Issued May 1967

SOIL SURVEY

Tehama County California

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service and Forest Service
In cooperation with
UNIVERSITY OF CALIFORNIA AGRICULTURAL EXPERIMENT STATION

Major fieldwork for this soil survey was done in the period 1952–59. Soil names and descriptions were approved in 1962. Unless otherwise indicated, statements in the publication refer to conditions in Tehama County in 1959. This survey was made cooperatively by the University of California Agricultural Experiment Station, the Forest Service, and the Soil Conservation Service. The Corning, Cottonwood, Lassen View, and Vina Soil Conservation Districts serve Tehama County.

HOW TO USE THIS SOIL SURVEY REPORT

THIS SOIL SURVEY of Tehama County contains information that can be applied in managing farms, ranches, and woodlands; in selecting sites for roads, ponds, buildings, or other structures; and in appraising the value of tracts of land for agriculture, industry, or recreation.

Locating Soils

All the soils of Tehama County are shown on the detailed map at the back of this report. This map consists of many sheets that are made from aerial photographs. Each sheet is numbered to correspond with numbers shown on the Index to Map Sheets.

On each sheet of the detailed map, soil areas are outlined and are identified by symbol. 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 in the report. This guide lists all of the soils of the county in alphabetic order by map symbol. It shows the page where each kind of soil is described, and also the page for the capability unit in which the soil has been placed.

Individual colored maps showing the relative suitability or limitations of soils for many specific purposes can be developed by using the soil map and information in the text. Interpretations not included in the text can be developed by grouping the soils according to their suitability or limitations for a particular use. Translucent material can be used as an overlay over the soil map and colored to show soils that have the same limitation or suitability. For example, soils that have a slight limitation for a given use can be colored green, those with a moderate limitation can be colored yellow, and those with a severe limitation can be colored red.

Farmers and those who work with farmers can learn about use and management of the soils in the section that describes the soils and in the section that discusses management of the soils for cultivated crops and for orchard crops.

Foresters and others can refer to the section "Woodland," to learn about the suitability of the soils for trees.

Ranchers and others interested in range can find, under the section "Pasture and Range," information about the suitability of the soils for pasture and range and also the kinds of plants that grow in the county.

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

Students, teachers, and others will find information about soils and their management in various parts of the text.

Newcomers in Tehama County may be especially interested in the section "General Soil Map," where broad patterns of soils are described. They may also be interested in the section "General Nature of the County," which gives additional information about the county.

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NOTICE TO LIBRARIANS

Series year and series number are no longer shown on soil surveys. See explanation on the next page.

Issued May 1967

EXPLANATION

Series Year and Series Number

Series year and number were dropped from all soil surveys sent to the printer after December 31, 1965. Many surveys, however, were then at such advanced stage of printing that it was not feasible to remove series year and number. Consequently, the last issues bearing series year and number will be as follows:

Series 1957, No. 23, Las Vegas and Eldorado Valleys Area, Nev.
Series 1958, No. 34, Grand Traverse County, Mich.
Series 1959, No. 42, Judith Basin Area, Mont.
Series 1960, No. 31, Elbert County, Colo. (Eastern Part)
Series 1961, No. 42, Camden County, N.J.
Series 1962, No. 13, Chicot County, Ark.
Series 1963, No. 1, Tippah County, Miss.

Series numbers will be consecutive in each series year, up to and including the numbers shown in the foregoing list. The soil survey for Tippah County, Miss., will be the last to have a series year and series number.

SOIL SURVEY OF TEHAMA COUNTY, CALIFORNIA

REPORT BY K. D. GOWANS, UNIVERSITY OF CALIFORNIA

FIELDWORK BY K. D. GOWANS, UNIVERSITY OF CALIFORNIA; J. M. CRAWFORD, J. I. MALLORY, O. C. OLSON, U.S. FOREST SERVICE; AND J. DE LAPP, F. SMITH, TEHAMA COUNTY[1]

UNITED STATES DEPARTMENT OF AGRICULTURE AND THE UNIVERSITY OF CALIFORNIA AGRICULTURAL EXPERIMENT STATION[2]

TEHAMA COUNTY is in the north-central part of California (fig. 1). It has a land area of 1,904,640 acres, or 2,976 square miles. The soil survey covers 1,851,601 acres. The rest of the acreage makes up the Yolla-bolly-Middle Eel Wilderness Area, which was excluded from the survey. Red Bluff, the county seat, is in the central part of the county.

Much of the county is used to provide pasture and range for cattle and sheep. These areas are chiefly in the foothills and are grassy, but some of the areas have a cover of grass and oak. Timber is harvested from the commercial forests on the east and west sides of the county, about 50 percent of which are federally owned. About 9 percent of the acreage is cultivated. Much of the cultivated land is irrigated and used for orchards, row crops, and field crops. Most of the intensively cultivated land is on the alluvial flood plains and low terraces. Dryfarmed grain, which is less intensively cultivated, is grown on the gently sloping foothills and terraces in the western part of the county.

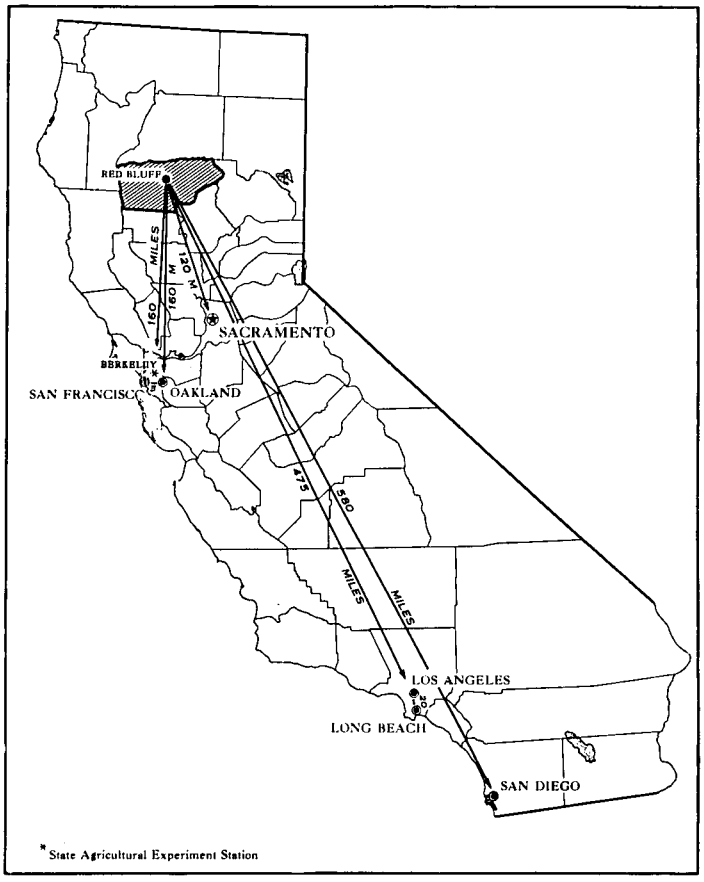

Figure 1.—Location of Tehama County in California

How This Soil Survey Was Made

Soil scientists made this survey to learn what kinds of soils are in Tehama County, where they are located, and how they can be used.

They went into the county knowing they likely would find many soils they had already seen, and perhaps some they had not. As they traveled over the county, they observed steepness, length, and shape of slopes; size and speed of streams; kinds of native plants or crops; 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 roots of plants.

The soil scientists made comparisons among the profiles they studied, and they compared these profiles with those in counties nearby and in places more distant. They classified and named the soils according to nationwide, uniform procedures. For successful use of this report, it is necessary to know the kinds of groupings most used in a local soil classification.

[1] ROBERT MANNING of the Shasta Forest Company and ROBERT SERVICE of the Collins Pine Company also participated in the soil survey.

[2] Upland parts of Tehama County were mapped by the State Cooperative Soil-Vegetation Survey. This was a cooperative undertaking of the California Division of Forestry, the Pacific Southwest Forest and Range Experiment Station of the U.S. Forest Service, and the University of California. Mapping in the National Forest was done cooperatively with the California Region, U.S. Forest Service.

Soils that have profiles almost alike make up a soil series. Except for different texture in the surface layer, all the soils of one series have major horizons that are similar in thickness, arrangement, and other important characteristics. Each soil series is named for a town or other geographic feature near the place where a soil of that series was first observed and mapped. Corning and Tehama, for example, are the names of two soil series. All the soils in the United States having the same series name are essentially alike in those characteristics that go with their behavior in the natural landscape. Soils of one series can differ in texture of the surface soil and in slope, stoniness, or some other characteristic that affects use of the soils by man.

Many soil series contain soils that differ in texture of their surface layer. According to such differences in texture, separations called soil types are made. Within a series, all the soils having a surface layer of the same texture belong to one soil type. Columbia loam and Columbia silt loam are two soil types in the Columbia series. The difference in texture of their surface layers is apparent from their names.

Some soil types vary so much in slope, degree of erosion, number and size of stones, or some other feature affecting their use, that practical suggestions about their management could not be made if they were shown on the soil map as one unit. Such soil types are divided into phases. The name of a soil phase indicates a feature that affects management. For example, Columbia silt loam, 0 to 3 percent slopes, is one of several phases of Columbia silt loam, a soil type that ranges from nearly level to gently sloping.

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

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

In preparing some detailed maps, the soil scientists have a problem of delineating areas where different kinds of soils are so intricately mixed, and so small in size that it is not practical to show them separately on the map. Therefore, they show this mixture of soils as one mapping unit and call it a soil complex. Ordinarily, a soil complex is named for the major kinds of soil in it, for example, Corning-Newville gravelly loams, 3 to 10 percent slopes, eroded. The soil scientists may also show as one mapping unit two or more soils that have differences not significant enough to make it practical to show them separately on the map. Such a mapping unit is called an undifferentiated soil group. An example is Lodo and Maymen shaly loams, 10 to 30 percent slopes, eroded. Also, on most soil maps, areas are shown that are so rocky, so shallow, or so frequently worked by wind and water that they scarcely can be called soils. These areas are shown on a soil map like other mapping units, but they are given descriptive names, such as Riverwash or Rock land.

While a soil survey is in progress, samples of soils are taken, as needed, for laboratory measurements and for engineering tests. Laboratory data from the same kinds of soils in other places are 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. Yields under defined management are estimated for all the soils that are suitable for cultivation.

But only part of a soil survey is done when the soils have been named, described, and delineated on the map, and the laboratory data and yield data have been assembled. The mass of detailed information then needs to be organized in a way that it is readily useful to different groups of readers, among them farmers, ranchers, managers of woodland, engineers, and homeowners. Grouping soils that are similar in suitability for each specified use is the method of organization commonly used in the soil survey reports. The soil scientists set up trial groups, based on the yield and practice tables and other data, and test them by further study and by consultation with farmers, agronomists, engineers, and others. Then, the scientists 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 present methods of use and management.

General Soil Map

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

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

There are three major parts in Tehama County. These are (1) the flood plains and terraces, (2) the foothills, and (3) the mountains. Three or more associations are in each part.

Soils of the Flood Plains and Terraces

The soils of the flood plains and terraces are dominantly brown or reddish brown and are very deep to shallow. Soils of the flood plains form the nearly level and very gently sloping areas along the Sacramento River and its tributaries; these soils are deep to very deep. The elevation ranges from about 250 to 500 feet, and rainfall from 19 to 25 inches annually.

Soils of the terraces are mostly west of the Sacramento River, but one large area is just east of Vina and Los

Molinos. Here the elevation ranges from 300 to 800 feet, and annual rainfall ranges from 19 to 30 inches.

Four of the associations in Tehama County are on the flood plains and terraces.

1. Columbia-Vina association

Very deep, nearly level, moderately fine textured to moderately coarse textured soils on flood plains of the Sacramento River

This soil association is on nearly level flood plains along the Sacramento River. All of the acreage is in a narrow strip that runs from north to south through the center of the county. The soils formed in alluvium derived from sedimentary, volcanic, and granitic rocks. The elevation ranges from 200 to 1,000 feet, and annual precipitation ranges from 19 to 25 inches. Except for a narrow area along the river, most areas have been cleared of natural vegetation. Sycamore, valley oak, wild grape, elderberry, and many other shrubs grow along the river, as well as many grasses and forbs. The association makes up about 7 percent of the county.

The Columbia and Vina soils are nearly level, very deep, well drained, and neutral and are moderately fine textured to moderately coarse textured. The Columbia soils are brown, and the Vina soils are dark grayish brown. Most areas of these Columbia and Vina soils are smooth. In places near the channel of the main stream, however, the areas are cut by channels of abandoned streams, which are likely to have water in them during years of high rainfall. The soils in the channels also contain very gravelly layers at a depth of less than 5 feet in places.

Minor soils in this association are those of the Zamora, Los Robles, Berrendos, and Farwell series. The Zamora soils are farther from the river than the Columbia and Vina soils. They are very deep, well-drained, dark grayish-brown soils that are neutral and are medium textured to moderately fine textured. The Los Robles soils are similar to the Vina soils but have more clay in the subsoil. Berrendos soils are clay throughout. Farwell soils are clay loam in texture.

The soils in this association are among the most productive in the county. Yields of beans, alfalfa, corn, sugarbeets, milo, and melons are high, and excellent orchards of peaches, prunes, and walnuts are on the soils. Most farms in this association are family farms that are generally less than 100 acres in size.

Water for irrigation is readily available in all areas, and nearly all crops are irrigated. Basin and furrow irrigation are used in areas that have been leveled; overhead sprinklers are used in other areas. Nitrogen fertilizer is required for high yields of most crops. In a few areas some row and field crops require phosphate fertilizer for increased yields, and in places some crops respond if sulfur is applied. Zinc sprays are required on some orchard crops.

The gravelly substratum in a few areas near the main stream channel reduces the water-holding capacity of the soils there, and lowers yields of crops. These areas are also likely to be flooded for short periods during winter. The use of the areas is therefore somewhat limited, but severity of flooding has been reduced considerably since the Shasta Dam was built.

2. Maywood-Tehama association

Very deep to moderately deep, nearly level to very gently sloping soils on flood plains and terraces along tributaries of the Sacramento River

This soil association is on recent and older deposits of alluvium on nearly level to gently sloping flood plains and terraces west of the Sacramento River. The alluvium was derived mainly from sedimentary and metamorphic rocks but also includes material derived from serpentine and ultrabasic rocks. Elevation ranges from 300 to 800 feet, and annual precipitation ranges from 19 to 25 inches. The native vegetation consisted of grasses and forbs and varying amounts of blue oak, valley oak, cottonwood, and shrubs. Much of the vegetation has been removed, and the areas are now cultivated. This association occupies about 8 percent of the county.

Soils of the Maywood and Tehama series are dominant in this association, but minor areas of several associated soils are included.

