrop soils are characterized by an ochric epipedon; an argillic horizon; and discontinuous, weakly cemented laminae in the substratum.

Ancient Lake Toiyabe covered Big Smoky Valley during stages of the Pleistocene. The lacustrine sediments and erosional products are high in silt, calcium

carbonate, and soluble salts and were the parent materials for most of the wet soils in the survey area. Deposits of ash add to the complexity of the parent materials. Gravel bars of relic short lines were the parent materials for Zaba soils.

Umberland, Parran, Yobe, Nyserva, and Caudle soils formed in lacustrine sediments and associated detritus. Umberland soils have a substratum of silty clay loam, and Parran soils have a substratum of clay. Yobe soils have a substrata of mainly silty clay loam and silt loam. Nyserva and Caudle soils have a substratum of loam and clay loam, respectively, and both have strata of gravel. Nyserva and Caudle soils have argillic horizons and durinodes in the substratum.

Lahontan, Orizaba, and Charnock soils formed in lake-laid materials and some interstratified alluvium. The soils are clayey and loamy and have some sand and gravel strata. Lahontan soils have a clayey subsoil and substratum. Orizaba soils have a silty clay loam subsoil and a loam and sand substratum. Charnock soils have a loam subsoil and substratum and have durinodes in the substratum.

Roic soils formed in partly consolidated lacustrine sediments. The soils are thin because they were eroded at about the same rate as they formed. Plant roots and moisture are unable to penetrate this sediment. The soils have an ochric epipedon as the primary evidence of soil genesis.

Soils in outwash plains in the southern part of Big Smoky Valley formed in material derived mainly from the volcanic rocks of the Toiyabe, Toquima, and San Antonio Mountains. The soils in this part of the survey area have a high content of basaltic and rhyolitic gravel and are mostly moderately coarse textured. Major soils which formed on landscapes in this part of the Area include Timper, Koyen, Yomba, Youngston, and Domez soils. Timper soils formed in moderately coarse textured materials and have a cambic horizon. Yomba soils formed in moderately coarse textured materials and have weak cementation in the subsoil. The finer textured Youngston and Domez soils formed in recent deposits on flood plains.

Relief

The influence of relief upon soil formation is related to its effect upon drainage, runoff, geologic and accelerated erosion, direction of slope, and slope gradient. The soils of the survey area are well drained to excessively drained except for the soils peripheral to the large playa in the northern part, and a small area near the San Antonio and Peavine Ranches. These areas are somewhat poorly drained and poorly drained.

The survey area has four distinct geomorphic features. They are mountains and foothills, alluvial fans, valley plains, and playas. The mountains rise abruptly from the valley floor and have steep to very steep sides. Plateaus of the San Antonio Mountains are topped with rimrock and many rock outcrops. The foothills and lower lying uplands are rounded and have short sides. The mountains and foothills were formed by fault-block uplifts and subsequent volcanism, all of which may have been tilted. Alluvial fans are irregularly shaped cones built up by sediment derived from the uplands during erosion cycles. They flank mountains and foothills and debouch upon basins and flood plains. They are steepest near the mountains and become smooth and nearly level at their lowest elevations. The valley plain is a structural valley partially filled with many feet of alluvium eroded from the Toiyabe, Toquima and San Antonio Mountains.

The large playa in the northern part of the survey area formed as the result of the dessication of Pleistocene Lake Toiyabe. Playas are enclosed basins (internally drained) that are somewhat poorly drained and poorly drained. Sand dunes have been stabilized along the margins of the playa in the southern part of the survey area, and clay dunes, which are formed by detachment of aggregates of clay blown into coppice mounds 2 to about 7 feet high, are in the northern part. A few springs are near the periphery of the playa. Some of the spring water is hot and has formed thenardite (a sodium sulfate mineral) and travertine (a calcium carbonate mineral). The cold-water springs have formed small mounds of organic matter about 4 feet high.

Most of the soils near the playa are greatly influenced by the restricted drainage in that area. When the ancient lake was dessicated, the sediments became saline-alkali. Because of the lack of a drainage outlet, the drainage has changed little and the soils have shown little development.

Wave-built terraces or offshore bars have cut the large playa into four lesser bodies. One bar is near the northern survey boundary, one is west of Northumberland Canyon, and another is west of Moores Creek. Parran, Umberland, and Yobe soils formed in the periphery of the large center portion of the playa and in the two smaller northern parts. Zaba soils formed in the very gravelly offshore bars. Lahontan, Orizaba, and Charnock soils formed near the southern part and have been influenced by alluvium interstratified with lacustrine materials.

Parran soils have a salic horizon because the net water movement has been upward and the salts have been concentrated near the surface. Parran, Umberland, and Yobe soils are strongly saline-alkali mostly because of the lack of a drainage outlet.

Soil colors are strongly influenced by iron in the soil, although colors of the soil matrix and mottles can be masked by large quantities of calcium carbonate. In soils containing large amounts of organic matter and water, iron is reduced to the ferrous oxide form that is soluble and that may be translocated by percolating water. Ferric oxide is along root channels and cracks. It is reddish, and it mottles the soil where it has precipitated. Ferric oxide mottling generally occurs in soils with a fluctuating water table and consequently a variable content of oxygen.

The oxidation state of iron materially affects the color of soils. Chromas of less than 2; neutral colors; or hues of 2.5Y or 5Y, or both suggest a reducing environment and the presence of ferrous iron. The Orizaba, Parran, Charnock, and Umberland soils have mottling resulting from wetness. Mottles in the wet Yobe soils have been obscured by the high content of calcium carbonate.

The soils on alluvial fans and aprons are well drained to excessively drained and are generally free from harmful salts in the upper parts of their profiles. The upper parts of the alluvial fans are generally gently sloping to moderately sloping and deeply dissected by many dry washes. As the slope gradient lessens, the dissection becomes less and the alluvial fans grade into secondary alluvial toeslopes or aprons. Some of the higher alluvial fans have been truncated and are severely dissected by many intermittent streams. Ardivey, Dobel, Vigus, and Koyen soils are typical of soils on the alluvial fans. South of the San Antonio Ranch is a large area of sandy soils and large sand dunes on alluvial fans. Stumble soils are dominant in this area. The alluvial fans are generally smooth and have few drainageways.

The soils on valley plains are well drained and nearly level. Moderately coarse textured soils are dominant. Timper and Yomba soils are the major soils. Fivemile and Youngston soils formed in the narrow flood plains.

When erosion rates are about the same as the rate of soil development, the soils are relatively stable. Old Camp soils are examples of stable soils. They have bedrock at a shallow depth and have developed an argillic horizon. The Pintwater soils have developed only an ochric epipedon because erosion removes material rapidly, thus limiting the stability necessary for the development of subsurface horizons. Pebbles, cobbles, and stones all tend to reduce erosion rates. Erosion of McCann and Mina soils is low because of the stones on the surface.

Climate

Climate affects soil formation through its influence on the kinds and amount of animal life, plant growth, weathering, leaching, runoff, and erosion. The nature of the precipitation determines its effectiveness on plant growth, depth of wetting, and as an agent of erosion. Wind is a drying agent, and soil blowing is a very great hazard in this arid region. Precipitation affects the rate of weathering because water is the medium in which chemical reactions take place and is the main source of hydrogen, the principal agent of weathering.

In areas of low rainfall, soil forming processes are accelerated by high temperatures and are slowed by scant precipitation. Because limited precipitation does not remove the water-soluble products from the soil entirely, such products accumulate in the soil. The soluble products of weathering precipitate near the surface, and the pedogenic processes are slowed down or stopped. The kinds and amounts of plants are controlled to some extent by the amount of precipitation. Therefore, precipitation influences the kinds and amounts of organic matter, the intensity of weathering, and the translocation of weathered products.