The Maywood and associated soils, on recent alluvium, are nearly level. They are on long, narrow flood plains and benches along streams that run in a west to east direction. The largest areas are along Thomes, Red Bank, Burch, Rice, and Elder Creeks. The Maywood soils are pale brown and are medium textured throughout.

Associated with the Maywood soils, and similar to them, are the minor Yolo, Orland, Cortina, Zamora, and Myers soils. The Yolo soils are brown, and the Orland soils are grayish brown; both are medium textured. Cortina soils are generally gravelly and droughty, and the Zamora soils have an increase of clay in the subsoil. The Myers soil is clay textured throughout.

Alfalfa, corn, beans, milo, sugarbeets, barley, irrigated pasture, peaches, prunes, walnuts, and almonds grow on the Maywood and associated soils, which are some of the best soils in the county. Narrow stringers of these soils in valleys in the foothills are used for pasture and range, partly because irrigation water is not available. Water is readily available, however, to most areas of these soils in the central part of the valley.

On the older alluvium on flood plains and terraces west of the Sacramento River are the Tehama and associated soils. The Tehama soils are nearly level, well drained, pale brown, and neutral to slightly acid. They have a medium-textured surface soil and a moderately fine textured subsoil and are very deep. The associated minor Hillgate and Arbuckle soils are similar to the Tehama soils. Hillgate soils are nearly level to gently sloping and are moderately deep to a claypan, however, and the Arbuckle soils are gravelly throughout.

Other minor soils associated with the Tehama soils are the Kimball, Perkins, and Clear Lake soils. The Kimball and Perkins soils are reddish brown and are neutral. Kimball soils have a gravelly, medium-textured surface soil and a gravelly, fine-textured subsoil. Perkins soils have a surface soil similar to that of the Kimball soils but a moderately fine textured subsoil. The Clear Lake soil is very deep, nearly black clay and is in local small basins on terraces. It is poorly drained, particularly during winter; deep, wide cracks form in this soil in summer when it is dry.

The Tehama and associated soils are used primarily for irrigated pasture and dryfarmed grain. Milo and alfalfa

are grown in some areas, and yields are fair. A fairly large acreage of olives is grown in the vicinity of Corning. The kinds of crops grown on these soils are limited because of the dense clayey subsoil; productivity is also limited. Many crops grown on the Tehama and associated soils require nitrogen fertilizer, and in many places phosphate also is needed for best yields.

3. *Corning-Redding association*

Nearly level to sloping, gravelly, medium-textured soils that are moderately deep to shallow to claypan or hardpan; on terraces west of the Sacramento River and along its tributaries

This soil association is mostly on high terraces west of the Sacramento River, but some areas are along tributaries of that river. The areas are nearly level to gently sloping and in most places have a mound and depression relief known as hogwallow microrelief. The soils consist of stratified deposits of alluvium derived from sedimentary and metamorphic rocks of the Coast Range Mountains. They are gravelly, medium-textured soils that are moderately deep to shallow to claypan or hardpan. Elevation ranges from about 350 to 800 feet, and annual rainfall from 19 to 30 inches. Grasses and forbs are the dominant vegetation, but areas in the north end of the county have a moderately dense cover of blue oak and manzanita. This association makes up about 5 percent of the county.

The Corning and Redding soils have a hummocky surface soil of reddish-brown gravelly or slightly gravelly loam that is slightly acid to medium acid. Both of these soils have a subsoil of very dense clay, but the Redding soils have a cemented hardpan under the dense clay.

Minor soils of this association are in the Red Bluff series. The surface soil of these soils is smooth. It is very strongly acid but is otherwise similar to that of the Corning and Redding soils. The subsoil of the Red Bluff soils is moderately dense clay loam that is strongly acid.

Most of the acreage in this association is used for pasture, range, and dryfarmed grain. The quantity of the forage produced is small and its quality is poor. Also yields of grain are low. Applying fertilizer that contains nitrogen and phosphate increases yields. Water for irrigation is not readily available, mainly because the cost of lifting water to the areas is more than the returns that can be expected.

4. *Tuscan-Inks association*

Nearly level to steep, cobbly soils that are shallow to moderately deep to hardpan; on terraces east of the Sacramento River

This soil association is on old terraces east of the Sacramento River. It is mostly in a fairly narrow area that lies in a north to south direction just east of the center of the county between recent alluvial deposits and the foothills. A few small areas are to the north near the county line. The tops of the terraces are nearly level or gently sloping and are dissected by entrenched streams where the slopes are moderately steep. Many small basinlike areas are on top of the terrace. The soils are cobbly and are shallow to moderately deep to hardpan. They consist of stratified deposits of alluvium derived from volcanic rocks. These rocks are mainly andesitic, but some are basaltic and rhyolitic. The elevation ranges from about 300 to 800 feet, and the annual rainfall from 19 to 30 inches. All areas have a fairly sparse cover of grasses and forbs, but some slopes of the dissected terrace also have a moderately dense cover of blue oak and interior live oak. This association occupies 5 percent of the county.

The Tuscan soils, on the top of the old terraces, are made up of layers of reddish-brown cobbly loam or clay loam. They have a cemented hardpan, generally at a depth of less than 20 inches. Inks soils are on the slopes of the dissected terrace. They consist of layers of cobbly loam and clay loam over a cemented substratum.

Minor soils in this association are those of the Anita, Keefers, and Laniger series. The Anita soils, in the basins on top of the terrace, are dark-gray clay throughout and are mostly less than 36 inches deep. Keefers soils have a smooth, nearly level surface. They have a surface layer of brown, slightly acid loam and a subsoil of moderately dense cobbly clay or clay loam. The light-colored, sandy Laniger soils are on low hills, slightly above the top of the old terrace. These soils have a smooth but sloping surface and are less than 4 feet deep.

Most of this soil association is used for pasture and range. The quantity of forage produced on the Keefers and Laniger soils is moderately large and the quality is moderately good. On the Tuscan, Inks, and Anita soils, the quantity of forage is small to moderate and its quality is poor to fair. In places the Anita and Keefers soils are irrigated and are planted mainly to pasture, but in a few places milo and barley are grown. In many places crops respond to nitrogen fertilizer, and in some places they respond to phosphate fertilizer.

Soils of the Foothills

The foothills are made up mainly of brown or reddish-brown soils that are shallow to deep. West of the Sacramento River, the soils occupy a wide area between the terraces and the mountains. The soils here formed in material from softly consolidated sediments and from sandstone and hard shale. They are medium textured to fine textured and are moderately steep to very steep. The elevation ranges from 500 to 2,000 feet, and annual rainfall ranges from 19 to 35 inches.

East of the Sacramento River are shallow to moderately deep, rocky loams formed in material from volcanic rock. These soils are gently sloping to steep. They are at elevations of 500 to 4,000 feet where annual precipitation ranges from 20 to 35 inches.

Three of the associations in Tehama County are in the foothills.

5. *Newville-Dibble association*

Shallow to deep, moderately steep or steep, medium- to fine-textured soils underlain by soft sedimentary rock

This association is in the foothills west of the Sacramento River on remnants of a dissected terrace. The terrace is similar to that in the center of the valley where soils of association 3 occur, but that terrace has its original surface remaining, and the surface of this terrace has been removed by erosion. The soils are brown. They are shallow to deep, moderately steep to steep, and medium textured to fine textured, and they are underlain by stratified, soft sedimentary rock. They are on smooth, rounded hills

and form an area 5 to 25 miles wide cut in many places by streams that form an intricately branched, or denditric, pattern. The sediments in which these soils formed are mainly from siltstone but in places consist of very gravelly material and of material high in lime or calcium carbonate. The elevation ranges from 500 to 2,000 feet, and the annual precipitation from 19 to 30 inches. The vegetation in places consists of grasses and forbs alone, but in other places it also includes blue oak, manzanita, buckbrush, interior live oak, and Digger pine. This soil association makes up 10 percent of the county.

Predominant in this association are the Newville and Dibble soils. Newville soils have a surface layer of gravelly loam and a subsoil of gravelly clay. Dibble soils consist of layers of silt loam or silty clay loam over dense, compact siltstone.

Minor soils of this association are the Nacimiento soils and the Altamont terrace soils. Nacimiento soils consist of layers of light brownish-gray or light-gray calcareous silty clay loam over moderately soft limestone. The Altamont terrace soils have a surface layer of brown, neutral clay and a subsoil of brown, calcareous clay.

Most of this association is used for pasture and range. The quantity of forage produced on the Newville and Dibble soils is small to moderate, and the quality is poor to fair. On the Altamont terrace soils and the Nacimiento soils, the quantity of forage is moderate to moderately large and the quality is good to very good. In many places where the slopes are not too steep and the oaks have been removed, barley is grown in rotation with pasture. Crops on all soils in this association respond to nitrogen fertilizer and in places to phosphate and sulfur.

6. *Millsholm-Lodo association*

Shallow to moderately deep, moderately steep to very steep soils underlain by sandstone and shale

This soil association is in the foothills in the western part of the county just west of soil association 5. The area ranges from about 2 to 10 miles wide and crosses the county from north to south. The hills are partly rounded and in places are nearly wedge shaped and have slopes that are steeper to the west than to the east. The soils are brown in color. They are shallow to moderately deep, are moderately steep to very steep, and are underlain by hard sandstone and shale. The sandstone and shale are tilted on the west side to an angle of about 45 degrees. Main streams that drain the area cut across this rock formation at nearly right angles but tend to run in a north to south direction. The elevation ranges from about 500 feet to 2,000 feet, and the rainfall from 20 inches to 35 inches. The vegetation consists of grasses and forbs with varying amounts of blue oak, manzanita, buckbrush, interior live oak, and Digger pine. This association makes up about 7 percent of the county.

Predominant in this association are the Millsholm and Lodo soils. The Millsholm soils consist of clay loams that are 12 to 30 inches deep to sandstone or shale, and the Lodo, of shaly loams that are 6 to 12 inches deep to shale.

Minor soils in this association are the Millsap, Sehorn, and Altamont. Millsap soils consist of layers of loam over layers of clay loam or clay. They are 24 to 36 inches deep to sandstone or shale. Sehorn soils consist of 20 to 40 inches of clay over shale or sandstone. Altamont soils are clays that have lime in the subsoil and are 24 to 48 inches deep over sandstone and shale.

Most of this association is in pasture and range, but grain is grown in rotation with pasture on a small acreage of the Millsholm, Sehorn, and Altamont soils. The quantity of forage produced is moderate to moderately large on the Altamont, Sehorn, and Millsholm soils, and the quality is good to very good. About moderate amounts of forage of fair quality are produced on the Millsap soil. Forage produced on the Lodo soils is small in quantity and poor in quality. Plants on soils of this association respond to nitrogen fertilizer and in some places to phosphate fertilizer.

7. *Toomes-Guenoc association*

Shallow or moderately deep, rocky, gently sloping to steep soils underlain by volcanic rock

This soil association is in the foothills east of the Sacramento River. The soils are mostly in a wide area that runs through the county from north to south and that slopes upward toward the east. They are shallow or moderately deep, rocky, gently sloping to steep soils underlain by a large volcanic mud and lava flow. The main area has been dissected by many streams. It is consequently a series of narrow, sloping ridges and many deep, steep-walled canyons, but if viewed across, it appears to be a plateau. The underlying volcanic rock is dominantly andesite with inclusions of basalt. Elevation ranges from about 500 feet to 4,000 feet, and rainfall from 20 to 35 inches. The vegetation in some places is grasses and forbs alone, but in other places it includes blue oak, interior live oak, buckbrush, manzanita, and Digger pine. This association covers about 19 percent of the county.

The Toomes and Guenoc soils are dominant in this association. Toomes soils are brown to reddish-brown loams that in many places are less than 15 inches deep and are very rocky. Guenoc soils have a surface layer of reddish-brown rocky loam and a subsoil of reddish-brown, dense clay loam or clay; depth to hard volcanic rock is 20 to 40 inches.

Also in this association are the minor Supan, Inskip, and Cone soils. The Supan soils have a surface soil of brown, rocky loam and a subsoil of reddish-brown or brown, rocky clay loam; depth to hard rock ranges from 36 to 48 inches. Inskip soils have a surface layer of pale-brown very rocky silt loam and overlie broken lava rock from recent volcanic flows at a depth of 10 to 30 inches. The Cone soils, which consist of yellowish-brown gravelly silt loams, formed in material from volcanic cinder cones.

All of this association is used for pasture and range. The quantity of forage produced is moderate to very small, and its quality is fair to very poor. A few areas of the Guenoc soil near Manton have been cleared of woody vegetation and rocks and planted to irrigated pasture and barley. Yellow pine is harvested for lumber from some of the Inskip and Cone soils.

Soils of the Mountains

In the mountains are chiefly brown, reddish-brown, or light-gray soils that are shallow to moderately deep. The areas are in the western and eastern parts of the county.

and the elevation is mostly more than 3,000 feet. Precipitation ranges from 25 to more than 70 inches annually.

Seven of the soil associations in Tehama County are in the mountains.

8. *Maymen-Los Gatos-Parrish association*

Shallow or moderately deep, steep or very steep, rocky soils underlain by sandstone and shale

All of this association is west of the Sacramento River along the eastern edge of the Coast Range Mountains. The areas are made up of a series of narrow ridges and deep canyons. The soils are shallow or moderately deep, are steep or very steep, and are rocky. They are underlain mainly by hard sandstone and shale, but a few areas are underlain by hard mica schist. The rocks have been tilted toward the west to an angle of 45 or more degrees. Elevation ranges from about 1,000 to 4,000 feet, and rainfall from 25 to 45 inches. The vegetation is a dense cover of shrubs, mainly chamise, buckbrush, common manzanita, white leaf manzanita, mountain-mahogany, interior live oak, Brewer oak, and Digger pine. This association occupies about 8 percent of the county.

Most of the Maymen, Los Gatos, and Parrish soils, which are dominant in this association, are underlain by hard sandstone and shale. Maymen soils consist of brown, gravelly loam that is less than 20 inches thick over hard rock. Los Gatos soils are as much as 30 inches deep and have a subsoil of light clay loam; Parrish soils are as much as 40 inches deep and have a subsoil of reddish-brown clay. The natural vegetation on all these soils is shrubs.

The minor Tyson and Hulls soils are underlain by hard mica schist. Tyson soils consist of layers of dark grayish-brown gravelly sandy loam that are less than 36 inches thick over hard rock, and Hulls soils of layers of grayish-brown gravelly loam that are less than 30 inches thick over hard rock. On the Tyson soils the natural vegetation is dominantly Brewer oak, but on the Hulls soils it is grasses and forbs.

Except for the Hulls soils, all of this soil association is under brush. The brush protects the watershed and provides browse and cover for wildlife. Hulls soils are used for limited pasture and range, and they produce a moderate amount of forage of good quality.

9. *Henneke-Stonyford association*

Shallow or moderately shallow, steep or very steep, rocky soils underlain by volcanic rock

All of this soil association is on the eastern edge of the Coast Range Mountains. The areas occupy a narrow strip in the south half of the county between areas of sandstone and shale and areas of schist, as well as a smaller area at the northern edge of the county. The soils are shallow or moderately shallow, steep or very steep, and rocky. They are underlain by hard volcanic rock of serpentine and greenstone (altered basalt and andesite). Elevation ranges from about 1,500 to 4,000 feet, and annual rainfall from 20 to 45 inches. The vegetation is chamise, buckbrush, mountain-mahogany, common manzanita, whiteleaf manzanita, leather oak, scrub oak, California holly, and Digger pine. This association occupies less than 2 percent of the county.

The rocky, shallow Henneke soils, dominant in this association, formed in material from serpentine rock. The Stonyford soils, also extensive, and the minor Goulding soils both formed in material from greenstone. They are also rocky and are shallow or are moderately shallow. Stonyford soils are reddish brown, and the Goulding are brown.

Shrubs are the dominant plants on soils in this association. They protect the watershed and provide browse and cover for wildlife.

10. *Dubakella-Neuns association*

Moderately deep or deep, steep or very steep, stony soils underlain by volcanic rock

All of this soil association is in a mountainous area in the northwest corner of the county. The area consists of several narrow ridges and deep, steep-walled canyons. The soils are moderately deep or deep, steep or very steep, and stony. They are underlain by volcanic rock. Elevation ranges from 3,000 to 5,000 feet, and annual rainfall from 35 to 50 inches. The vegetation is dominantly yellow pine, Jeffrey pine, sugar pine, white fir, Douglas-fir, incense-cedar, and black oak. This association covers about 3 percent of the county.

The Dubakella and Neuns soils are dominant in this association. Dubakella soils formed in material from serpentine and consist of layers of reddish-brown stony loam and clay loam that are less than 30 inches deep over fractured rock. The Neuns soils and the minor Cohasset soils formed in material from greenstone. Neuns soils consist of layers of brown stony loam and sandy loam that are less than 30 inches deep over fractured hard rock. Cohasset soils, on the other hand, consist of layers of reddish-brown loam and clay loam that are more than 5 feet deep over weathered rock.

Timber is grown on the soils in this association. Trees grow slowly on the Dubakella soils, and the stands are sparse. On the Neuns and Cohasset soils, trees grow well, and the stands are more dense.

11. *Sheetiron-Josephine association*

Moderately deep or deep, steep or very steep soils underlain by hard sedimentary rock

Most of the mountainous area in the western part of the county at an altitude of more than 3,500 feet is in this soil association. The soils are moderately deep or deep and are steep or very steep. They are underlain by hard sedimentary rock, mainly fractured mica schist. Annual rainfall ranges from 35 to 60 inches. The vegetation is chiefly yellow pine, sugar pine, white fir, Douglas-fir, incense-cedar, and black oak but includes some shrubs, forbs, and grasses. This association occupies about 8 percent of the county.

Dominant in this association are the Sheetiron and Josephine soils. Sheetiron soils consist of layers of pale-brown gravelly or rocky loam that are less than 32 inches thick over fractured rock. Josephine soils have a surface layer of reddish-brown loam and a subsoil of reddish-brown clay loam and are more than 5 feet deep.

Minor soils in this association are the Masterson, Hugo, and Yollabolly. Masterson soils have a surface layer of dark-brown loam and a subsoil of yellowish-brown or reddish-brown loam or clay loam; they are less than 4 feet deep. The acreage of the Hugo soils is small, and these gravelly loams are in the northeastern corner of the asso-

ciation. Yollabolly soils, along the ridge of the Coast Range Mountains, are shallow and very rocky.

Timber is grown on most soils in this association, and the rate of growth is fair to good. The Yollabolly soils, however, have only sparse stands of Jeffrey pine and white fir growing on them.

12. Cohasset-McCarthy association

Moderately deep or deep, moderately steep or steep, stony soils underlain by volcanic rock

This soil association is in the eastern part of the county on a sloping plateau, or very large fan, which is deeply entrenched by many streams. Some of the ridgetops between the deep, steep-walled canyons formed by the entrenched streams are fairly large, partly rounded, and gently sloping. The soils are moderately deep or deep, moderately steep or steep, and stony and are underlain by volcanic rock. The rock is dominantly hard volcanic breccia or is mudflow composed of cemented andesitic tuff. Elevation ranges from about 3,500 to 6,000 feet. Annual precipitation is between 40 and 60 inches, and much of it comes as snow in winter. The vegetation is chiefly dense stands of yellow pine, sugar pine, white fir, Douglas-fir, and incense-cedar but includes some hardwoods, shrubs, forbs, and grasses. Nearly all roads in this area are along the ridgetops rather than in the canyons. This association covers about 8 percent of the county.

The Cohasset and McCarthy soils are dominant in this association. Cohasset soils, on ridgetops, consist of layers of brown stony loam and loam underlain by a subsoil of reddish-brown clay loam. Depth to weathered volcanic rock is more than 40 inches. McCarthy soils are on the steep canyon slopes. They have a surface layer of dark-brown sandy loam and a subsoil of strong-brown gravelly sandy loam. Depth to weathered volcanic rock is between 20 to 40 inches in many places.

The Aiken soils, minor in this association, are on ridgetops near the Cohasset soils. They are similar to the Cohasset soils but have a red clay subsoil.

The soils of this association are some of the most productive soils in the county for timber. Trees are grown on all of the soils, and the rate of growth is good to very good. The trees help to protect the watershed and to provide food and cover for wildlife. These soils also provide suitable sites for recreational purposes.

13. Windy-Iron Mountain association

Very shallow or moderately deep, moderately steep or steep, stony soils underlain by volcanic rock

Areas of this soil association are in the eastern part of the county. They are on moderately steep plateaus or on steep side slopes at elevations of more than 6,000 feet. The soils are very shallow to moderately deep, are stony, and are underlain by volcanic breccia or rock from volcanic flow. The rocks are dominantly andesitic in composition. Annual precipitation ranges from 50 to 70 inches, and most of it comes as snow. The vegetation is conifers, shrubs, and forbs. Less than 5 percent of the county is in this association.

The Windy soils have a surface soil of dark-brown stony or gravelly sandy loam and a subsoil of strong-brown sandy loam or yellowish-brown loam. In most places they are gravelly and stony throughout. Iron Mountain soils occupy a fairly small acreage in the association. These shallow sandy loams are in nearly barren areas. Conifers or shrubs cover the Windy soils. The trees are mainly white fir, sugar pine, red fir, white pine, and mountain hemlock. Green leaf manzanita, pine-mat manzanita, bearbrush, and huckleberry oak are the dominant shrubs. On the Iron Mountain soils, the vegetation is various kinds of shrubs, grasses, and forbs.

Timber is produced on the Windy soils of this association, and Christmas trees are grown in a few areas. Iron Mountain soils provide browse and protection for wildlife and in places summer forage for cattle. Many areas are used extensively for recreation in summer and fall and for sports in winter.

14. Jiggs-Lyonville-Forward association

Moderately deep, moderately steep or steep, stony, light-gray soils underlain by volcanic rock

All of this association is in mountainous areas in the eastern part of the county where the ridges are fairly broad and the canyons are deep and steep walled. The soils are light gray and are moderately deep, moderately steep or steep, and stony. They are underlain by rhyolitic rock flow, which nearly caps the top of the ridges. Elevation ranges from about 2,000 to 6,000 feet. Annual precipitation ranges from about 45 to 60 inches, and most of it comes as snow. The vegetation is chiefly yellow pine, white fir, sugar pine, Douglas-fir, incense-cedar, and black oak but includes a few shrubs, forbs, and grasses. This association occupies about 5 percent of the county.

Dominant in this association are the Jiggs, Lyonsville, and Forward soils. Jiggs soils consist of layers of stony sandy loam that are less than 30 inches deep over fractured rhyolitic rock. Lyonsville soils have a layer of gravelly or stony sandy loam over gravelly or stony sandy loam or sandy clay loam; depth to fractured rhyolitic rock is about 40 inches. Forward soils consist of layers of sandy loam or loamy sand over dense, partly cemented, volcanic tuff.

Minor soils in the association are of the Childs, Chummy, Elam, and Nanny series. These soils are on alluvial fans and in mountain meadows in this soil association.

Most of this soil association is used for timber. Many areas have been cut over, and natural restocking has been good. Soils of the Childs and Chummy series in meadow are used for summer grazing.

Descriptions of the Soils

This section provides detailed information about the soils in the county. It describes each soil series, and then each soil, or mapping unit. The soils are described in alphabetical order.

The description of a soil series mentions features that apply to all of the soils of that series. Unless otherwise stated, the profile described for the series is considered to be representative for all the soils in the series. Differences among the soils of one series are pointed out in the descriptions of the individual soils.

Several soils, or mapping units, described in this report had other names on advance sheets published by the University of California Agricultural Extension Service and

the California Division of Forestry during the years 1953–59. Those units that had other names are footnoted in the text where they are described.

In describing a soil profile, the scientist frequently assigns a letter symbol, for example, "A1," to the various layers. These letter symbols have a special meaning for soil scientists and others who make detailed studies of the soils. Most readers will need to remember only that all letter symbols beginning with "A" are the surface soil; those beginning with "B" are the subsoil; those beginning with "C" are the substratum, or parent material; and those beginning with "R" are bedrock. All measurements refer to depth from the surface.

The color of each horizon is described in words, such as yellowish brown, and is also indicated by symbols for hue, value, and chroma, such as 10YR 5/4. These symbols, called Munsell color notations (*10*)[3], are used by soil scientists to evaluate the color of the soil precisely.

The texture of the soil refers to the content of sand, silt, and clay. It is determined by the way the soil feels when rubbed between the fingers, and it is checked by laboratory analyses. Each mapping unit is identified by a textural class name, such as "fine sandy loam." This name refers to the texture of the surface layer, or A horizon.

The structure is indicated by the way the individual soil particles are arranged in larger grains, or aggregates and the amount of pore space between grains. The structure of the soil is described by terms that denote strength or grade, size, and shape of the aggregates. For example, a layer may consist of soil materials that have "weak, fine, blocky structure."

Boundaries between the horizons are described so as to indicate their thickness and shape. The terms for thickness are *abrupt*, *clear*, *gradual*, and *diffuse*. The shape of the boundary is described as *smooth*, *wavy*, *irregular*, or *broken*.

Other terms used for describing the soils are defined in the Glossary. For more general information about the soils, the reader can refer to the section "General Soil Map," in which the broad patterns of soils are described. The approximate acreage and proportionate extent of the soils are given in table 1, and their location and extent are shown on the detailed soil map at the back of the report.

[3] Italic numbers in parentheses refer to Literature Cited, p. 122.

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

Soil symbol	Soil	Acres	Percent	Soil symbol	Soil	Acres	Percent
AaD	Aiken loam, 10 to 30 percent slopes	426	(1)	Bg	Berrendos clay loam, 0 to 3 percent slopes	534	(1)
AbD	Altamont clay, 10 to 30 percent slopes	453	(1)	Bh	Berrendos clay loam, hardpan substratum, 0 to 3 percent slopes	338	(1)
AbE	Altamont clay, 30 to 50 percent slopes	949	0. 1	BuD	Burris stony clay, 10 to 30 percent slopes	247	(1)
AcA	Altamont clay, terrace, 0 to 3 percent slopes	2, 983	. 2	CaC	Childs gravelly loam, 5 to 15 percent slopes	9, 250	0. 5
AcB	Altamont clay, terrace, 3 to 10 percent slopes	1, 038	. 1	Cb	Chummy soils, 0 to 3 percent slopes	12, 750	. 7
AcD	Altamont clay, terrace, 10 to 30 percent slopes	232	(1)	Cc	Clear Lake clay	1, 280	. 1
AcE	Altamont clay, terrace, 30 to 50 percent slopes	822	(1)	CdD	Cohasset loam, 10 to 30 percent slopes	29, 001	1. 5
Af	Anita clay, moderately deep	1, 454	. 1	CdE	Cohasset loam, 30 to 50 percent slopes	2, 352	. 1
Ag	Anita clay, deep	977	. 1	CdF	Cohasset loam, 50 to 65 percent slopes	135	(1)
Ad	Anita clay	1, 300	. 1	CeD	Cohasset loam, very deep, 10 to 30 percent slopes	16, 085	. 9
An	Anita cobbly clay	524	(1)	CgE	Cohasset stony loam, 30 to 50 percent slopes	5, 181	. 3
Ao	Anita cobbly clay, moderately deep	911	(1)	CgD	Cohasset stony loam, 10 to 30 percent slopes	20, 743	1. 1
Ap	Anita gravelly clay, moderately deep	774	(1)	ChD2	Cohasset stony loam, moderately deep, 10 to 30 percent slopes, eroded	165	(1)
AsB	Anita stony clay, 0 to 8 percent slopes	161	(1)	CfD	Cohasset gravelly loam, 10 to 30 percent slopes	16, 715	. 9
At	Anita-Keefers complex, 0 to 3 percent slopes	972	. 1	CfE	Cohasset gravelly loam, 30 to 50 percent slopes	2, 805	. 2
AvA	Arbuckle gravelly loam, 0 to 3 percent slopes	17, 454	. 9	ClF	Colluvial land, sedimentary rocks	11, 331	. 6
AvB	Arbuckle gravelly loam, 3 to 8 percent slopes	734	(1)	CkF	Colluvial land, volcanic rocks	15, 425	. 8
Aw	Arbuckle gravelly loam, clayey substratum, 0 to 3 percent slopes	676	(1)	CmA	Columbia fine sandy loam, 0 to 3 percent slopes	2, 073	. 1
Ay	Arbuckle gravelly loam, clayey substratum, channeled	12, 926	. 7	Cn	Columbia fine sandy loam, moderately deep, 0 to 3 percent slopes	378	(1)
Au	Arbuckle gravelly fine sandy loam, 0 to 3 percent slopes	4, 174	. 2	CmB	Columbia fine sandy loam, 3 to 8 percent slopes	1, 315	. 1
Az	Arbuckle-Tehama complex, 0 to 3 percent slopes	1, 946	. 1	Co	Columbia loam, 0 to 3 percent slopes	2, 292	. 1
Bc	Berrendos clay, 0 to 3 percent slopes	220	(1)				
Bd	Berrendos clay, hardpan substratum, 0 to 3 percent slopes	845	(1)				

See footnote at end of table.