The soils of the alluvial fans and valley plains have very low organic matter content because the amount of precipitation is low and the oxidation rate is high. Typical of soils that have low organic matter content are Koyen and Timper soils. Somewhat poorly drained and poorly drained soils have higher organic matter content because most of their moisture for growth comes from gound water, the soil is cooler, and the oxidation rate is lower. The Settlemeyer soils have a relatively high content of organic matter.

Soils in arid parts of the survey area where precipitation is 4 to 6 inches annually have thin A horizons, and the accumulation of carbonates and silica cementation is generally less than 15 inches below the surface. Typical of these soils are Timper and Koyen soils. Timber soils have a shallow hardpan, and Koyen soils have carbonate accumulations about 14 inches below the surface.

In areas where the precipitation is 8 to 14 inches, the additional precipitation has resulted in more vigorous plant growth, deeper leaching, and increased pedogenic processes. The epipedons are thicker, the development of cambic horizons or argillic horizons is more pronounced, and thicker zones that have strong cementation are apparent. Stone heaving by shrink-swell and frost action become more evident in the areas of higher precipitation and lower soil temperatures.

Climate, mainly high intensity summer storms, has caused severe erosion throughout the survey area. These storms have eroded soils, deepened channels, and exposed bedrock. Some areas of Vinini, McCann, Mina, Timblin, and Mazuma soils have been severely eroded.

Wind has eroded sandy soils and created sand dunes at various locations throughout the survey area. It has also transported and deposited clay as dunes on playas in the northern part. Coppice dunes of fine sand have been deposited around the bases of most plants in arid parts of the Area. Deflation of the surface fine-earth fraction of some of the older soils which have gravelly parent materials has resulted in a concentration of gravel on the surface.

Biological forces

Biological forces affect soil formation through the combined influences of plants and animals. Plants have affected soil formation in the survey area more than micro-organisms have. Vegetation in arid parts of the survey area is desert shrubs and ephemeral grasses. The vegetation surrounding the large playa is halophytic. In low foothills it is dominantly low sagebrush and some pinyon and juniper trees at higher elevations.

Typical soils of the arid parts of the survey area are well drained to excessively drained and are dry for long periods. The plant cover is less than 5 percent. This vegetation adds little organic matter to the soil, gives scant protection from erosion or soil blowing, and provides little shade; thus, the soils are low in organic matter and are poor habitats for microorganisms. Organic matter in the upper part of the epipedon is rapidly oxidized during long periods of heat and sunshine, but it accumulates to some extent in the underlying horizon insulated by the surface layer. Koyen and Timper soils typify soils that have characteristics developed under sparse plant cover. In these soils the upper part of the epipedon has less organic matter than the lower part, and the soil surfaces are light colored, generally massive, and slightly hard.

Plant density is generally low in the area around

the large playa in the northern part of the survey area because the soils are salty and tend to crust; this inhibits the growth of seedlings. The water table is within the root zone of most plants, but the salt tends to reduce the growth. The salty Umberland and Yobe soils have sparse vegetation.

The Settlemeyer soils have lush, water-tolerant vegetation that obtains its moisture for growth from ground water. The plants cover 10 to 20 percent of the surface and have added large quantities of organic matter to the soil. These soils provide a good habitat for micro-organisms. The soil surface is dark colored because of the accumulation of organic matter. The saline-alkali Lahontan and Orizaba soils have less organic matter than Settlemeyer soils but more than Umberland and Yobe soils. The salt and alkali have not inhibited the growth of plants in these soils as severely as they did in Umberland and Yobe soils. Lahontan and Orizaba soils have a crusty surface and a dense subsoil.

Increases in the amount of precipitation as elevation increases has resulted in an increased variety and amount of plant cover. This is reflected by the higher amounts of organic matter and darker colors of the surface horizons.

Time

Time is required for pedogenic processes to transform parent rock and alluvium into parent material and then into soil. The longer a soil is in place, the more pronounced are the profile characteristics.

The soils of the Big Smoky Valley Area vary considerably in age. The time required for a soil to form varies as other soil forming factors vary. Soil begins to form in parent material when the land surface has become relatively stable. Soils that are shallow to bedrock begin forming after the parent rock weathers to permeable material. Generally, the age or maturity of a soil is indicated by the thickness and distinctness of soil horizons which have developed.

In general, sandy dune areas, playas, flood plains, and presently aggrading alluvial fans are the most recent parent materials. Some materials recently exposed to weathering by erosion are in the uplands. Soils on these recent surfaces have little or no profile development other than an A horizon in places. Tipperary soils in dune areas, Bluewing and Stumble soils on alluvial fans, Fivemile and Youngston soils on flood plains, and Pintwater soils on upland slopes are examples of some of the most recent soils.

Soil formation on geomorphic surfaces which have been relatively stable since the close of the Pleistocene is believed to be minimal in the survey area. The formation of A horizons, leaching and accumulation of salts and lime, development of cambic subsurface horizons, and weak cementation of subsurface horizons with silica are major characteristics which tend to differentiate these soils. Broyles, Koyen, Orovada, and Timper soils formed on surfaces which have been relatively stable since the close of the Pleistocene about 11,000 years ago.

Some soils formed on Holocene surfaces in materials that have high exchangeable sodium have weak argillic horizons in addition to some of the characteristics mentioned above. Monte Cristo soils are an example.

Soils that have an A horizon and distinct argillic horizons which may or may not overlie a duripan, formed over a long period of time on surfaces which have been stable since perhaps the late and middle Pleistocene. These soils are for the most part on old alluvial fans and relic upland surfaces. The ages of these old surfaces and their associated soils are difficult to ascertain because of the complexity of erosion and sedimentation which occurred during pluvial and interpluvial stages of the Pleistocene.

Some of the oldest soils in the survey area are on alluvial fans that have distinctly convex slopes and relic drainage patterns. Subsequent drainage channels, believed to be late Pleistocene, incise these old alluvial fan surfaces. Lathrop, Lyda, Timblin, and Vinini soils formed in these later surfaces, and they extend across the relic drainageways. These soils are probably some of the oldest soils in the Area.

Soils of intermediate age formed on surfaces that have been stable since late Pleistocene. These surfaces are mostly on alluvial fans that have neither relic drainage patterns nor distinct convex slopes. If relic drainage patterns are present, the soils associated with these surfaces have not formed across the channels. Dobel soils, which have a thin argillic horizon and a weakly cemented duripan, are an example of soils formed on surfaces of intermediate age.

Classification

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 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 woodland; 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.

The system of soil classification currently used was adopted by the National Cooperative Soil Survey in 1965 (*8*). Because this system is under continual study, readers interested in developments of the current system should search the latest literature available.