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

Soil symbol	Soil	Acres	Percent
CpB	Columbia loamy fine sand, 1 to 8 percent slopes	644	(1)
CsA	Columbia silt loam, 0 to 3 percent slopes	6,334	0.3
Ct	Columbia silt loam, moderately deep, 0 to 3 percent slopes	291	(1)
CsB	Columbia silt loam, 3 to 8 percent slopes	1,270	.1
Cu	Columbia complex, channeled	8,367	.5
CvD	Cone extremely gravelly sandy loam, 10 to 30 percent slopes	524	(1)
CvE	Cone extremely gravelly sandy loam, 30 to 50 percent slopes	394	(1)
CwA	Corning gravelly loam, 0 to 3 percent slopes	7,607	.4
CwB	Corning gravelly loam, 3 to 8 percent slopes	3,214	.2
CxB2	Corning-Newville gravelly loams, 3 to 10 percent slopes, eroded	36,712	2.0
CyB	Corning-Redding gravelly loams, 0 to 5 percent slopes	22,783	1.2
Cz	Cortina gravelly fine sandy loam	1,858	.1
Czm	Cortina gravelly fine sandy loam, moderately deep	1,287	.1
Czs	Cortina very gravelly fine sandy loam	1,443	.1
Czx	Cortina complex	5,854	.3
DbD	Dibble silty clay loam, 10 to 30 percent slopes	505	(1)
DbE	Dibble silty clay loam, 30 to 50 percent slopes	795	(1)
DgD	Dibble-gullied land complex, 10 to 30 percent slopes	975	.3
DgE	Dibble-gullied land complex, 30 to 50 percent slopes	525	.3
DnD	Dibble-Newville complex, 10 to 30 percent slopes	3,228	.2
DnE	Dibble-Newville complex, 30 to 50 percent slopes	2,131	.1
DxD	Dibble-Newville-gullied land complex, 10 to 30 percent slopes	1,835	.1
DxE	Dibble-Newville-gullied land complex, 30 to 50 percent slopes	1,895	.1
DyD	Dubakella stony loam, 10 to 30 percent slopes	290	(1)
DyE	Dubakella stony loam, 30 to 50 percent slopes	3,360	.2
EgB	Elam very gravelly loamy sand, 0 to 8 percent slopes	3,200	.2
EmB	Elam very gravelly loamy sand, moderately deep, 0 to 8 percent slopes	1,650	.1
Ew	Elam very gravelly loamy sand, imperfectly drained variant, 0 to 3 percent slopes	4,150	.2
Fa	Farwell clay loam, 0 to 3 percent slopes	524	(1)
FoD	Forward sandy loam, 10 to 30 percent slopes	1,319	.1
GgE	Goulding stony loam, 30 to 50 percent slopes	1,875	.1
GgF	Goulding stony loam, 50 to 65 percent slopes	1,395	.1
GnD	Guenoc loam, 10 to 30 percent slopes	1,226	.1
GnE	Guenoc loam, 30 to 50 percent slopes	577	(1)
GsD	Guenoc stony loam, 10 to 30 percent slopes	4,442	.2
GsE	Guenoc stony loam, 30 to 50 percent slopes	405	(1)
HeE	Henneke stony loam, 30 to 65 percent slopes	19,425	1.0
HeD	Henneke stony loam, 10 to 30 percent slopes	4,284	0.2
HfE	Henneke stony loam, landslips, 30 to 65 percent slopes	264	(1)
HfD	Henneke stony loam, landslips, 10 to 30 percent slopes	740	(1)
HgA	Hillgate loam, 0 to 3 percent slopes	11,462	.6
HgB	Hillgate loam, 3 to 8 percent slopes	1,296	.1
HhB	Hillgate loam, shaly substratum, 0 to 8 percent slopes	586	(1)
Hk	Hillgate gravelly loam, 0 to 3 percent slopes	175	(1)
Hl	Hillgate silt loam, 0 to 3 percent slopes	4,046	.2
HmE	Hillgate-Lodo complex, 3 to 50 percent slopes	1,102	.1
HtD	Hillgate-Millsholm complex, 3 to 30 percent slopes	4,995	.3
HuF	Hugo gravelly sandy loam, 50 to 65 percent slopes	215	(1)
HuE	Hugo gravelly sandy loam, 30 to 50 percent slopes	80	(1)
HvE	Hulls gravelly loam, 30 to 50 percent slopes	3,300	.2
HvD	Hulls gravelly loam, 10 to 30 percent slopes	483	(1)
HvF	Hulls gravelly loam, 50 to 65 percent slopes	570	(1)
IcD	Inks cobbly loam, 3 to 30 percent slopes	13,808	.7
IcE	Inks cobbly loam, 30 to 50 percent slope	2,815	.2
IkD	Inskip very rocky silt loam, 10 to 30 percent slopes	717	(1)
IkE	Inskip very rocky silt loam, 30 to 50 percent slopes	512	(1)
ImD	Inskip very rocky silt loam, moderately deep, 10 to 30 percent slopes	13,815	.7
ImE	Inskip very rocky silt loam, moderately deep, 30 to 50 percent slopes	299	(1)
IrD	Iron Mountain rocky sandy loam, 10 to 30 percent slopes	376	(1)
IrE	Iron Mountain rocky sandy loam, 30 to 50 percent slopes	13,902	.7
IrF	Iron Mountain rocky sandy loam, 50 to 65 percent slopes	4,910	.3
IsE	Iron Mountain stony loam, 30 to 50 percent slopes	200	(1)
IxE	Iron Mountain-Supan complex, 30 to 50 percent slopes	1,333	.1
JgD	Jiggs stony sandy loam, 10 to 30 percent slopes	9,727	.5
JgD2	Jiggs stony sandy loam, 10 to 30 percent slopes, eroded	291	(1)
JgE	Jiggs stony sandy loam, 30 to 50 percent slopes	6,496	.3
JgE2	Jiggs stony sandy loam, 30 to 50 percent slopes, eroded	3,057	.2
JgF	Jiggs stony sandy loam, 50 to 65 percent slopes	791	(1)
JgF2	Jiggs stony sandy loam, 50 to 65 percent slopes, eroded	284	(1)
JoE	Josephine gravelly loam, 30 to 50 percent slopes	3,251	.2
JoD	Josephine gravelly loam, 10 to 30 percent slopes	728	(1)
JoE2	Josephine gravelly loam, 30 to 50 percent slopes, eroded	140	(1)
JoF2	Josephine gravelly loam, 50 to 65 percent slopes, eroded	380	(1)

See footnote at end of table.

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

Soil symbol	Soil	Acres	Percent	Soil symbol	Soil	Acres	Percent
JsD	Josephine-Sheetiron gravelly loams, 10 to 30 percent slopes	6, 995	0. 4	MbgE	Maymen and Lodo gravelly loams, 30 to 65 percent slopes	17, 005	0. 9
JsE	Josephine-Sheetiron gravelly loams, 30 to 50 percent slopes	10, 281	. 5	Me	Maywood loam, 0 to 3 percent slopes	634	(1)
Kf	Keefers loam, 0 to 3 percent slopes	2, 717	. 1	Mc	Maywood fine sandy loam, 0 to 3 percent slopes	706	(1)
Km	Keefers loam, moderately deep, 0 to 3 percent slopes	3, 190	. 2	Md	Maywood fine sandy loam, moderately deep, 0 to 3 percent slopes	562	(1)
Kc	Keefers cobbly loam, moderately deep, 0 to 3 percent slopes	1, 385	. 1	Mh	Maywood silt loam, 0 to 3 percent slopes	628	(1)
Kn	Keefers complex, channeled	1, 697	. 1	Mf	Maywood loam, high terrace, 0 to 3 percent slopes	4, 948	. 3
KpA	Kimball loam, 0 to 3 percent slopes	4, 475	. 2	Mg	Maywood loam, moderately well drained, 0 to 3 percent slopes	1, 216	. 1
KpB	Kimball loam, 3 to 8 percent slopes	707	(1)	MkE	McCarthy sandy loam, 30 to 50 percent slopes	42, 833	2. 3
KoA	Kimball gravelly loam, 0 to 3 percent slopes	2, 812	. 2	MkD	McCarthy sandy loam, 10 to 30 percent slopes	5, 243	. 3
KoB	Kimball gravelly loam, 3 to 8 percent slopes	3, 056	. 2	MkF	McCarthy sandy loam, 50 to 65 percent slopes	4, 617	. 2
LaB	Laniger fine sandy loam, 0 to 8 percent slopes	218	(1)	MmE	McCarthy stony sandy loam, 30 to 50 percent slopes	2, 652	. 1
LaD	Laniger fine sandy loam, 8 to 30 percent slopes	437	(1)	MmF	McCarthy stony sandy loam, 50 to 65 percent slopes	2, 046	. 1
LaE	Laniger fine sandy loam, 30 to 50 percent slopes	762	(1)	MnE	McCarthy-Iron Mountain complex, 30 to 50 percent slopes	1, 777	. 1
LbB	Laniger fine sandy loam, deep, 0 to 8 percent slopes	286	(1)	Mp	Millrace gravelly fine sandy loam, 0 to 3 percent slopes	392	(1)
LdD2	Lodo and Maymen shaly loams, 10 to 30 percent slopes, eroded	391	(1)	Mo	Millrace cobbly fine sandy loam, 0 to 3 percent slopes	378	(1)
LdE2	Lodo and Maymen shaly loams, 30 to 65 percent slopes, eroded	39, 330	2. 1	Mr	Millrace complex, channeled	645	(1)
LfD	Lodo-Millsholm complex, 10 to 30 percent slopes	3, 653	. 2	MsE	Millsap loam, 30 to 50 percent slopes	8, 613	. 5
LfE	Lodo-Millsholm complex, 30 to 50 percent slopes	7, 312	. 4	MsD	Millsap loam, 10 to 30 percent slopes	1, 712	. 1
LfF	Lodo-Millsholm complex, 50 to 65 percent slopes	386	(1)	MsF	Millsap loam, 50 to 65 percent slopes	2, 164	. 1
LgE	Los Gatos gravelly loam, 30 to 50 percent slopes	5, 849	. 3	MtD	Millsholm clay loam, 10 to 30 percent slopes	38, 187	2. 0
LgF	Los Gatos gravelly loam, 50 to 65 percent slopes	2, 406	. 1	MtE	Millsholm clay loam, 30 to 50 percent slopes	4, 394	. 2
LhE	Los Gatos-Maymen gravelly loams, 30 to 65 percent slopes	6, 605	. 3	MtF	Millsholm clay loam, 50 to 65 percent slopes	4, 394	. 2
Lk	Los Robles clay loam, 0 to 3 percent slopes	3, 805	. 2	MuE	Millsholm rocky sandy loam, 30 to 50 percent slopes	808	(1)
Lm	Los Robles clay loam, moderately deep, 0 to 3 percent slopes	432	(1)	MuF	Millsholm rocky sandy loam, 50 to 65 percent slopes	407	(1)
Ln	Los Robles cobbly loam, moderately deep, 0 to 3 percent slopes	69	(1)	MvD	Millsholm-Millsap complex, 10 to 30 percent slopes	10, 808	. 6
Lo	Los Robles loam, 0 to 3 percent slopes	3, 007	. 2	MvE	Millsholm-Millsap complex, 30 to 50 percent slopes	1, 490	. 1
LsD	Lyonsville and Cohasset soils, 10 to 30 percent slopes	891	(1)	MvF	Millsholm-Millsap complex, 50 to 65 percent slopes	283	(1)
LtD	Lyonsville and Cohasset stony soils, 10 to 30 percent slopes	1, 706	. 1	Mx	Moda loam, 0 to 3 percent slopes	949	. 1
LvD	Lyonsville and Jiggs gravelly sandy loams, 10 to 30 percent slopes	18, 136	1. 0	Mw	Moda gravelly loam	281	(1)
LvE	Lyonsville and Jiggs gravelly sandy loams, 30 to 50 percent slopes	14, 572	. 8	My	Molinos fine sandy loam	1, 797	. 1
LvF	Lyonsville and Jiggs gravelly sandy loams, 50 to 65 percent slopes	377	(1)	Mz	Molinos fine sandy loam, moderately deep over clay	960	. 1
LyD	Lyonsville and Jiggs stony sandy loams, 10 to 30 percent slopes	4, 036	. 2	Mzd	Molinos fine sandy loam, deep over gravel	463	(1)
LyE	Lyonsville and Jiggs stony sandy loams, 30 to 50 percent slopes	5, 877	. 3	Mzm	Molinos fine sandy loam, moderately deep over gravel	975	. 1
LyF	Lyonsville and Jiggs stony sandy loams, 50 to 65 percent slopes	4, 730	. 2	Mzr	Molinos fine sandy loam, deep over rock	4, 085	. 2
MaD	Manton sandy loam, 10 to 30 percent slopes	3, 464	. 2	Mzs	Molinos gravelly fine sandy loam	1, 980	. 1
MbD	Masterson gravelly loam, 10 to 30 percent slopes	1, 793	. 1	Mzt	Molinos complex, channeled	1, 861	. 1
				Mzy	Myers clay, 0 to 3 percent slopes	147	(1)
				NaD	Nacimiento silty clay loam, 10 to 30 percent slopes	1, 453	. 1
				NaD2	Nacimiento silty clay loam, 10 to 30 percent slopes, eroded	333	(1)
				NaE	Nacimiento silty clay loam, 30 to 50 percent slopes	1, 499	. 1

See footnote at end of table.