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 are observable and measurable. The properties are chosen, however, so that the soils of similar genesis, or mode of origin, are grouped. In table 11, the soils of Big Smoky Valley Area are placed in four categories of the cur-

TABLE 11.—*Classification*

Series	Family	Subgroup	Order
Ardivey	Loamy-skeletal, mixed, mesic	Duric Haplargids	Aridisols.
Basket	Loamy-skeletal, mixed, frigid	Xerollic Haplargids	Aridisols.
Belcher	Loamy, mixed, mesic, shallow	Entic Durorthids	Aridisols.
Belted	Loamy, mixed, mesic, shallow	Haplic Durargids	Aridisols.
Bluewing	Sandy-skeletal, mixed, mesic	Typic Torriorthents	Entisols.
Broe	Sandy, mixed, mesic	Duric Camborthids	Aridisols.
Broyles	Coarse-loamy, mixed, mesic	Duric Camborthids	Aridisols.
Caudle	Fine-loamy, mixed, mesic	Duric Haplargids	Aridisols.
Charnock	Fine-loamy, mixed (calcareous), mesic	Aeric Halaquepts	Inceptisols.
Deerlodge variant	Loamy-skeletal, mixed, mesic	Xerollic Durargids	Aridisols.
Dobel	Loamy, mixed, mesic, shallow	Haplic Durargids	Aridisols.
Domez	Fine-loamy, mixed (calcareous), mesic	Durorthidic Torriorthents	Entisols.
Fivemile	Fine-silty, mixed (calcareous), mesic	Typic Torrifluvents	Entisols.
Gabbs	Loamy-skeletal, mixed, mesic	Typic Durorthids	Aridisols.
Griffy	Fine-loamy, mixed, mesic	Typic Haplargids	Aridisols.
Jolan	Coarse-loamy, mixed, mesic	Typic Durorthids	Aridisols.
Koyen	Coarse-loamy, mixed, mesic	Typic Camborthids	Aridisols.
Kyler	Loamy-skeletal, carbonatic, mesic	Lithic Xeric Torriorthents	Entisols.
Lahontan	Fine, montmorillonitic (calcareous), mesic	Aquic Xerofluvents	Entisols.
Lathrop	Fine-loamy over sandy or sandy-skeletal, mixed, mesic	Duric Haplargids	Aridisols.
Laxal	Loamy-skeletal, mixed (calcareous), mesic	Durorthidic Torriorthents	Entisols.
Lyda	Loamy-skeletal, mixed, mesic, shallow	Typic Durargids	Aridisols.
McCann	Loamy-skeletal, mixed, frigid	Aridic Duric Haploxerolls	Mollisols.
Maggie	Loamy-skeletal, mixed, mesic, shallow	Typic Durargids	Aridisols.
Malpais	Loamy-skeletal, mixed, mesic	Typic Camborthids	Aridisols.
Mazuma	Coarse-loamy, mixed (calcareous), mesic	Typic Torriorthents	Entisols.
Mina	Loamy-skeletal, mixed, mesic	Durixerollic Camborthids	Aridisols.
Monte Cristo	Loamy, mixed, mesic, shallow	Haplic Nadurargids	Aridisols.
Nevoyer	Loamy, mixed, mesic, shallow	Xerollic Durorthids	Aridisols.
Noyson	Coarse-loamy, mixed, mesic	Entic Durorthids	Aridisols.
Nyserva	Fine-loamy, mixed, mesic	Duric Natrargids	Aridisols.
Old Camp	Loamy-skeletal, mixed, mesic	Lithic Xeric Haplargids	Aridisols.
Orizaba	Fine-loamy, mixed (calcareous), mesic	Aeric Halaquepts	Inceptisols.
Orovada	Coarse-loamy, mixed, mesic	Durixerollic Camborthids	Aridisols.
Orphant	Loamy, mixed, mesic, shallow	Haplic Durargids	Aridisols.
Osobb	Loamy-skeletal, mixed, mesic, shallow	Typic Durorthids	Aridisols.
Parran	Fine, montmorillonitic, mesic	Typic Salorthids	Aridisols.
Penelas	Loamy-skeletal, mixed, mesic, shallow	Xerollic Haplargids	Aridisols.
Penelas variant	Loamy-skeletal, mixed, frigid, shallow	Orthidic Durixerolls	Mollisols.
Pintwater	Loamy-skeletal, mixed (calcareous), mesic	Lithic Torriorthents	Entisols.
Pumel	Loamy-skeletal, mixed (calcareous), mesic, shallow	Typic Torriorthents	Entisols.
Quima	Coarse-loamy, mixed, mesic	Typic Camborthids	Aridisols.
Roic	Loamy, mixed (calcareous), mesic, shallow	Typic Torriorthents	Entisols.
Settlemeyer	Fine-loamy, mixed, mesic	Fluvaquentic Haplaquolls	Mollisols.
Silverbow	Loamy-skeletal, mixed, mesic, shallow	Typic Durargids	Aridisols.
Spanel	Loamy, mixed, mesic, shallow	Typic Durargids	Aridisols.
Stargo	Sandy, mixed, mesic	Durorthidic Torrifluvents	Entisols.
Stumble	Mixed, mesic	Typic Torripsamments	Entisols.
Sundown	Mixed, mesic	Typic Torripsamments	Entisols.
Timblin	Fine, montmorillonitic, frigid	Haploxerollic Durargids	Aridisols.
Timper	Loamy, mixed, mesic, shallow	Entic Durorthids	Aridisols.
Tipperary	Mixed, mesic	Typic Torripsamments	Entisols.
Tomel	Loamy-skeletal, mixed, mesic, shallow	Typic Durargids	Aridisols.
Tybo [1]	Loamy, mixed, mesic, shallow	Typic Durorthids	Aridisols.
Umberland	Fine, montmorillonitic (calcareous), mesic	Aquic Torriorthents	Entisols.
Unsel	Fine-loamy, mixed, mesic	Duric Haplargids	Aridisols.
Vigus	Fine-loamy, mixed, mesic	Duric Haplargids	Aridisols.
Vinini	Loamy-skeletal, mixed, frigid, shallow	Xerollic Durargids	Aridisols.
Wardenot	Sandy-skeletal, mixed, mesic	Typic Torriorthents	Entisols.
Wrango	Sandy-skeletal, mixed, mesic	Xeric Torriorthents	Entisols.
Yobe	Fine-silty, mixed (calcareous), mesic	Aeric Halaquepts	Inceptisols.
Yomba	Sandy-skeletal, mixed, mesic	Duric Camborthids	Aridisols.
Youngston	Fine-loamy, mixed (calcareous), mesic	Typic Torrifluvents	Entisols.
Zaba	Loamy-skeletal, mixed, mesic	Typic Haplargids	Aridisols.

[1] Parts of soils shown as Tybo are a taxadjunct to the series but the classification is the same as for Tybo series.

rent system. Categories of the current system are briefly defined in the following paragraphs.

ORDER. Ten soil orders are recognized as classes in the system. The properties used to differentiate among soil orders are those that tend to give broad climatic groupings of soils. The two exceptions to this are the Entisols and Histosols, which occur in many different climates.

SUBORDER. Each order is subdivided into suborders that are based mainly on those soil characteristics that seem to produce classes with the greatest genetic similarity. The suborders narrow the broad climatic range permitted in the orders. The soil properties used to separate suborders are mainly those that reflect either the presence or absence of waterlogging, or soil differences resulting from the climate or vegetation.

GREAT GROUP. Soil suborders are separated into great groups on the basis of uniformity in the kinds and sequence of major soil horizons and features. The horizons used to make separations are those in which clay, iron, or humus have accumulated; those that have pans that interfere with growth of roots, movement of water, or both; and thick, dark colored surface horizons. The features used are the self-mulching properties of clay, soil temperature, major differences in chemical composition (mainly calcium, magnesium, sodium, and potassium), dark red and dark brown colors associated with basic rocks, and the like.

SUBGROUP. Great groups are subdivided into subgroups, one representing the central (typic) segment of the group, and the other, called intergrades, that have properties of the group and also one or more properties of another great group, suborder, or order. Subgroups may also be made in those instances where soil properties integrade outside the range of any other great group, suborder, or order.

FAMILY. Soil families are separated within a subgroup mainly on the basis of properties important to the growth of plants or on the behavior of soils when used for engineering. Among the properties considered are texture, mineralogy, reaction, soil temperature, permeability, thickness of horizons, and consistence.

SERIES. The series is a group of soils that have major horizons that, except for texture of the surface layer, are similar in important characteristics and in arrangement in the profile. Soil series are named for a geographic location near the place where the series was first observed and mapped. The series are further explained in the section "How This Survey Was Made."

Literature Cited

(1) American Association of State Highway [and Transportation] Officials. 1970. Standard specifications for highway materials and methods of sampling and testing. Ed. 10, 2 vol., illus.

(2) American Society for Testing and Materials. 1974. Method for classification of soils for engineering purposes. ASTM stand. D 2487–69. *In* 1974 Annual Book of ASTM Standards, Part 19, 464 pp., illus.

(3) Ferguson, H. G. and Cutheart, S. H. 1954. Geology map of the Round Mountain Quadrangle, Nevada. U.S. Geol. Surv.

(4) Kral, Victor. 1951. Mineral resources of Nye County, Nevada. Serv. 50, Univ. Nev. Bull., vol. 45, no. 3.

(5) Meizner, Oscar E. 1917. Geology and water resources of Big Smoky, Clayton, and Alkali Spring Valleys, Nevada. U.S. Geol. Surv. Water Supply Pap. 423, 167 pp., illus.

(6) Rush, F. E. and Schroer, C. V. 1951. Water resources of Big Smoky Valley, Lander, Nye, and Esmeralda Counties, Nevada. Water Resour. Bull. 41.

(7) United States Department of Agriculture. 1951. Soil survey manual. U.S. Dep. Agric. Handb. 18, 503 pp., illus. [Supplements replacing pp. 173–188 issued May 1962]

(8) United States Department of Agriculture. 1975. Soil Taxonomy: a basic system of soil classification for making and interpreting soil surveys. Soil Conserv. Serv. U.S. Dep. Agric. Handb. 436, 754 pp., illus.

(9) United States Department of Agriculture. 1972. National engineering handbook, sec. 4, hydrology, illus.

(10) United States Department of Agriculture. 1971. Estimated yields by soil irrigation subclass. Cent. Nev. Resour. Conserv. and Dev. Proj. File, Soil Conserv. Serv.

(11) United States Department of Commerce. 1970. Climatography of the United States. No. 20–26. Climatol. Summ., NOAA Environ. Data Serv.

Glossary

Alkali soil. Generally, a highly alkaline soil. Specifically, an alkali soil has so high a degree of alkalinity (pH 8.5 or higher) or so high a percentage of exchangeable sodium (15 percent or more of the total exchangeable bases), or both, that the growth of most crop plants is low from this cause.

Alluvial fan. A fan-shaped deposit of sand, gravel, and fine material dropped by a stream where its gradient 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.

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 at field capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil.

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.

Coarse fragments. Mineral or rock particles more than 2 millimeters in diameter.

Coarse-textured soil. Sand and loamy sand.

Cobblestone. A rounded or partly rounded fragment of rock, 3 to 10 inches in diameter.

Colluvium. Soil material, rock fragments, or both, moved by creep, slide, or local wash and deposited at the base of steep slopes.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrations of compounds, or of soil grains cemented together. The composition of some concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are examples of material commonly found in concretions.

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.

Desert pavement. The layer of gravel or stones left on the land surface in desert regions after the removal of the fine material by wind.

Desert varnish. A glossy sheen or coating on stones and gravel in arid regions.

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.

Erosion. The wearing away of the land surface by wind (sandblast), running water, and other geological agents.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the oven-dry weight, after the gravitational, or free, water has been allowed to drain away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity.*

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.

Gravelly soil material. From 15 to 50 percent of material by volume, consists of rounded or angular rock fragments that are not prominently flattened and are up to 3 inches in diameter.

Ground water (geology). Water that fills all the unblocked pores of underlying material below the water table, which is the upper limit of saturation.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rains. The distinction between gully and rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by normal tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage. V-shaped gullies result if the material is more difficult to erode with depth; whereas U-shaped gullies result if the lower material is more easily eroded than that above it.

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.

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.

Impervious soil. A soil through which water, air, or roots, penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

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.

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.

Landscape. All the characteristics that distinguish a certain kind of area on the earth's surface and give it a distinguishing pattern, in contrast to other kinds of areas. Any one kind of soil is said to have a characteristic natural landscape, and under different uses it has one or more characteristic cultural landscapes.

Leached soil. A soil from which most of the soluble material has been removed from the entire profile or has been

removed from one part of the profile and has accumulated in another part.

Lime concretion. An aggregate cemented by the precipitation of calcium carbonate ($CaCO_3$).

Loess. Fine-grained material, dominantly of silt-sized particles, that has been deposited by wind.

Medium-textured soil. Soil of very fine sandy loam, loam, silt loam, or silt texture.

Montmorillonite. A fine, platy, alumino-silicate clay mineral that expands and contracts with the absorption and loss of water. It has a high cation-exchange capacity and is plastic and sticky when moist.

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.

Mottling, soil. Irregularly marked with spots of different colors that vary in number and size. Mottling in soils usually indicates poor aeration and lack of drainage. Descriptive terms are as follows: abundance—*few, common,* and *many;* size—*fine, medium,* and *coarse;* and contrast—*faint, distinct,* and *prominent.* The size measurements are these: *fine,* less than 5 millimeters (about 0.2 inch) in diameter along the greatest dimension; *medium,* ranging from 5 millimeters to 15 millimeters (about 0.2 to 0.6 inch) in diameter along the greatest dimension; and *coarse,* more than 15 millimeters (about 0.6 inch) in diameter along the greatest dimension.

Munsell notation. A system for designating color by degrees of the three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with a hue of 10YR, a value of 6, and a chroma of 4.

Parent material. Disintegrated and partly weathered rock from which soil has formed.

Percolation. The downward movement of water through the soil.

Permeability. The quality that enables the soil to transmit water or air. Terms used to describe permeability are as follows: *very slow, slow, moderately slow, moderate, moderately rapid, rapid,* and *very rapid.*

Phase, soil. A subdivision of a soil, series, or other unit in the soil classification system made because of differences in the soil that affect its management but do not affect its classification in the natural landscape. A soil series, for example, may be divided into phases because of differences in slope, stoniness, thickness, or some other characteristic that affects its management but not its behavior in the natural landscape.

Pore space. That fraction of the total space in a soil that is not occupied by solid particles.

Porosity, soil. The degree to which the soil mass is permeated with pores or cavities.

Profile, soil. A vertical section of the soil through all its horizons and extending into the parent material.

Reaction, soil. The degree of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is precisely neutral in reaction because it is neither acid nor alkaline. An acid, or "sour," soil is one that gives an acid reaction; an alkaline soil is one that is alkaline in reaction. In words, the degrees of acidity or alkalinity are expressed thus:

	pH		*pH*
Extremely acid	Below 4.5	Neutral	6.6 to 7.3
Very strongly acid	4.5 to 5.0	Mildly alkaline	7.4 to 7.8
Strongly acid	5.1 to 5:5	Moderately alkaline	7.9 to 8.4
Medium acid	5.6 to 6.0	Strongly alkaline	8.5 to 9.0
Slightly acid	6.1 to 6.5	Very strongly alkaline	9.1 and higher

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 location 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.

Series, soil. A group of soils developed from a particular type of parent material and having genetic horizons that, except for texture of the surface layer, are similar in differentiating characteristics and in arrangement in the profile.

Silica. Silica is a combination of silicon and oxygen. The mineral form is called quartz.

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.

Soil. A natural, three-dimensional body on the earth's surface that supports plants and that has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes of separates recognized in the United States are as follows: *Very coarse sand* (2.0 to 1.0 millimeter); *coarse sand* (1.0 to 0.5 millimeter); *medium sand* (0.5 to 0.25 millimeter); *fine sand* (0.25 to 0.10 millimeter); *very fine sand* (0.10 to 0.05 millimeter); *silt* (0.05 to 0.002 millimeter); and *clay* (less than 0.002 millimeter). The separates recognized by the International Society of Soil Science are as follows: I (2.0 to 0.2 millimeter); II (0.2 to 0.02 millimeter); III (0.02 to 0.002 millimeter); IV (less than 0.002 millimeter).

Variant, soil. A soil having properties sufficiently different from those of 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.

Stones. Rock fragments greater than 10 inches in diameter if rounded, and greater than 15 inches along the longer axis if flat.