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

Soil symbol	Soil	Acres	Percent
NaE2	Nacimiento silty clay loam, 30 to 50 percent slopes, eroded	469	(1)
NcB	Nacimiento-Altamont complex, 3 to 10 percent slopes	2, 149	0. 1
NcD	Nacimiento-Altamont complex, 10 to 30 percent slopes	5, 250	. 3
NcD2	Nacimiento-Altamont complex, 10 to 30 percent slopes, eroded	2, 747	. 1
NcE2	Nacimiento-Altamont complex, 30 to 50 percent slopes, eroded	7, 212	. 4
NhB	Nacimiento-Newville complex, 3 to 10 percent slopes	3, 595	. 2
NhD	Nacimiento-Newville complex, 10 to 30 percent slopes	7, 354	. 4
NhE	Nacimiento-Newville complex, 30 to 50 percent slopes	4, 855	. 3
NhD2	Nacimiento-Newville complex, 10 to 30 percent slopes, eroded	1, 222	. 1
NhE2	Nacimiento-Newville complex, 30 to 50 percent slopes, eroded	4, 155	. 2
NkB	Nanny stony loam, 0 to 8 percent slopes	9, 120	. 5
NmB	Nanny stony loam, moderately deep, 0 to 8 percent slopes	4, 880	. 3
NnD	Neuns stony loam, 10 to 30 percent slopes	5, 166	. 3
NnE	Neuns stony loam, 30 to 50 percent slopes	6, 865	. 4
NnF	Neuns stony loam, 50 to 65 percent slopes	5, 734	. 3
NoF	Neuns stony loam, deep, 50 to 65 percent slopes	255	(1)
NpE	Neuns-Dubakella complex, 30 to 50 percent slopes	528	(1)
NrD	Newville gravelly loam, 10 to 30 percent slopes	36, 798	2. 0
NrB	Newville gravelly loam, 3 to 10 percent slopes	1, 683	. 1
NrB2	Newville gravelly loam, 3 to 10 percent slopes, eroded	1, 010	. 1
NrD2	Newville gravelly loam, 10 to 30 percent slopes, eroded	15, 195	. 8
NrE	Newville gravelly loam, 30 to 50 percent slopes	91, 281	4. 6
NrE2	Newville gravelly loam, 30 to 50 percent slopes, eroded	6, 346	. 3
NrF	Newville gravelly loam, 50 to 65 percent slopes	1, 373	. 1
NvD	Newville-Dibble complex, 10 to 30 percent slopes	10, 821	. 6
NvE	Newville-Dibble complex, 30 to 50 percent slopes	16, 530	. 9
NwD	Newville-Dibble-gullied land complex, 10 to 30 percent slopes	4, 033	. 2
NwE	Newville-Dibble-gullied land complex, 30 to 50 percent slopes	9, 360	. 5
NxD	Newville-Laniger complex, 10 to 30 percent slopes	120	(1)
Om	Orland loam	188	(1)
Op	Orland loam, moderately deep over clay loam	101	(1)
Or	Orland loam, moderately deep over gravel	718	(1)
Of	Orland fine sandy loam	796	(1)
Os	Orland silt loam	1, 386	. 1
PaE	Parrish gravelly loam, 30 to 50 percent slopes	29, 901	1. 6
PaD	Parrish gravelly loam, 10 to 30 percent slopes	856	(1)
PaF	Parrish gravelly loam, 50 to 65 percent slopes	2, 199	. 1
PgE	Parrish-Los Gatos gravelly loams, 30 to 50 percent slopes	3, 209	0. 2
PkA	Perkins gravelly loam, 0 to 3 percent slopes	7, 329	. 4
PkB	Perkins gravelly loam, 3 to 8 percent slopes	1, 433	. 1
Pm	Perkins-Kimball gravelly loams, 0 to 3 percent slopes	455	(1)
PrD	Peters clay, 8 to 30 percent slopes	468	(1)
PrB	Peters clay, 1 to 8 percent slopes	101	(1)
PrD2	Peters clay, 8 to 30 percent slopes, eroded	3, 256	. 2
PrE	Peters clay, 30 to 50 percent slopes	59	(1)
PsE	Peters-Newville complex, 30 to 50 percent slopes	2, 978	. 2
PvB	Pleasanton gravelly loam, 1 to 10 percent slopes	652	(1)
Rg	Red Bluff gravelly loam, 0 to 3 percent slopes	9, 493	. 5
Rh	Red Bluff gravelly loam, hardpan substratum, 0 to 3 percent slopes	2, 115	. 1
Rb	Red Bluff loam, 0 to 3 percent slopes	461	(1)
RnA	Redding gravelly loam, 0 to 3 percent slopes	7, 788	. 4
RnB	Redding gravelly loam, 3 to 8 percent slopes	486	(1)
Ro	Redding gravelly loam, very shallow, 0 to 3 percent slopes	1, 030	. 1
Rm	Redding loam, 0 to 3 percent slopes	206	(1)
RpD	Redding-Newville complex, 3 to 30 percent slopes	778	(1)
Rr	Riverwash	17, 592	1. 0
RtF	Rock land	32, 007	1. 7
RuF	Rubble land	3, 558	. 2
ScE	Sehorn clay and clay loam, 30 to 50 percent slopes	11, 482	. 6
ScD	Sehorn clay and clay loam, 10 to 30 percent slopes	2, 477	. 1
ShE	Sehorn-Altamont clays, 30 to 50 percent slopes	2, 882	. 1
SmD	Sehorn-Millsholm complex, 10 to 30 percent slopes	5, 827	. 3
SmE	Sehorn-Millsholm complex, 30 to 50 percent slopes	8, 184	. 4
SnE	Sheetiron gravelly loam, 30 to 50 percent slopes	107, 492	5. 5
SnD	Sheetiron gravelly loam, 10 to 30 percent slopes	3, 595	. 2
SnF	Sheetiron gravelly loam, 50 to 65 percent slopes	22, 961	1. 2
SrE	Sheetiron rocky loam, 30 to 50 percent slopes	1, 425	. 1
SrF	Sheetiron rocky loam, 50 to 65 percent slopes	790	(1)
StE	Stonyford stony loam, 30 to 50 percent slopes	6, 985	. 4
StF	Stonyford stony loam, 50 to 65 percent slopes	3, 371	. 2
SuD	Supan stony loam, 10 to 30 percent slopes	14, 772	. 8
SuE	Supan stony loam, 30 to 50 percent slopes	20, 110	1. 1
Tc	Tehama silt loam, 0 to 3 percent slopes	7, 975	. 4
TaA	Tehama loam, 0 to 3 percent slopes	9, 239	. 5
TaB	Tehama loam, 3 to 8 percent slopes	8, 492	. 5
Tb	Tehama gravelly loam, 0 to 3 percent slopes	919	(1)

See footnote at end of table.

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

Soil symbol	Soil	Acres	Percent	Soil symbol	Soil	Acres	Percent
TeF	Terrace escarpments	411	(1)	Vd	Vina loam, deep, 0 to 3 percent slopes	5, 362	0. 3
TgD	Toomes very rocky loam, 10 to 30 percent slopes	106, 473	5. 7	Vw	Vina loam, water table, 0 to 3 percent slopes	791	(1)
TgE	Toomes very rocky loam, 30 to 50 percent slopes	52, 216	2. 8	Vy	Vina clay loam, deep, 0 to 3 percent slopes	1, 318	. 1
TkB	Toomes very rocky silt loam, 1 to 10 percent slopes	6, 165	. 3	WsD	Windy stony sandy loam, 10 to 30 percent slopes	10, 830	. 6
TkD	Toomes very rocky silt loam, 10 to 30 percent slopes	66	(1)	WsE	Windy stony sandy loam, 30 to 50 percent slopes	15, 216	. 8
ThE	Toomes extremely rocky loam, 1 to 50 percent slopes	64, 677	3. 5	WsF	Windy stony sandy loam, 50 to 65 percent slopes	415	(1)
TfD	Toomes rocky loam, 10 to 30 percent slopes	13, 566	. 7	WgD	Windy gravelly sandy loam, 10 to 30 percent slopes	2, 011	. 1
TfE	Toomes rocky loam, 30 to 50 percent slopes	10, 674	. 6	WgE	Windy gravelly sandy loam, 30 to 50 percent slopes	4, 327	. 2
TmD	Toomes-Supan rocky loams, 10 to 30 percent slopes	4, 703	. 2	WnD	Windy rocky sandy loam, 10 to 30 percent slopes	10, 066	. 5
TmE	Toomes-Supan rocky loams, 30 to 50 percent slopes	3, 118	. 2	WnE	Windy rocky sandy loam, 30 to 50 percent slopes	4, 338	. 2
TnD	Toomes-Supan rocky complex, 10 to 30 percent slopes	4, 431	. 2	WnF	Windy rocky sandy loam, 50 to 65 percent slopes	727	(1)
TnE	Toomes-Supan rocky complex, 30 to 50 percent slopes	9, 576	. 5	WrE2	Windy rocky sandy loam, moderately deep, 10 to 50 percent slopes, eroded	4, 541	. 2
ToE	Toomes-Supan extremely rocky complex, 10 to 50 percent slopes	5, 730	. 3	Wz	Wyo silt loam, 0 to 3 percent slopes	435	(1)
TuB	Tuscan cobbly loam, 1 to 5 percent slopes	28, 152	1. 5	Wy	Wyo loam, 0 to 3 percent slopes	1, 433	(1)
TvB	Tuscan cobbly loam, moderately deep, 1 to 5 percent slopes	502	(1)	YbE	Yollabolly very rocky loam, 30 to 65 percent slopes	2, 305	. 1
TtB	Tuscan clay loam, 1 to 8 percent slopes	1, 224	. 1	YbD	Yollabolly very rocky loam, 10 to 30 percent slopes	435	(1)
TwB	Tuscan stony loam, 1 to 5 percent slopes	1, 759	. 1	Yo	Yolo loam	1, 230	. 1
TxC	Tuscan very stony loam, 3 to 15 percent slopes	1, 379	. 1	Ys	Yolo loam, clay loam substratum	493	(1)
TsB	Tuscan loam, 1 to 5 percent slopes	6, 180	. 3	Yt	Yolo clay loam	302	(1)
TyE	Tyson gravelly sandy loam, 30 to 50 percent slopes	5, 122	. 3	Zm	Zamora silt loam, 0 to 3 percent slopes	2, 556	. 1
TyD	Tyson gravelly sandy loam, 10 to 30 percent slopes	330	(1)	Zc	Zamora clay loam, 0 to 3 percent slopes	546	(1)
TyF	Tyson gravelly sandy loam, 50 to 65 percent slopes	2, 020	. 1	Za	Zamora loam, 0 to 3 percent slopes	1, 960	. 1
VnA	Vina loam, 0 to 3 percent slopes	200	(1)	Zo	Zamora silty clay loam, 0 to 3 percent slopes	1, 285	. 1
VnB	Vina loam, 3 to 8 percent slopes	67	(1)		Total land area surveyed	1, 851, 601	100. 00

[1] Less than 0.05 percent.

Aiken Series

The Aiken series consists of moderately steep, well-drained, reddish soils formed in material from basic volcanic rock. These soils are on old volcanic cinder cones in mountainous areas in the eastern part of the county. Their surface soil is loam, and their subsoil is clay. Reaction ranges from nearly neutral in the surface soil to strongly acid in the subsoil. The soils are under a dense cover of ponderosa pine, Douglas-fir, white fir, sugar pine, incense-cedar, and black oak. They are used for the production of timber.

Profile of Aiken loam on a slope of 15 percent facing north, under a moderately dense stand of conifers, hardwoods, and shrubs that has been partly logged (west of Mineral, near the center of the NW¼NW¼ sec. 25, T. 30 N., R. 2 E.):

O1—1 inch to 0, partly decomposed and fresh conifer needles and oak leaves; abrupt, smooth boundary. 1 to 2 inches thick.

A1—0 to 8 inches, weak-red (10R 4/4) loam, dark red (10R 3/6) when moist; strong, fine, granular structure; soft when dry and moist, nonsticky when wet; many, fine and medium roots; very porous; a few, fine, rounded pellets; slightly acid; clear, wavy boundary. 5 to 10 inches thick.

A3—8 to 17 inches, red (10R 4/6) heavy loam, dark red (10R 3/6) when moist; strong, fine to medium, granular structure; soft when dry and moist, nonsticky when wet; many, fine and medium roots; very porous; a few, fine, rounded pellets; slightly acid; clear, wavy boundary. 6 to 12 inches thick.

B1t—17 to 25 inches, red (10R 4/6) clay loam, dark red (10R 3/6) when moist; strong, medium, granular structure; slightly hard when dry, friable when moist; slightly sticky when wet; many, fine and medium roots; very porous; slightly acid; abrupt, wavy boundary. 6 to 12 inches thick.

B2t—25 to 62 inches +, red (10R 4/6) clay, dark red (10R 3/6) when moist; massive; very hard when dry, friable to firm when moist, slightly sticky when wet; a few fine roots, and a few large roots; many, fine and medium pores; medium acid; a few, soft, weathered rocks in the lower part; grades to unweathered cinders at a depth of 8 to 10 feet.

The A horizon is weak-red, red, or reddish-brown sandy loam or loam that is neutral or slightly acid. The subsoil is red or reddish brown and is medium acid or strongly acid. In some places the lower part of the subsoil is yellowish red. In a few places unweathered cinders occur in the profile at a depth of less than 6 feet.

Aiken loam, 10 to 30 percent slopes (AaD).—This is the only Aiken soil mapped in the county. It is on narrow, rounded ridgetops, mostly in fairly small areas. Drainage is good, and runoff is slow. Internal drainage is moderately slow when the soil is saturated, although the soil absorbs water rapidly until it is saturated above the B2t horizon. The available water holding capacity is high, and fertility is moderate. The effective root depth is very deep. Under present cover there is no erosion hazard.

Included with this soil in mapping are small areas of Cohasset, Forward, and Jiggs soils.

Aiken loam, 10 to 30 percent slopes, is used for timber, but apples, pears, and walnuts are grown on similar soils in other parts of the State. Capability unit IVe–1.

Altamont Series

Soils of the Altamont series are nearly level to steep and are well drained and fine textured. They formed in material from hard sandstone and shale and from softly consolidated sediments. The surface soil is brown, neutral clay, and the subsoil is pale-brown, calcareous clay. Altamont soils are nearly free of stones and are on the tops of rounded hills or are on dissected slopes of terraces. They are mostly on foothills in the western part of the county at elevations of 500 to 2,000 feet. The vegetation is annual grass and forbs, and the soils are used for pasture and range.

Profile of Altamont clay on a slope of 10 percent facing west, under a dense stand of annual grasses and forbs (about 3.5 miles north and 1 mile east of Cold Fork, in the southwest corner of the NW¼SW¼ sec. 3, T. 27 N., R. 7 W.):

A11—0 to 2 inches, dark-brown (10YR 4/3) clay; weak, thin, platy structure that breaks to strong, coarse, granular when dry; very hard when dry, firm when moist, sticky when wet; many fine roots; many very fine pores; neutral; abrupt, wavy boundary. 1 to 3 inches thick.

A12—2 to 7 inches, brown (10YR 5/3) clay, dark brown (10YR 4/3) when moist; strong, coarse, prismatic structure when dry, but massive when moist; very hard when dry, firm when moist, sticky when wet; the prisms extend from the horizon above into the horizon below; many fine roots; many fine pores; neutral; clear, wavy boundary. 4 to 9 inches thick.

A13—7 to 17 inches, similar to the A12 horizon just above except that this horizon is moderately alkaline and is slightly calcareous; clear, wavy boundary. 6 to 15 inches thick.

AC—17 to 24 inches, pale-brown (10YR 6/3) clay, brown (10YR 5/3) when moist; massive but breaks to subangular blocky structure; very hard when dry, firm when moist, sticky when wet; a few fine roots; many very fine pores; moderately alkaline and moderately calcareous; clear, wavy boundary. 6 to 12 inches thick.

Cca—24 to 35 inches, similar to the AC horizon, except that this horizon is very calcareous and in places contains segregated lime and a few nodules of lime; contains angular fragments of shale that increase in number with increasing depth; abrupt, very irregular boundary. 10 to 20 inches thick.

R—35 inches +, weathered, hard, dark-gray, fractured shale.

The color of the surface soil ranges from dark brown to dark grayish brown. The soils are less gray with increasing depth, and the lower part of their subsoil is pale brown to yellowish brown. The surface soil is slightly acid to neutral, but in places it contains a few nodules of lime. The amount of lime in the subsoil varies, but segregated lime and nodules of lime are generally present. As the soils dry, prisms a foot or more across form, and deep cracks commonly result. In some places the cracks are nearly 2 feet deep, but they seldom extend into the Cca horizon. The soils range from 2 to 4 feet in depth and are generally more than 30 inches deep.

Altamont clay, 10 to 30 percent slopes (AbD).—This soil is on the tops of rounded hills, mostly in fairly small areas that are irregular in shape. Drainage is good. During the first rains in fall, water intake is very rapid, but when the soil is moist it expands, the cracks close, and intake of water slows. Runoff from the moist soil is slow to moderate. During years of high rainfall, when the soil is wet, areas as much as an acre in size slip as far as 100 feet down slope. The available water holding capacity is high, and fertility is also high.

Included with this soil in mapping are areas of Millsholm and Sehorn soils.

This Altamont soil is one of the best for pasture and range in the county. On most areas the percentage of wild oats and burclover is high. On some areas, however, medusahead wildrye, an undesirable annual grass, has invaded and has considerably reduced the value of the forage. Grain has been grown on some areas. Capability unit IVe–5.

Altamont clay, 30 to 50 percent slopes (AbE).—This steep soil is not suitable for cultivation. Because of the steep slopes, landslips occur more frequently than on the less steep Altamont soils.

This soil is used solely for pasture and range and produces some of the best forage in the county. Capability unit VIe–5.

ALTAMONT CLAYS, TERRACE

The Altamont clay, terrace, soils are on rounded hills in the western part of the county at elevations of 300 to 1,000 feet. They are well-drained soils that formed in softly consolidated sediments. The sediments consist mostly of siltstone that can be cut with a shovel and are part of the Tehama geologic formation. The soils are fine textured and are brown throughout. They have a slightly acid surface soil and are calcareous in the lower part of the subsoil.

Profile of Altamont clay, terrace, on a slope of 26 percent that faces northeast, at an elevation of 550 feet under a crop of barley (11 miles west and 2.5 miles north of Richfield, about 500 feet southeast of the center of the NE¼ of sec. 24, T. 25 N., R. 5 W.):[4]

A11—0 to 18 inches, brown (10YR 5/3) clay, dark brown (10YR 3/3) when moist; massive when dry and moist, but cracks to strong, coarse, prismatic structure when dry; in places the cracks are as much as 30 inches deep; hard when dry, firm when moist, sticky and

[4] This soil and the three other terrace phases of the Altamont series mapped in Tehama County were shown as members of the Walker series on advance sheets published by the University of California Agricultural Extension Service and the California Division of Forestry during the years 1953–59.

plastic when wet; many fine roots; many very fine pores; a plow layer may be broken out of this horizon at a depth of 6 or 9 inches but it is no different than balance of the horizon; slightly acid; gradual, smooth boundary. 10 to 20 inches thick.

A12—18 to 28 inches, brown (7.5YR 5/3) clay, dark brown (7.5YR 3/4) when moist; massive when dry and moist but cracks extend through this horizon from the A11 horizon when the soil is dry; very hard when dry, very firm when moist, very sticky and very plastic when wet; a few fine roots; many very fine pores; polished pressure faces throughout this horizon; mildly alkaline but in places contains lime in the lower part; gradual, irregular boundary. 8 to 15 inches thick.

Cca—28 to 36 inches, this horizon is similar to the A12 horizon but cracks from that horizon seldom extend into this horizon; reaction is moderately alkaline but layers contain much segregated lime; clear, irregular boundary. 6 to 12 inches thick.

C2—36 to 50 inches, pale-brown (10YR 6/3) clay loam, yellowish brown (10YR 5/3) when moist; massive and slightly brittle; very hard when dry, firm when moist; fine pores in places; seams filled with soil material from the Cca horizon; moderately alkaline.

The A11 horizon is dark brown or brown and is slightly acid or neutral. The A12 horizon is brown or is nearly reddish brown. It is neutral or is mildly alkaline in the upper part and is moderately alkaline in the lower part. The C horizon is pale brown, brown, or reddish brown and has flecks of pale yellow or light olive brown. The lime content in the lower part of the C horizon varies in amount, and depth at which the lime occurs also varies. In many places the greatest amount of lime is in the lower part of the C horizon. Segregated lime occurs in the Cca horizon in most places.

Altamont clay, terrace, 0 to 3 percent slopes (AcA).—This soil is less sloping but is otherwise similar to Altamont clay, 10 to 30 percent slopes. It is on remnants of dissected terraces west of the Sacramento River. The areas extend from the low terraces along the river to the foothills. The surface is smooth but rounded, and slopes are gentle. Because of its texture, it is difficult to prepare a seedbed in this soil.

Included with this soil in mapping are small areas of Hillgate, Nacimiento, Newville, and Tehama soils.

If this Altamont soil is irrigated, pasture plants, corn, sugarbeets, alfalfa, olives, walnuts, and prunes can be grown successfully. Areas that are not irrigated are used for dryfarmed grain and for pasture and range. Capability unit IIIs–5.

Altamont clay, terrace, 3 to 10 percent slopes (AcB).—This gently sloping soil has slow runoff and is subject to slight erosion. The areas are too sloping to be irrigated other than by overhead sprinklers. Capability unit IIIe–5.

Altamont clay, terrace, 10 to 30 percent slopes (AcD).—This moderately sloping to strongly sloping soil has slow to medium runoff. The erosion hazard is medium. In places the drainageways are cut by gullies.

Most areas of this soil are used for dryfarmed grain. In many places the rotation is 1 year of grain and 2 to 4 years of forage crops. The quantity of forage produced is large, and its quality is very good. Capability unit IVe–5.

Altamont clay, terrace, 30 to 50 percent slopes (AcE).—This steeply sloping soil is not suitable for cultivation. All areas are used for pasture and range. The quantity of forage produced is large, and its quality is very good. Capability unit VIe–5.

Anita Series

In the Anita series are nearly level, imperfectly drained soils that formed in alluvium derived from such basic volcanic rocks as basalt and andesite. These soils are dark colored, fine textured, and slightly acid to medium acid. They have a hardpan or cemented layer at a depth of 1 to 5 feet. Anita soils are in local basins and in seep areas on high terraces east of the Sacramento River at elevations from about 200 to 500 feet. The vegetation is grasses and forbs. Row crops and pasture are grown in irrigated areas; other areas are used for pasture and range.

Profile of Anita clay in a nearly level field used for grazing sheep; under grasses and forbs of low quality; elevation of 250 feet (1.5 miles north of the Butte County line on U.S. Highway No. 99E, near the southeast corner of sec. 29, T. 24 N., R. 1 W.):

A11—0 to 3 inches, dark-gray (5YR 4/1) clay, very dark gray (5YR 3/1) when moist; massive when wet but breaks to strong, medium, granular structure; extremely hard when dry, very firm when moist, very sticky and plastic when wet; many very fine roots and pores; slightly acid; abrupt, wavy boundary. 2 to 4 inches thick.

A12—3 to 15 inches, dark-gray (5YR 4/1) clay, very dark gray (5YR 3/1) when moist; massive when moist but cracks to strong, coarse, prismatic structure when dry; slickensides are common; a few fine roots and pores; slightly acid; abrupt, wavy boundary. 8 to 60 inches thick.

IICm—15 inches +, stratified brown and pale-brown, hard, cemented soil material (hardpan); the upper half inch of this horizon is very dark gray.

These soils range from black to very dark reddish brown. They are neutral to slightly acid. Rounded cobblestones of basalt and andesite 3 to 12 inches in diameter cover as much as 25 percent of the surface. Depth to the hardpan ranges from 10 inches to nearly 5 feet. When they dry, the soils crack to a coarse, prismatic structure of the kind characteristic of adobe soils. In places the cracks extend to the hardpan.

Anita clay, moderately deep (Af).—This soil is in basins on terraces in areas that vary considerably in size and shape. Depth to the cemented layer is 20 to 36 inches. Some areas have a few rounded cobblestones on the surface. Drainage is imperfect. Runoff and permeability are very slow. If drainage is not provided, water stands on the soil in some places for several weeks at a time during the winter. The available water holding capacity is low to moderate, and fertility is low. It is difficult to prepare a seedbed in this soil.

Included with this soil in mapping are small areas of Keefers and Tuscan soils.

If drainage is provided, Anita clay, moderately deep, is suited to grain and to irrigated pasture. All areas are suitable for pasture and range, but the forage is generally of low quality. The predominant grasses and forbs are nutgrass, fescue, turkeymullein, coyote thistle, tarweed, and brodiea. In places the plant deathcamas, the bulb of which is poisonous to stock, is a hazard. Capability unit IIIw–5.

Anita clay, deep (Ag).—In this soil depth to the cemented layer ranges from 3 to 5 feet. Most areas are ponded during winter and early in spring and are used for pasture and range early in summer. A few areas have been drained, and here grain and irrigated pasture plants are grown. Capability unit IIIw–5.

Anita clay (Ad).—This soil ranges from 10 to 20 inches in depth. Consequently forage on this soil dries a little sooner than on the deeper Anita soils. Capability unit IVw–5.

Anita cobbly clay (An).—This soil is in small basins near the Tuscan soils. Rounded cobblestones of volcanic rock that range from 3 to 10 inches in diameter cover from 5 to 20 percent of the surface. Depth of the soil ranges from 10 to 22 inches.

Included with this soil in mapping are small areas of the Tuscan and Keefers soils.

All areas of Anita cobbly clay are used for pasture and range, and the quality of the forage is poor. Capability unit IVw–5.

Anita cobbly clay, moderately deep (Ao).—This soil has rounded cobblestones of volcanic rock on the surface. The cobblestones range from 3 to 10 inches in diameter and cover from 5 to 15 percent of the surface. Very few cobblestones are within the soil profile.

Included with this soil in mapping are small areas of Keefers and Tuscan soils.

Unless the cobblestones are removed from the surface, it is impractical to cultivate this Anita soil. In a few areas the cobblestones have been pushed aside into ridges and the areas are used for irrigated pasture. Most areas, however, are used for pasture and range. Capability unit IIIw–5.

Anita gravelly clay, moderately deep (Ap).—This soil is 10 to 20 percent of rounded gravel. Irrigated pasture is grown on some areas, but other areas are used for pasture and range. The pebbles and fine texture make this soil difficult to cultivate. Capability unit IIIw–5.

Anita stony clay, 0 to 8 percent slopes (AsB).—This soil is on slopes below seep areas on the upper edges of old fans. Rounded fragments of volcanic rock 6 to 20 inches in diameter cover from 10 to 20 percent of the surface. Depth of the soil ranges from 10 to 22 inches.

Included in mapping are small areas of Toomes and Tuscan soils, which in many places adjoin areas of this soil.

This Anita soil is used for pasture and range. The quality of the forage is poor. Capability unit IVw–5.

Anita-Keefers complex, 0 to 3 percent slopes (At).—This complex consists of Anita clay, moderately deep, and of Keefers loam, moderately deep, 0 to 3 percent slopes. The individual soils occur in small areas in so complex a pattern that they cannot be mapped separately. Either soil may occupy from 20 to 80 percent of any one area. Anita part, capability unit IIIw–5; Keefers part, capability unit IIIs–3.

Arbuckle Series

Soils of the Arbuckle series are nearly level to gently sloping, well drained, and gravelly. They formed in gravelly alluvium derived from sedimentary and metamorphic rocks. The alluvium contains many, light-colored pebbles of quartzite and chert.

These soils have a surface soil of brown, slightly acid gravelly loam or fine sandy loam. The subsoil is brown, neutral gravelly clay loam or loam. It generally grades to a substratum of very gravelly sandy loam, but in places the substratum is dense and slowly permeable.

Arbuckle soils are along most of the streams west of the Sacramento River at elevations between 200 and 1,000 feet. Grass and oak make up the vegetation.

Row crops, field crops, and orchard crops are grown successfully on the Arbuckle soils. Many areas along narrow flood plains are used for range.

Profile of Arbuckle gravelly loam in a nearly level field that has been used for grazing sheep; elevation of about 300 feet (1.5 miles south and 1 mile west of the airport near Red Bluff, in the southeast corner of the SW¼SW¼ of sec. 1, T. 26 N., R. 4 W.):

A11—0 to 2 inches, brown (10YR 5/3) gravelly loam, dark brown (10YR 3/3) when moist; weak, platy structure, hard when dry, friable when moist, nonsticky when wet; many fine roots; many fine pores; slightly acid; abrupt, smooth boundary. 1 to 3 inches thick.

A12—2 to 14 inches, yellowish-brown (10YR 5/4) gravelly loam, dark yellowish brown (10YR 3/4) when moist; massive; hard when dry, friable when moist, nonsticky when wet; many fine roots; many fine and medium pores; slightly acid; clear, smooth boundary. 10 to 20 inches thick.

B1–14 to 25 inches, yellowish-brown (10YR 5/4) gravelly loam, dark yellowish brown (10 YR 3/4) when moist; massive; hard when dry, friable when moist, nonsticky when wet; in places thin clay films are in the pores and on the pebbles; slightly acid; gradual, irregular boundary. 10 to 15 inches thick.

B2t—25 to 59 inches, yellowish-brown (10YR 5/4) gravelly sandy clay loam, dark yellowish brown (10YR 3/4) when moist; massive; hard when dry, friable when moist, sticky when wet; many large, irregular pores; clay films around the pebbles and on the walls of the pores; a few fine roots; neutral; gradual, irregular boundary. 20 to 40 inches thick.

C—59 to 72 inches +, yellowish-brown (10YR 5/4) very gravelly loam, dark yellowish brown (10YR 3/4) when moist; massive; hard when dry, friable when moist, slightly sticky when wet; many large pores; thin clay films around the pebbles and inside of the pores; a few fine roots; neutral.

The A horizon in many places is yellowish brown or pale brown. In a few areas it has a reddish cast, and along Thomes Creek it is nearly grayish brown in color. In areas that have not been cultivated, the A11 horizon is thin and dark brown and has weak, platy structure. The texture of the surface soil ranges from gravelly loam to gravelly fine sandy loam. The B2t horizon is the same color or is slightly redder than the A horizon; it is gravelly fine sandy loam, gravelly loam, or gravelly sandy clay loam. The soils range from slightly acid to neutral.

Arbuckle gravelly loam, 0 to 3 percent slopes (AvA).—This soil is along streams west of the Sacramento River. Some of the areas are more than 500 acres in size, and many areas are long and narrow. Drainage is good, runoff is slow, and permeability is moderate to moderately rapid. The available water holding capacity is moderate, and fertility is also moderate. There is no erosion hazard. The gravel in the soil interferes with preparation of the seedbed and causes the implements used in cultivating the soil to wear excessively. This soil does not hold as much water as soils that are not gravelly, and it therefore requires more frequent irrigation.

Included with this soil in mapping are small areas of Cortina, Hillgate, Maywood, and Tehama soils.

Alfalfa, corn, beans, milo, irrigated pasture plants, olives, prunes, grain, and similar crops can be grown successfully on this Arbuckle soil. Tests show that plants growing in a greenhouse in material from the surface layer

of this soil respond if nitrogen and phosphate are applied. Orchard crops in a few areas along Burch Creek west of Corning are likely to be damaged because of a perched water table. Capability unit IIs–4.