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.

Substratum. Technically, the part of the soil below the solum.

Surface soil. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, about 5 to 8 inches in thickness. The plowed layer.

Terrace (geological). An old alluvial plain, ordinarily flat or undulating, bordering a river, lake, or the sea. Stream terraces are frequently called second bottoms, as contrasted to flood plains, and are seldom subject to overflow. Marine terraces were deposited by the sea and are generally wide.

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."

Tilth, soil. The condition of the soil in relation to the growth of plants, especially soil structure. Good tilth refers to the friable state and is associated with high noncapillary porosity and stable, granular structure. A soil in poor tilth is nonfriable, hard, nonaggregated, and difficult to till.

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.

Weathering. All physical and chemical changes produced in rocks at or near the earth's surface by atmospheric agents. These changes result in more or less complete disintegration and decomposition of the rock

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 range sites, see pages 75 through 81; for wildlife suitability groups, see pages 81 through 89.

Map symbol	Mapping unit	Page	Capability unit or subclass Irrigated Symbol	Irrigated Page	Dry Symbol	Dry Page	Range site Symbol	Wildlife suitability group Irrigated Symbol	Dry Symbol
AR	Ardivey-Wardenot association	13	-------	--	VIIs	74	----------	-----	4-44
	Ardivey part	--	-------	--	-----	--	NV 28-2 and NV 29-2, Desert Loamy Sal	-----	----
	Wardenot part	--	-------	--	-----	--	NV 28-1 and NV 29-1, Desert Loamy	-----	----
	Bluewing part	--	-------	--	-----	--	NV 28-2 and NV 29-2, Desert Loamy Sal	-----	----
BA	Badland-Belcher association	13	-------	--	-----	--	----------	-----	----
	Badland part	--	-------	--	VIIIe	74	----------	-----	----
	Belcher part	--	-------	--	VIIs	74	NV 29-16, Desert Sand	-----	4-44
	Belted part	--	-------	--	VIIs	74	NV 28-2 and NV 29-2, Desert Loamy Sal	-----	4-44
BB	Badland-Pintwater association	14	-------	--	-----	--	----------	-----	----
	Badland part	--	-------	--	VIIIe	74	----------	-----	----
	Pintwater part	--	-------	--	VIIs	74	NV 29-14, Desert Stony Hill	-----	4-44
BC	Basket-Mina association	14	-------	--	VIIs	74	----------	-----	----
	Basket part	--	-------	--	-----	--	NV 28-7 and NV 29-7, Upland Juniper Slope	-----	4-44
	Mina part	--	-------	--	-----	--	NV 29-10, Semidesert Loamy Slope	-----	4-43
BEB	Belcher gravelly sand, 0 to 4 percent slopes	15	-------	--	VIIs	74	NV 29-16, Desert Sand	-----	4-44
BHC	Belted gravelly loamy sand, 2 to 8 percent slopes	16	-------	--	VIIs	74	NV 28-2 and NV 29-2, Desert Loamy Sal	-----	4-44
BLC	Bluewing very gravelly sand, 0 to 8 percent slopes	16	-------	--	VIIs	74	NV 28-2 and NV 29-2, Desert Loamy Sal	-----	4-44
BMB	Bluewing gravelly loamy sand, 0 to 4 percent slopes	16	-------	--	VIIs	74	NV 28-1 and NV 29-1, Desert Loamy	-----	4-44
BNC	Bluewing very stony loamy sand, 2 to 8 percent slopes	16	-------	--	VIIs	74	NV 28-2 and NV 29-2, Desert Loamy Sal	-----	4-44
BOB	Bluewing gravelly loam, 0 to 4 percent slopes	17	-------	--	VIIs	74	NV 28-2 and NV 29-2, Desert Loamy Sal	-----	4-44
BPB	Broe gravelly fine sand, 0 to 4 percent slopes	17	IIIs-22	72	VIIs	74	NV 28-2 and NV 29-2, Desert Loamy Sal	2-42I	4-44
BrA	Broyles fine sandy loam, 0 to 2 percent slopes	18	IIc-1	71	VIIc	74	NV 28-1 and NV 29-1, Desert Loamy	1-41I	4-44
BrB	Broyles fine sandy loam, 2 to 4 percent slopes	18	IIe-20	70	VIIc	74	NV 28-1 and NV 29-1, Desert Loamy	1-41I	4-44

Map symbol	Mapping unit	Page	Capability unit or subclass Irrigated Symbol	Page	Dry Symbol	Page	Range site Symbol	Wildlife suitability group Irrigated Symbol	Dry Symbol
Bt	Broyles-Laxal complex------	18	IIIs-45	73	VIIs	74	NV 28-1 and NV 29-1, Desert Loamy	-----	----
	Broyles part----------	--	-------	--	-----	--	----------	1-41I	4-44
	Laxal part----------	--	-------	--	-----	--	----------	2-42I	4-44
Cf	Caudle fine sandy loam-----	19	IIc-1	71	VIIc	74	NV 29-6, Loamy Bottom	1-41I	4-44
Cg	Caudle fine sandy loam, saline-alkali----------	19	-------	--	VIIw	74	NV 28-3 and NV 29-3, Sodic Flat	-----	4-44
Ch	Charnock fine sandy loam, strongly saline-alkali---	20	-------	--	VIIw	74	NV 28-13, Saline Meadow	-----	4-34
Ck	Charnock clay loam, slightly saline-alkali---	20	-------	--	VIw	73	NV 28-4, Saline Bottom	-----	3-23
Cm	Charnock complex----------	20	-------	--	VIIw	74	----------	-----	----
	Charnock fine sandy loam, strongly saline-alkali--------	--	-------	--	-----	--	NV 28-13, Saline Meadow	-----	4-34
	Charnock clay loam, slightly saline-alkali--------	--	-------	--	-----	--	NV 28-4, Saline Bottom	-----	3-23
DEC	Deerlodge stony loam, very gravelly subsoil variant, 4 to 8 percent slopes----	21	-------	--	VIIs	74	NV 29-12, Semidesert Shallow Loamy	-----	4-44
DN	Dobel-Bluewing association-	22	-------	--	VIIs	74	NV 28-2 and NV 29-2, Desert Loamy Sal	-----	4-44
Do	Domez sand----------	22	IIs-4	71	VIIs	74	NV 28-2 and NV 29-2, Desert Loamy Sal	1-41I	4-44
Dr	Domez fine sandy loam------	22	IIc-1	71	VIIc	74	NV 28-2 and NV 29-2, Desert Loamy Sal	1-41I	4-44
Ds	Domez-Playas complex-------	22	-------	--	VIIc	74	----------	-----	----
	Domez part----------	--	-------	--	-----	--	NV 28-2 and NV 29-2, Desert Loamy Sal	1-41I	4-44
	Playas part----------	--	-------	--	-----	--	----------	-----	----
DU	Dune land----------	23	-------	--	VIIIs	75	----------	-----	----
Fa	Fivemile loam----------	23	IIc-1	71	VIIc	74	NV 29-6, Loamy Bottom	1-21I	4-44
Fb	Fivemile complex----------	23	IIw-91	71	VIIw	74	NV 29-6, Loamy Bottom	1-21I	4-44
GA	Gabbs-Old Camp association-	24	-------	--	-----	--	----------	-----	----
	Gabbs part----------	--	-------	--	VIIs	74	NV 29-14, Desert Stony Hill	-----	4-44
	Old Camp part----------	--	-------	--	VIIs	74	NV 29-12, Semidesert Shallow Loamy	-----	4-44
	Rock outcrop part------	--	-------	--	VIIIs	75	----------	-----	----
Gr	Griffy loamy sand----------	25	IIs-43	71	VIIc	74	NV 28-1 and NV 29-1, Desert Loamy	1-41I	4-44
Gs	Griffy gravelly loam-------	25	IIc-1	71	VIIc	74	NV 28-1 and NV 29-1, Desert Loamy	1-41I	4-44
JO	Jolan gravelly loamy coarse sand----------	26	IVs-12	73	VIIs	74	NV 28-2 and NV 29-2, Desert Loamy Sal	3-12I	4-44
KoA	Koyen sand, 0 to 2 percent slopes----------	26	IIs-4	71	VIIc	74	NV 28-2 and NV 29-2, Desert Loamy Sal	1-41I	4-44
KrB	Koyen fine sandy loam, 2 to 4 percent slopes----	26	IIe-20	70	VIIc	74	NV 28-2 and NV 29-2, Desert Loamy Sal	1-41I	4-44

Map symbol	Mapping unit	Page	Capability unit or subclass Irrigated Symbol	Page	Dry Symbol	Page	Range site Symbol	Wildlife suitability group Irrigated Symbol	Dry Symbol
KsA	Koyen gravelly fine sandy loam, 0 to 2 percent slopes	26	IIc-1	71	VIIc	74	NV 28-2 and NV 29-2, Desert Loamy Sal	1-41I	4-44
KT	Kyler-Rock outcrop complex--	27	-------	--	VIIs	74	----------	-----	----
	Kyler part	--	-------	--	-----	--	NV 29-12, Semidesert Shallow Loamy	-----	4-44
	Rock outcrop part	--	-------	--	-----	--	----------	-----	----
La	Lahontan silty clay loam, slightly saline-alkali	28	-------	--	VIw	73	NV 28-4, Saline Bottom	-----	3-23
Lb	Lahontan clay loam, strongly saline-alkali	28	-------	--	VIIw	74	NV 28-13, Saline Meadow	-----	4-34
LCB	Lathrop gravelly loamy sand, 0 to 4 percent slopes	29	-------	--	VIIs	74	NV 28-2 and NV 29-2, Desert Loamy Sal	-----	4-44
LF	Lathrop-Bluewing association	29	-------	--	VIIs	74	----------	-----	4-44
	Lathrop part	--	-------	--	-----	--	NV 28-1 and NV 29-1, Desert Loamy	-----	----
	Bluewing part	--	-------	--	-----	--	NV 28-2 and NV 29-2, Desert Loamy Sal	-----	----
LmA	Laxal gravelly fine sandy loam, 0 to 2 percent slopes	29	IIIs-45	73	VIIs	74	NV 28-1 and NV 29-1, Desert Loamy	2-42I	4-44
LnA	Laxal gravelly fine sandy loam, occasionally flooded, 0 to 2 percent slopes	30	IIIw-39	72	VIIw	74	NV 28-1 and NV 29-1, Desert Loamy	2-42I	4-44
LRB	Laxal gravelly loam, 2 to 4 percent slopes	30	IIIe-25	71	VIIs	74	NV 28-1 and NV 29-1, Desert Loamy	2-42I	4-44
LS	Laxal-Rock outcrop complex--	30	-------	--	VIIs	74	----------	-----	----
	Laxal part	--	-------	--	-----	--	NV 28-1 and NV 29-1, Desert Loamy	-----	4-44
	Rock outcrop part	--	-------	--	-----	--	----------	-----	----
LTC	Lyda very gravelly fine sandy loam, 2 to 8 percent slopes	31	-------	--	VIIs	74	NV 28-2 and NV 29-2, Desert Loamy Sal	-----	4-44
MA	Maggie-Pintwater association	31	-------	--	VIIs	74	----------	-----	4-44
	Maggie part	--	-------	--	-----	--	NV 28-2 and NV 29-2, Desert Loamy Sal	-----	----
	Pintwater part	--	-------	--	-----	--	NV 29-14, Desert Stony Hill	-----	----
	Bluewing part	--	-------	--	-----	--	NV 28-2 and NV 29-2, Desert Loamy Sal	-----	----
MB	Malpais-Rock outcrop association	32	-------	--	-----	--	----------	-----	----
	Malpais part	--	-------	--	VIIs	74	NV 29-14, Desert Stony Hill	-----	4-44
	Rock outcrop part	--	-------	--	VIIIs	75	----------	-----	----
McA	Mazuma fine sandy loam, 0 to 2 percent slopes	32	IIc-1	71	VIIc	74	NV 28-1 and NV 29-1, Desert Loamy	1-41I	4-44

Map symbol	Mapping unit	Page	Capability unit or subclass Irrigated		Capability unit or subclass Dry		Range site	Wildlife suitability group Irrigated	Wildlife suitability group Dry
			Symbol	Page	Symbol	Page	Symbol	Symbol	Symbol
McA3	Mazuma fine sandy loam, 0 to 2 percent slopes, severely eroded	33	-------	--	VIIc	74	NV 28-2 and NV 29-2, Desert Loamy Sal	-----	4-44
MdA	Mazuma fine sandy loam, slightly wet, 0 to 2 percent slopes	33	IIc-1	71	VIIc	74	NV 29-6, Loamy Bottom	1-41I	4-44
MeB	Mazuma very fine sandy loam, 2 to 4 percent slopes	33	IIe-20	70	VIIc	74	NV 29-6, Loamy Bottom	1-41I	4-44
Mf	Mazuma complex	33	IIs-43	71	VIIc	74	----------	-----	4-44
	Mazuma fine sandy loam, 0 to 2 percent slopes	--	-------	--	-----	--	NV 28-1 and NV 29-1, Desert Loamy	1-41I	----
	Mazuma loamy fine sand, 0 to 2 percent slopes	--	-------	--	-----	--	NV 29-6, Loamy Bottom	1-41I	----
MG	Mine dumps	34	-------	--	VIIIs	75	----------	-----	----
MO	Monte Cristo-Playas complex	35	-------	--	VIIs	74	----------	-----	----
	Monte Cristo part	--	-------	--	-----	--	NV 28-1 and NV 29-1, Desert Loamy	-----	4-44
	Playas part	--	-------	--	-----	--	----------	-----	----
No	Noyson sand	36	IVs-12	73	VIIs	74	NV 28-2 and NV 29-2, Desert Loamy Sal	3-42I	4-44
Np	Noyson gravelly sandy loam	36	IVs-12	73	VIIs	74	NV 28-2 and NV 29-2, Desert Loamy Sal	3-42I	4-44
Ny	Nyserva-Tipperary complex	37	-------	--	VIIw	74	----------	-----	4-44
	Nyserva part	--	-------	--	-----	--	NV 28-3 and NV 29-3, Sodic Flat	-----	----
	Tipperary part	--	-------	--	-----	--	NV 28-18 and NV 29-18, Desert Dune	-----	----
OA	Old Camp-Mina association	38	-------	--	VIIs	74	----------	-----	----
	Old Camp part	--	-------	--	-----	--	NV 29-12, Semidesert Shallow Loamy	-----	4-44
	Mina part	--	-------	--	-----	--	NV 29-10, Semidesert Loamy Slope	-----	4-43
OB	Old Camp-Osobb association	38	-------	--	VIIs	74	----------	-----	4-44
	Old Camp part	--	-------	--	-----	--	NV 29-12, Semidesert Shallow Loamy	-----	----
	Osobb part	--	-------	--	-----	--	NV 28-2 and NV 29-2, Desert Loamy Sal	-----	----
OC	Old Camp-Pintwater association	38	-------	--	VIIs	74	----------	-----	4-44
	Old Camp part	--	-------	--	-----	--	NV 29-12, Semidesert Shallow Loamy	-----	----
	Pintwater part	--	-------	--	-----	--	NV 29-14, Desert Stony Hill	-----	----
OD	Old Camp-Rock outcrop complex	38	-------	--	VIIs	74	----------	-----	----
	Old Camp part	--	-------	--	-----	--	NV 29-12, Semidesert Shallow Loamy	-----	4-44
	Rock outcrop part	--	-------	--	-----	--	----------	-----	----
	Pintwater part	--	-------	--	-----	--	NV 29-14, Desert Stony Hill	-----	4-44
Oe	Orizaba loam, drained	39	IIw-60	70	VIw	73	NV 28-4, Saline Bottom	1-41I	4-44
Of	Orizaba loam, slightly saline-alkali	39	IVw-61	73	VIw	73	NV 28-4, Saline Bottom	-----	3-23
Og	Orizaba loam, strongly saline-alkali	39	-------	--	VIIw	74	NV 28-13, Saline Meadow	-----	4-34