Arbuckle gravelly loam, 3 to 8 percent slopes (AvB).—This sloping soil is in narrow areas along the edges of terraces. Most areas occupy less than 50 acres. Runoff is moderately rapid, and slight sheet erosion has occurred in most of the cultivated areas.

The same crops can be grown on this soil as on Arbuckle gravelly loam, 0 to 3 percent slopes. Irrigation furrows or checks, however, should be placed on the contour. Capability unit IIe–4.

Arbuckle gravelly loam, clayey substratum, 0 to 3 percent slopes (Aw).—This soil is underlain by very slowly permeable clay or partly consolidated siltstone at depths of 3 to 6 feet. The water table is high during years of high rainfall and when excess irrigation water accumulates. Runoff and permeability are slow. The available water holding capacity and fertility are moderate.

Included with this soil in mapping are small areas of Hillgate, Maywood, and Tehama soils. Also included are some Arbuckle soils in the Paskenta area that are underlain by hard shale.

This Arbuckle soil is not suitable for deep-rooted crops; its substratum is slowly permeable. Cereal grains, corn, milo, and irrigated pasture can be grown successfully. Capability unit IIIs–3.

Arbuckle gravelly loam, clayey substratum, channeled (Ay).—This soil is along narrow drainageways in low foothills in the western part of the county. It is channeled by meandering, intermittent streams but otherwise is similar to Arbuckle gravelly loam, clayey substratum, 0 to 3 percent slopes. The streams have cut the soil into areas as small as 20 acres. The areas adjoin the sloping to steep foothills through which the streams flow. Their size and location are such that they cannot be managed separately from the adjoining soils on the foothills.

Included with this soil in mapping are small areas of Cortina, Maywood, and Tehama soils.

Much of this Arbuckle soil is used for pasture and range, but some is used for dryfarmed grain. Capability unit IIIs–3.

Arbuckle gravelly fine sandy loam, 0 to 3 percent slopes (Au).—This soil has a gravelly fine sandy loam surface soil but otherwise is similar to Arbuckle gravelly loam, 0 to 3 percent slopes. It holds less water than the Arbuckle gravelly loam and therefore requires more frequent irrigation. Irrigation runs should be short because the water moves through the soils moderately rapidly.

Crops grown on this soil are similar to those grown on Arbuckle gravelly loam, 0 to 3 percent slopes. Capability unit IIs–4.

Arbuckle-Tehama complex, 0 to 3 percent slopes (Az).—This complex consists of Arbuckle gravelly loam, 0 to 3 percent slopes, and of Tehama loam, 0 to 3 percent slopes. Either soil may occupy from 20 to 80 percent of any one area. Arbuckle part, capability unit IIs–4; Tehama part, capability unit IIs–3.

Berrendos Series

The Berrendos series consists of nearly level, moderately well drained, fine-textured soils. These soils are on narrow flood plains east of the Sacramento River at elevations of 200 to 1,000 feet. They formed in alluvium derived from basic volcanic rock. Berrendos soils have a surface soil of dark grayish-brown, slightly acid light clay or clay loam. The subsoil is dark grayish-brown, neutral clay. These soils are generally more than 6 feet deep, but in a few areas a cemented layer is at a depth of about 3 feet.

Many kinds of crops are grown successfully on the Berrendos soils, but they are more difficult to manage than medium-textured soils. Water penetrates them slowly; they puddle readily, and seedbeds are difficult to prepare in them.

Profile of Berrendos clay in a nearly level area in a prune orchard; elevation of 250 feet (about 2 miles north of Mill Creek and ½ mile east of U.S. Highway No. 99E on 8th Avenue, in the NE¼NE¼ sec. 28, T. 26 N., R. 2 W.):

Ap—0 to 5 inches, dark grayish-brown (10YR 4/2) light clay, very dark grayish brown when moist; strong, medium, subangular blocky structure; very hard when dry firm when moist, very sticky and plastic when wet; many very fine roots and pores; slightly acid; abrupt, smooth boundary. 0 to 8 inches thick.

A1—5 to 14 inches, dark grayish-brown (10YR 4/2) clay, very dark grayish brown when moist; strong, coarse, angular blocky structure; very hard when dry, very sticky and plastic when wet; many fine roots and pores; slightly acid; gradual, smooth boundary. 9 to 20 inches thick.

B1t—14 to 24 inches, dark grayish-brown (10YR 4/2) clay, very dark grayish brown (10YR 3/2) when moist; cracks markedly into large prisms when dry; very hard when dry, very firm when moist, very sticky and plastic when wet; a few fine and medium roots; many very fine pores; a few, fine dark concretions about 1 millimeter in diameter; thin, continuous films in pores; many slickensides; slightly acid; smooth boundary; 8 to 15 inches thick.

B2t—24 to 54 inches, dark grayish-brown (10YR 4/2) clay, very dark grayish brown (10YR 3/2) when moist; coarse, prismatic structure; very hard when dry, very firm when moist, very sticky and plastic when wet; a few fine and medium roots; many very fine pores; moderately thick, continuous clay films; neutral; gradual, wavy boundary. 20 to 40 inches thick.

C—54 to 67 inches +, yellowish-brown (10YR 5/4) clay loam, brown (10YR 4/3) when moist; massive; hard when dry, firm when moist, sticky and plastic when wet; a few roots; many fine pores; neutral.

The A horizon ranges from brown to very dark grayish brown in color and from clay loam to light clay in texture. The darkest soils are in areas that adjoin areas of the Anita soils. The B horizon is about the same color as the A horizon, but it is nearly 7.5YR in hue. Its texture is clay. The C horizon ranges from yellowish brown to dark brown, and it is generally clay loam. These soils are slightly acid or neutral in the surface soil and neutral or mildly alkaline in the subsoil. In places segregated lime occurs in the lower part of the subsoil. In some places a semiconsolidated substratum similar to that of the Tuscan soils occurs at a depth of 3 to 4 feet, particularly along narrow stream channels.

Berrendos clay, 0 to 3 percent slopes (Bc).—This soil is on flood plains east of the Sacramento River. It is generally deep, but where it is near areas of Tuscan soils a semiconsolidated layer occurs within 5 to 8 feet of the surface.

This soil is moderately well drained. Runoff and permeability are slow. The available water holding capacity and fertility are moderate. There is no erosion hazard. In some areas water stands on the surface for short periods after a rain. Because the water intake rate is slow, irrigation water can be applied at a slow rate for a fairly long period of time. It is difficult to prepare a seedbed in this soil.

Included with this soil in mapping are small areas of Los Robles and Anita soils.

Irrigated crops such as alfalfa, pasture, milo, sugarbeets, corn, and prunes are grown on this Berrendos soil. Some areas are used for pasture and range or for dryfarmed grain. These are grown in rotation with other crops or in areas where irrigation water is not available. Capability unit IIIw–5.

Berrendos clay, hardpan substratum, 0 to 3 percent slopes (Bd).—This soil is along entrenched drainageways several feet below areas of Tuscan soils, or it is on alluvial fans below but in the vicinity of those soils. It has an unrelated cemented layer at a depth of 3 to 5 feet. The alluvium from which it formed was deposited on this rocklike, cemented layer, which roots and water cannot penetrate.

This soil is not suitable for deep-rooted crops, because the root zone is restricted and a perched water table injurious to roots may form over the cemented layer. Barley, irrigated pasture, corn, beans, and similar crops can be grown successfully. Some areas along narrow drainageways that are too small and irregular in shape to be used intensively for agriculture are used for pasture and range. Capability unit IIIw–5.

Berrendos clay loam, 0 to 3 percent slopes (Bg).—This soil has less clay in the surface soil but is otherwise similar to Berrendos clay, 0 to 3 percent slopes. It is also easier to cultivate, and water moves through it faster.

Small areas of Los Robles soils are included with this soil in mapping.

The crops grown on this Berrendos soil are similar to those grown on Berrendos clay, 0 to 3 percent slopes. Capability unit IIs–5.

Berrendos clay loam, hardpan substratum, 0 to 3 percent slopes (Bh).—This soil has less clay in the surface soil but is otherwise similar to Berrendos clay, hardpan substratum, 0 to 3 percent slopes. It is also easier to cultivate, and water moves through it faster.

The crops grown on this soil are similar to those grown on Berrendos clay, hardpan substratum, 0 to 3 percent slopes. Capability unit IIIs–8.

Burris Series

Soils of the Burris series are gently sloping to moderately sloping and are fine textured and imperfectly drained. These soils formed in alluvium or colluvium from basic igneous rock. They are deep, very dark gray soils and are clay throughout. The surface soil is slightly acid, and the subsoil is mildly alkaline and calcareous. Most of the soils contain some angular cobblestones of basalt. The soils are on alluvial fans around the edges of flat-topped buttes. A small area occurs around Black Butte in the southwestern part of the county. Elevations range from 500 to 700 feet. The vegetation is grasses and forbs, and the soils are used for pasture and range.

Profile of Burris stony clay on a slope of 8 percent that faces east; grazing land consisting of annual grasses and forbs; elevation of 550 feet (in Glenn County on the east side of the buttes near Orland, near the center of sec. 5, T. 22 N., R. 4 W.):

A11—0 to 7 inches, very dark gray (2.5Y 3/1) stony clay, dry and moist; strong, coarse, angular blocky structure when dry, but strong, medium to coarse, granular structure in the uppermost ¼- to 1-inch part of this layer; very hard when dry, very firm when moist, sticky and plastic when wet; abundant very fine roots; many very fine pores; slightly acid (pH 6.1); clear, smooth boundary. 6 to 11 inches thick.

A12—7 to 19 inches, very dark gray (2.5Y 3/1) cobbly clay dry and moist; coarse, blocky structure; very hard when dry, very firm when moist, sticky and plastic when wet; many slickensides; slightly acid (pH 6.5); clear, wavy boundary. 6 to 15 inches thick.

AC—19 to 31 inches, olive-gray (5Y 4/2) cobbly clay, dry and moist; contains more cobblestones than the A12 horizon; massive; very hard when dry, very firm when moist, very sticky and plastic when wet; a few very fine roots; many, very fine, tubular pores; many slickensides; neutral (pH 7.2) and slightly calcareous and contains a few, small, soft concretions of lime; clear, wavy boundary. 8 to 15 inches thick.

Cgca—31 to 46 inches +, mottled dark-gray (5Y 4/1), olive-gray (5Y 5/2), and white (5Y 8/1), angular cobbly clay, mottled dark gray (5Y 4/1), olive gray (5Y 4/2), light gray (5Y 7/2), and light olive brown (2.5Y 5/6) when moist; massive; very hard when dry, firm when moist, sticky and plastic when wet; mildly alkaline (pH 7.7) and strongly calcareous and contains many lime concretions; permanently moist or wet; many inches thick.

The A horizon ranges from dark gray to black in color. The C horizon is dark grayish brown, olive brown, or olive. These soils are slightly acid in the surface soil and alkaline in the C horizon, which is strongly calcareous. Variable amounts of angular pebbles, cobblestones, and boulders are scattered over the surface of the soil.

Burris stony clay, 10 to 30 percent slopes (BuD).—This is the only Burris soil mapped in the county. All of it is near Black Butte on the south edge of the county. Angular stones, some more than 10 inches in diameter, are scattered over 1 to 5 percent of the surface. Slopes are less than 800 feet long, but they are cut by short drainageways, which make them uneven. Drainage is imperfect, runoff is medium, and permeability is very slow. The available water holding capacity and fertility are moderate. Seeps are common near the upper edge of the slopes. The erosion hazard is slight to moderate.

Small areas of Altamont and Toomes soils are included with this soil in mapping.

Burris stony clay, 10 to 30 percent slopes, is used for pasture and range. The quality of the forage is good. Most areas, however, have been invaded by medusahead, an undesirable grass. Because of the stones, the slopes, and inaccessibility of the areas, this soil is not well suited to intensive use for agriculture. Capability unit VIe–5.

Childs Series

Soils of the Childs series are gently sloping to moderately steep, moderately well drained, and medium textured. They formed in alluvium derived from dominantly basic igneous rocks. The surface soil is dark-gray, strongly acid to medium acid gravelly loam. The subsoil is light-gray, neutral gravelly clay loam. These soils are on

alluvial fans at high elevations in the eastern part of the county; slopes are short. The fans appear to have been wet meadows that have been drained by entrenched streams. The vegetation is sparse and is mainly grasses and forbs but includes some conifers (fig. 2). The Childs soils are used for pasture and range and for timber.

Profile of Childs gravelly loam on a slope of 10 percent that faces south; under sparse vegetation, mainly grasses and forbs, but includes a few ponderosa and lodgepole pines; elevation of 5,000 feet (0.5 mile east of California Highway 36 on Wilson Lake Road, in the southeast corner of the SW¼NW¼ sec. 30, T. 29 N., R. 5 E) :

A11—0 to 5 inches, dark-gray (10YR 4/1) gravelly loam, very dark gray (10YR 3/1) when moist; strong, very fine, granular structure; slightly hard when dry, very friable when moist; many very fine roots and pores; strongly acid; gradual, smooth boundary. 2 to 8 inches thick.

A12—5 to 16 inches, dark-gray (10YR 4/1) gravelly loam, black (10YR 2/1) when moist; massive; hard when dry, friable when moist, slightly sticky and slightly plastic when wet; a few very fine roots; many very fine pores; medium acid; gradual, smooth boundary. 4 to 12 inches thick.

A3 & B1—16 to 31 inches, gray (10YR 5/1) gravelly loam, very dark gray (10YR 3/1) when moist; massive; hard when dry, friable when moist, slightly sticky and slightly plastic when wet; a few very fine roots; common very fine pores; a few, thin discontinuous clay films in pores that increase in number with increasing depth; medium acid; gradual, smooth boundary. 10 to 24 inches thick.

B2t—31 to 50 inches, light-gray (10YR 6/1) gravelly clay loam, dark gray (10YR 4/1) when moist; massive; hard when dry, firm when moist, slightly plastic and slightly sticky when wet; a few very fine roots; many fine pores; many, moderately thick, continuous clay films in pores; neutral; gradual, smooth boundary. 15 to 25 inches thick.

C—50 to 64 inches, light-gray (10YR 7/2) gravelly loam that is nearly a gravelly clay loam, grayish brown (2.5Y 5/2) with common, medium, distinct mottles of strong brown (7.5YR 4/6) when moist; massive; very hard when dry, firm when moist, slightly plastic and slightly sticky when wet; a few roots; common very fine pores; weakly cemented, does not slake down in water; neutral.

Variations are mainly in the thickness of the horizons, in stratification of the parent material, and in depth to mottling. In some places the parent material contains strata of gravel, and in a few places the strata consist of cobblestones and larger stones. Mottles are visible in the C horizon when the soils are moist.