Map symbol	Mapping unit	Page	Capability unit or subclass Irrigated Symbol	Page	Dry Symbol	Page	Range site Symbol	Wildlife suitability group Irrigated Symbol	Dry Symbol
Oh	Orizaba loam, wet, slightly saline-alkali	39	-------	--	VIw	73	NV 28-9, Wet Meadow	-----	4-44
OmA	Orovada very gravelly loamy sand, 0 to 2 percent slopes	40	IIIs-43	72	VIIs	74	NV 29-6, Loamy Bottom	1-41I	4-44
OnA	Orovada fine sandy loam, 0 to 2 percent slopes	40	IIc-1	71	VIIc	74	NV 29-6, Loamy Bottom	1-41I	4-44
OpB	Orovada gravelly fine sandy loam, 2 to 4 percent slopes	40	IIe-20	70	VIIc	74	NV 29-6, Loamy Bottom	1-41I	4-44
OR	Orphant fine sand	41	-------	--	VIIs	74	NV 28-2 and NV 29-2, Desert Loamy Sal	-----	4-44
OS	Orphant-Bluewing association	41	-------	--	VIIs	74	NV 28-2 and NV 29-2, Desert Loamy Sal	-----	4-44
	Orphant part	--	-------	--	-----	--	----------	-----	----
	Bluewing part	--	-------	--	-----	--	----------	-----	----
OT	Osobb-Gabbs association	42	-------	--	VIIs	74	----------	-----	4-44
	Osobb part	--	-------	--	-----	--	NV 28-2 and NV 29-2, Desert Loamy Sal	-----	----
	Gabbs part	--	-------	--	-----	--	NV 29-14, Desert Stony Hill	-----	----
PA	Parran silty clay loam	43	-------	--	VIIw	74	NV 28-3 and NV 29-3, Sodic Flat	-----	4-34
PD	Penelas association	43	-------	--	VIIs	74	----------	-----	4-44
	Penelas variant part	--	-------	--	-----	--	NV 28-7 and NV 29-7, Upland Juniper Slope	-----	----
	Penelas part	--	-------	--	-----	--	NV 29-13, Semidesert Shallow Loamy	-----	----
PE	Penelas-Kyler association	44	-------	--	VIIs	74	NV 29-12, Semidesert Shallow Loamy	-----	4-44
PF	Penelas-Laxal association	44	-------	--	VIIs	74	----------	-----	4-44
	Penelas part	--	-------	--	-----	--	NV 28-2 and NV 29-2, Desert Loamy Sal	-----	----
	Laxal part	--	-------	--	-----	--	NV 28-1 and NV 29-1, Desert Loamy	-----	----
PG	Penelas-Rock outcrop complex	44	-------	--	VIIs	74	----------	-----	----
	Penelas part	--	-------	--	-----	--	NV 29-12, Semidesert Shallow Loamy	-----	4-44
	Rock outcrop part	--	-------	--	-----	--	----------	-----	----
PH	Pintwater-Bluewing association	45	-------	--	VIIs	74	----------	-----	4-44
	Pintwater part	--	-------	--	-----	--	NV 29-12, Semidesert Shallow Loamy	-----	----
	Bluewing part	--	-------	--	-----	--	NV 28-2 and NV 29-2, Desert Loamy Sal	-----	----
PK	Pintwater-Rock outcrop complex	45	-------	--	VIIs	74	----------	-----	----
	Pintwater part	--	-------	--	-----	--	NV 29-14, Desert Stony Hill	-----	4-44
	Rock outcrop part	--	-------	--	-----	--	----------	-----	----
PM	Pintwater-Rock outcrop complex, stony	45	-------	--	VIIs	74	----------	-----	----
	Pintwater part	--	-------	--	-----	--	NV 29-14, Desert Stony Hill	-----	4-44
	Rock outcrop part	--	-------	--	-----	--	----------	-----	----
PN	Playas	46	-------	--	VIIIw	74	----------	-----	----

Map symbol	Mapping unit	Page	Capability unit or subclass Irrigated Symbol	Page	Dry Symbol	Page	Range site Symbol	Wildlife suitability group Irrigated Symbol	Dry Symbol
PO	Playas-Parran complex-------	46	-------	--	VIIw	74	----------	-----	----
	Playas part----------	--	-------	--	-----	--	----------	-----	----
	Parran part----------	--	-------	--	-----	--	NV 28-3 and NV 29-3, Sodic Flat	-----	4-34
PR	Pumel-Rock outcrop complex--	46	-------	--	VIIs	74	----------	-----	----
	Pumel part----------	--	-------	--	-----	--	NV 29-12, Semidesert Shallow Loamy	-----	4-44
	Rock outcrop part-------	--	-------	--	-----	--	----------	-----	----
QrA	Quima coarse sandy loam, 0 to 2 percent slopes-----	47	IIIs-43	72	VIIc	74	NV 28-1 and NV 29-1, Desert Loamy	1-41I	4-44
QsB	Quima fine sandy loam, 2 to 4 percent slopes-----	47	IIe-20	70	VIIc	74	NV 28-1 and NV 29-1, Desert Loamy	1-41I	4-44
RO	Roic-Dobel association------	48	-------	--	VIIs	74	NV 28-2 and NV 29-2, Desert Loamy Sal	-----	4-44
Sb	Settlemeyer loam, drained---	49	IIw-60	70	VIw	73	NV 28-9, Wet Meadow	1-21I	4-24
Se	Settlemeyer silt loam-------	49	IIIw-60	72	VIw	73	NV 28-9, Wet Meadow	3-12I	3-12
SF	Settlemeyer-Yobe complex----	49	-------	--	VIIw	74	----------	-----	----
	Settlemeyer part--------	--	-------	--	-----	--	NV 28-9, Wet Meadow	3-12I	3-12
	Yobe part----------	--	-------	--	-----	--	NV 28-13, Saline Meadow	-----	4-44
SH	Silverbow-Rock outcrop complex----------	50	-------	--	VIIs	74	----------	-----	----
	Silverbow part----------	--	-------	--	-----	--	NV 29-14, Desert Stony Hill	-----	4-44
	Rock outcrop part-------	--	-------	--	-----	--	----------	-----	----
SK	Slickens----------	50	-------	--	VIIIw	74	----------	-----	----
SP	Spanel gravelly loamy sand--	51	-------	--	VIIs	74	NV 28-2 and NV 29-2, Desert Loamy Sal	-----	4-44
Sr	Stargo gravelly loamy sand--	51	IIIs-22	72	VIIs	74	NV 28-2 and NV 29-2, Desert Loamy Sal	2-42I	4-44
Ss	Stargo coarse sandy loam----	52	IIIw-39	72	VIIw	74	NV 28-2 and NV 29-2, Desert Loamy Sal	2-42I	4-44
STC	Stumble loamy fine sand, 0 to 8 percent slopes-----	52	IIIs-22	72	VIIs	74	NV 29-16, Desert Sand	2-42I	4-44
SuA	Stumble fine sandy loam, 0 to 2 percent slopes-----	52	IIIs-45	73	VIIs	74	NV 29-16, Desert Sand	2-42I	4-44
Sw	Sundown fine sand----------	53	IIIs-22	72	VIIs	74	NV 29-16, Desert Sand	2-42I	4-44
TC	Timblin-McCann association--	53	-------	--	VIIs	74	NV 28-7 and NV 29-7, Upland Juniper Slope	-----	----
	Timblin part----------	--	-------	--	-----	--	----------	-----	4-42
	McCann part----------	--	-------	--	-----	--	----------	-----	4-43
TdA	Timper sand, 0 to 2 percent slopes----------	54	IVs-50	73	VIIs	74	NV 28-2 and NV 29-2, Desert Loamy Sal	-----	4-44
TEB	Timper gravelly sandy loam, 0 to 4 percent slopes-----	54	IVs-50	73	VIIs	74	NV 28-2 and NV 29-2, Desert Loamy Sal	-----	4-44
TF	Timper-Playas complex-------	55	-------	--	VIIs	74	----------	-----	----
	Timper part----------	--	-------	--	-----	--	NV 28-2 and NV 29-2, Desert Loamy Sal	-----	4-44
	Playas part----------	--	-------	--	-----	--	----------	-----	----
TGE	Tipperary fine sand, 4 to 30 percent slopes----	55	-------	--	VIIs	74	NV 28-18 and NV 29-18, Desert Dune	-----	4-44

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TH	Tipperary-Fivemile complex--	55	-------	--	VIIs	74	----------	-----	4-44
	Tipperary part----------	--	-------	--	-----	--	NV 28-18 and NV 29-18, Desert Dune	-----	----
	Fivemile part----------	--	-------	--	-----	--	NV 29-6, Loamy Bottom	-----	----
TM	Tipperary-Playas complex----	55	-------	--	VIIs	74	----------	-----	----
	Tipperary part----------	--	-------	--	-----	--	NV 28-18 and NV 29-18, Desert Dune	-----	4-44
	Playas part----------	--	-------	--	-----	--	----------	-----	----
TN	Tomel-Laxal association-----	56	-------	--	VIIs	74	----------	-----	4-44
	Tomel part----------	--	-------	--	-----	--	NV 28-2 and NV 29-2, Desert Loamy Sal	-----	----
	Laxal part----------	--	IIIe-25	71	-----	--	NV 28-1 and NV 29-1, Desert Loamy	2-42I	----
TOB	Tybo loamy fine sand, 2 to 4 percent slopes-----	57	-------	--	VIIs	74	NV 28-2 and NV 29-2, Desert Loamy Sal	3-43I	4-44
TR	Tybo-Bluewing association---	57	-------	--	VIIs	74	NV 28-2 and NV 29-2, Desert Loamy Sal	-----	4-44
TS	Tybo-Stumble association----	57	-------	--	VIIs	74	----------	-----	4-44
	Tybo part----------	--	-------	--	-----	--	NV 28-2 and NV 29-2, Desert Loamy Sal	-----	----
	Stumble part----------	--	IIIs-22	72	-----	--	NV 29-16, Desert Sand	2-42I	----
UM	Umberland clay loam---------	58	-------	--	VIIw	74	NV 28-13, Saline Meadow	-----	4-34
UN	Umberland-Parran complex----	58	-------	--	VIIw	74	----------	-----	4-34
	Umberland part----------	--	-------	--	-----	--	NV 28-13, Saline Meadow	-----	----
	Parran part----------	--	-------	--	-----	--	NV 28-3 and NV 29-3, Sodic Flat	-----	----
UR	Umberland-Playas complex----	58	-------	--	VIIw	74	----------	-----	----
	Umberland part----------	--	-------	--	-----	--	NV 28-13, Saline Meadow	-----	4-34
	Playas part----------	--	-------	--	-----	--	----------	-----	----
	Tipperary part----------	--	-------	--	-----	--	NV 28-18 and NV 29-18, Desert Dune	-----	4-44
UT	Unsel-Bluewing complex------	59	-------	--	VIIs	74	NV 28-2 and NV 29-2, Desert Loamy Sal	-----	4-44
VGC	Vigus gravelly loamy sand, 2 to 8 percent slopes-----	60	IIIe-26	72	VIIc	74	NV 28-2 and NV 29-2, Desert Loamy Sal	1-41I	4-44
VK	Vigus-Koyen association-----	60	-------	--	VIIc	74	NV 28-2 and NV 29-2, Desert Loamy Sal	1-41I	4-44
	Vigus part----------	--	IIIe-26	72	-----	--	----------	-----	----
	Koyen part----------	--	IIe-20	70	-----	--	----------	-----	----
VM	Vinini-Mina association-----	61	-------	--	VIIs	74	----------	-----	----
	Vinini part----------	--	-------	--	-----	--	NV 29-12, Semidesert Shallow Loamy	-----	4-44
	Mina part----------	--	-------	--	-----	--	NV 29-10, Semidesert Loamy Slope	-----	4-34
VN	Vinini-Nevoyer association--	61	-------	--	VIIs	74	NV 29-12, Semidesert Shallow Loamy	-----	4-44
WA	Wardenot gravelly fine sandy loam, 0 to 8 percent slopes----------	62	-------	--	VIIs	74	NV 28-1 and NV 29-1, Desert Loamy	-----	4-44
WBB	Wrango gravelly fine sandy loam, 0 to 4 percent slopes----------	62	-------	--	VIIs	74	NV 29-6, Loamy Bottom	-----	4-44
WDC	Wrango stony fine sandy loam, 2 to 8 percent slopes-----	62	-------	--	VIIs	74	NV 28-2 and NV 29-2, Desert Loamy Sal	-----	4-44

Map symbol	Mapping unit	Page	Capability unit or subclass Irrigated: Symbol	Page	Dry: Symbol	Page	Range site: Symbol	Wildlife suitability group Irrigated: Symbol	Dry: Symbol
YB	Yobe silt loam	63	-------	--	VIIw	74	NV 28-13, Saline Meadow	-----	4-34
YC	Yobe-Tipperary complex	63	-------	--	VIIw	74	----------	-----	----
	Yobe part	--	-------	--	-----	--	NV 28-13, Saline Meadow	-----	4-34
	Tipperary part	--	-------	--	-----	--	NV 28-18 and NV 29-18, Desert Dune	-----	4-44
YD	Yobe-Umberland complex	63	-------	--	VIIw	74	NV 28-13, Saline Meadow	-----	4-34
Ym	Yomba gravelly sand	64	IIIs-22	72	VIIs	74	NV 28-2 and NV 29-2, Desert Loamy Sal	2-42I	4-44
Yn	Yomba gravelly fine sandy loam	64	IIIw-39	72	VIIw	74	NV 28-2 and NV 29-2, Desert Loamy Sal	2-42I	4-44
YO	Yomba-Playas complex	64	-------	--	VIIw	74	----------	-----	----
	Yomba part	--	-------	--	-----	--	NV 28-2 and NV 29-2, Desert Loamy Sal	-----	4-44
	Playas part	--	-------	--	-----	--	----------	-----	----
Yp	Youngston loamy sand	65	IIw-37	70	VIIw	74	NV 29-6, Loamy Bottom	1-21I	4-44
Yr	Youngston fine sandy loam	65	IIc-1	71	VIIc	74	NV 29-6, Loamy Bottom	1-21I	4-44
Ys	Youngston silt loam	65	IIw-91	71	VIIw	74	NV 29-6, Loamy Bottom	1-21I	4-44
ZN	Zaba-Nyserva association	66	-------	--	-----	--	NV 28-3 and NV 29-3, Sodic Flat	-----	4-44
	Zaba part	--	-------	--	VIIs	74	----------	-----	----
	Nyserva part	--	-------	--	VIIw	74	----------	-----	----

* U.S. GOVERNMENT PRINTING OFFICE: 1980-287-332/62

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