Childs gravelly loam, 5 to 15 percent slopes (CaC).—This is the only Childs soil mapped in the county. It is in mountain meadows in the eastern part of the county. Slopes are short and are cut by one or more stream channels. The soil is moderately well drained. Runoff is slow to medium, and permeability is moderately slow. The available water holding capacity is moderate, and fertility is low. There is no erosion hazard other than that caused as the streams that flow through the areas deepen and widen their channels.

Small areas of Chummy, Elam, and Nanny soils are included with this soil in mapping.

Childs gravelly loam, 5 to 15 percent slopes, is used for pasture and range and for timber. The quality of the forage is very poor. The timber occurs in open stands, and its quality is poor. Capability unit VIIs-4.

Chummy Series

In the Chummy series are nearly level, poorly drained soils formed from alluvium. The alluvium was derived from volcanic rocks that ranged from andesite to rhyolite in composition. The soils have an organic mat over a dark-gray surface soil. The layers in the lower part of the profile range from light gray to greenish gray, and they are always wet. The soils are medium textured to moderately fine textured throughout but in places contain stratified gravel. Reaction ranges from medium acid in the surface soil to neutral in the lower part of the subsoil. When dry, these soils become more acid. The Chummy soils are in mountain meadows in the eastern part of the county at elevations of 4,000 to 6,000 feet. A dense cover of sedges, grasses, and forbs grows on the soils, which are used for summer pasture and range.

Profile of Chummy silty clay loam (in mapping unit Chummy soils, 0 to 3 percent slopes) in a nearly level area used for grazing from May through August; under a dense cover of grasses, sedges, and forbs; elevation of 5,000 feet (about 200 feet from the northwest corner of Wilson Lake, near the center of the NW¼SW¼ sec. 28, T. 29 N., R. 5 E.) :

O1—2 inches to 0, material that consists mainly of a tangled mat of roots and decaying organic matter but that includes a small amount of mineral soil material; medium acid; abrupt, smooth boundary. 2 to 8 inches thick.

A11—0 to 9 inches, dark-gray (10YR 4/1) silty clay loam near silty clay, black (10YR 2/1) when moist; strong, medium, subangular blocky structure; hard when dry, friable when moist, slightly plastic and slightly sticky when wet; abundant very fine roots; many very fine pores; medium acid; clear, wavy boundary. 6 to 12 inches thick.

A12g—9 to 23 inches, light-gray (10YR 6/1) light clay loam, gray (10YR 5/1) when moist; nearly massive; slightly hard when dry, friable when moist, nonplastic and nonsticky when wet; many very fine roots; many very fine pores; medium acid; abrupt, smooth boundary. 10 to 15 inches thick.

C1g—23 to 29 inches, light brownish-gray (10YR 6/2) loam, dark grayish brown (10YR 4/2) when moist; massive; slightly hard when dry, friable when moist, slightly plastic and slightly sticky when wet; a few very fine roots; many fine pores; a few, fine, reddish-brown concretions; a thin, discontinuous, reddish-brown layer that is partly cemented and about one-fourth inch thick is near the base of this horizon; medium acid; clear, smooth boundary. 5 to 10 inches thick.

C2g—29 to 39 inches, strongly mottled light-gray (10YR 7/1), gray (10YR 5/1), and yellowish-brown (10YR 5/8) clay loam, gray (10YR 5/1), grayish brown (10YR 5/2), and brown (10YR 4/3) when moist; massive; a few very fine roots; many very fine pores; medium acid; abrupt, smooth boundary. 2 to 10 inches thick.

C3g—39 to 60 inches +, light-gray (2.5Y 7/2) and pale-yellow (2.5Y 7/4) light clay loam, greenish gray (5GY 5/1) and dark yellowish brown (7.5YR 4/4) when moist; color is light olive brown (2.5Y 5/4) if dried and rewet; massive; slightly hard when dry, friable when moist but slightly brittle when first displaced, slightly plastic and slightly sticky when wet; a few very fine roots; a few very fine pores; neutral; this horizon is always wet.

In color the A11 horizon ranges from very dark gray to very dark grayish brown, the A12g horizon from light gray to grayish brown, and the C1g horizon from light brownish gray to pale brown. Undried soils in the field are medium acid, about pH 6.0, in the surface soil. Acid-

Figure 2.—**Childs Meadows, a mountain meadow in eastern Tehama County. Childs and Nanny soils are in the foreground.**

ity decreases gradually with increasing depth to neutral in the C3g horizon. As the soils dry, they become more acid, and the C3g horizon in dry soils is very strongly acid, pH 5.0. The amount of gravel throughout the profile varies. In places a thin, discontinuous, iron-cemented layer is below the C2g horizon.

Chummy soils, 0 to 3 percent slopes (Cb).—This mapping unit is made up of variable amounts of Chummy silt loam, 0 to 3 percent slopes; Chummy gravelly silt loam, 0 to 3 percent slopes; Chummy silty clay loam, 0 to 3 percent slopes; and Chummy gravelly silty clay loam, 0 to 3 percent slopes. The soils are in wet meadows, and most areas are nearly level and smooth. In places along the edges of some of the meadows, however, the areas are gently sloping and are on fans kept wet by water from springs or short streams.

These soils have poor drainage. Runoff is very slow, permeability is moderately slow, and the available water holding capacity is high. Fertility is moderate. Depth to the water table varies considerably. The water table is near the surface early in summer and may be as deep as 5 feet in fall. Boggy areas near the center of the meadows are likely to trap animals that graze there. In winter the soils are partly frozen and covered with snow.

Included with this mapping unit are small areas of Childs, Elam, and Nanny soils.

All areas of Chummy soils, 0 to 3 percent slopes, are used for pasture and range. The quality of the forage varies considerably, according to the plant composition. Sedges, rushes, Spanish clover, bluejoint, slender muhly (*Muhlenbergia filliformis*), and alpine timothy are the dominant grasses and forbs. Capability unit Vw–2.

Clear Lake Series

The Clear Lake series consists of nearly level, dark-colored, poorly drained soils. These soils formed in alluvium derived from areas of sedimentary rocks. These soils are very dark gray, neutral clay to a depth of 2 to 3 feet. The subsoil is light-gray or light yellowish-gray,

calcareous clay loam or clay. Clear Lake soils are in basins west of the Sacramento River. All of the acreage has been cultivated.

Profile of Clear Lake clay in a nearly level area under irrigated pasture (1.75 miles south and 0.75 mile east of the Corning Memorial Hospital, 800 feet north and 500 feet east of the southwest corner of sec. 25, T. 24 N., R. 3 W.):

A11—0 to 3 inches, very dark gray (N 3/0) clay, black (N 2/0) when moist; strong, fine, granular structure in the uppermost part, but strong, coarse, blocky below; extremely hard when dry, firm when moist, very sticky and plastic when wet; many very fine roots and pores; neutral; clear, wavy boundary. 3 to 6 inches thick.

A12—3 to 13 inches, very dark gray (N 3/0) clay, black (N 2/0) when moist; strong, very coarse, prismatic structure; extremely hard when dry, extremely firm when moist, very sticky and plastic when wet; many very fine roots and pores; neutral; gradual, smooth boundary. 8 to 12 inches thick.

A13—13 to 19 inches, very dark gray (N 3/0) clay, black (N 2/0) when moist; strong, very coarse, prismatic structure; extremely hard when dry, extremely firm when moist, very sticky and plastic when wet; many, very fine roots and pores; numerous slickensides; neutral; gradual, smooth boundary. 6 to 10 inches thick.

AC—19 to 27 inches, very dark gray (N 3/0) clay, black (N 2/0) when moist, with tongues of the underlying horizon intermixed; moderate, coarse, prismatic structure; extremely hard when dry, extremely firm when moist, very sticky and plastic when wet; a few very fine roots and pores; many slickensides; a few, fine, soft, dark-reddish concretions; neutral, abrupt, irregular boundary. 8 to 12 inches thick.

C1—27 to 43 inches, light-gray (2.5Y 7/2) clay loam that contains some pebbles, light brownish gray (2.5Y 6/2) when moist; (small parts of the A horizon are intermixed throughout the upper part); massive; very hard when dry, firm when moist, sticky and plastic when wet; a few very fine roots; a few, very fine, tubular pores; neutral; a few fine segregations of lime; clear, wavy boundary. 12 to 20 inches thick.

C2—43 to 60 inches +, light yellowish-brown (2.5Y 6/4) clay, light olive brown when moist; massive; very hard when dry, very firm when moist, very sticky and plastic when wet; neutral; a few fine segregations of lime.

In color the A horizon ranges from black to very dark grayish brown, and the C horizon, which is generally mottled, from light gray to light yellowish brown. In some places pebbles occur in the A horizon. This horizon is slightly acid or neutral. The C horizon ranges from clay loam to clay in texture, and in some places it is gravelly. This horizon is generally calcareous. In many places during the winter, the water table is 3 to 5 feet below the surface, but when the soils are irrigated during the summer, it is less than 5 feet below the surface in places. Cracks 1 to 3 inches wide occur in the soils in summer. Tongues of material from the A and C horizons extend downward in most areas.

Clear Lake clay (Cc).—This is the only Clear Lake soil mapped in the county. It is smooth and nearly level and is in small basins on low terraces west of the Sacramento River. Drainage is poor, and runoff and permeability are very slow. The available water holding capacity is moderate, and fertility is also moderate. There is no erosion hazard. Because of its fine texture, it is difficult to cultivate and to prepare a seedbed in this soil. The soil stays wet during most of the winter, which also makes it difficult to manage. Plants growing in the greenhouse on this soil respond to fertilizer that contains nitrogen and phosphate.

Included with this soil in mapping are small areas of Hillgate and Tehama soils.

This Clear Lake soil is not suited to orchards or other deep-rooted crops, because water stands on it during the winter and damages the roots of these crops. In most areas the crop rotation is pasture and range plants for grazing sheep. If water is available, irrigated crops of pasture and milo are suitable. Capability unit IIIw-5.

Cohasset Series

In the Cohasset series are gently sloping to steep, well-drained soils that formed in material weathered from such volcanic rocks as andesite and breccia. The surface soil is brown, has granular structure, is medium textured, and is slightly acid to medium acid. The subsoil is reddish brown, has subangular blocky structure, is moderately fine textured, and is strongly acid to very strongly acid. Depth to partly weathered rock ranges from about 3 to 6 feet. In some places these soils are stony throughout.

Cohasset soils are in the eastern part of the county at elevations ranging from 3,000 to 5,000 feet. The vegetation is mostly various kinds of conifers but includes a few hardwoods. These soils are used mostly for timber.

Profile of Cohasset loam on a slope of 24 percent that faces west; under conifers, mainly ponderosa pine; elevation of 3,500 feet (about 3 miles southwest of Lassen Lodge, ¼ mile south of the north quarter-corner of sec. 33, T. 29 N., R. 2 E.):

O1 & O2—3 inches to 0, fresh, partly decomposed and decomposed needles from pines and firs; abrupt, smooth boundary. 2 to 4 inches thick.

A1-0 to 4 inches, brown (7.5YR 5/4) loam, dark reddish brown (5YR 3/4) when moist; strong, medium to fine, granular structure; soft when dry, very friable when moist, nonsticky when wet; many, hard, rounded concretions 2 to 3 millimeters in diameter; many large pores; slightly acid; abrupt, smooth boundary. 2 to 6 inches thick.

A3—4 to 15 inches, brown (7.5YR 5/4) loam, dark reddish brown (5YR 3/4) when moist; medium, granular structure; slightly hard when dry, friable when moist, slightly sticky when wet; medium acid; gradual, wavy boundary. 5 to 15 inches thick.

A1—0 to 4 inches, brown (7.5YR 5/4) loam, dark reddish brown (5YR 4/4) when moist; strong, medium, subangular blocky structure; hard when dry, friable when moist, slightly sticky when wet; a few medium roots and a few large roots; many fine pores; strongly acid; gradual, irregular boundary. 5 to 15 inches thick.

B2t—29 to 55 inches, reddish-brown (5YR 5/4) clay loam, reddish brown (5YR 4/4) when moist; massive; hard when dry, friable when moist, slightly sticky when wet; a few, thin, patchy clay films; a few weathered stones in the lower part; very strongly acid; diffuse boundary. 5 to 25 inches thick.

R—55 to 72 inches +, weathered volcanic rock.

The A horizon is brown or reddish-brown loam or sandy loam that is slightly acid or medium acid. The B horizon is generally reddish brown, but in some places it is yellowish brown in the lower part. It is strongly acid or very strongly acid clay loam. The amount of angular pebbles and cobblestones on the surface and throughout the profile varies.

Cohasset loam, 10 to 30 percent slopes (CdD).—This soil is on the tops of partly rounded ridges. Some areas cover more than 100 acres, have fairly uniform slopes, and are only slightly uneven. Depth to partly weathered rock

ranges from 3 to 4 feet. Drainage is good, runoff is slow, and permeability is moderate. The available water holding capacity and fertility are moderate. There is no erosion hazard, except in roadways, timber-loading areas, and similar excessively disturbed areas. Plants growing in the greenhouse on this soil respond to fertilizer that contains nitrogen, sulfur, and phosphate.

Included with this soil in mapping are small areas of Aiken, Lyonsville, Jiggs, and McCarthy soils. Also included are small areas of rock outcrops.

Apples are grown on a small acreage of Cohasset loam, 10 to 30 percent slopes, that has been cleared. In some areas of this soil, cattle are grazed during the summer, but in many of these yields of forage are limited. Ponderosa pine, sugar pine, Douglas-fir, and incense-cedar are conifers that are harvested for timber. Besides the conifers, black oak, squawcarpet, deerbrush, and greenleaf manzanita provide browse areas and shelter for wildlife. Because of the climate and the small amount of water available for irrigation, this soil is not likely to be used intensively for agriculture. Capability unit IVe–1.

Cohasset loam, 30 to 50 percent slopes (CdE).[5]—Most areas of this soil are along the upper edges of canyons. Because of the steep slopes, it is more difficult to harvest timber from this soil than from Cohasset loam, 10 to 30 percent slopes. The hazard of erosion is also greater. Capability unit VIe–1.

Cohasset loam, 50 to 65 percent slopes (CdF).[6]—Because of the steep slopes, it is difficult to harvest timber from this soil. Capability unit VIe–1.

Cohasset loam, very deep, 10 to 30 percent slopes (CeD).—This soil ranges from 4 to 6 feet in depth to partly weathered volcanic rock but is otherwise similar to Cohasset loam, 10 to 30 percent slopes. The available water holding capacity is high. Timber grows at a rapid rate on this soil, mainly because of the depth. Capability unit IVe–1.

Cohasset stony loam, 30 to 50 percent slopes (CgE).—The surface of this steeply sloping soil is covered by rock fragments as much as 3 to 36 inches in diameter. Because of the steep slopes and the rocks on the surface, it is difficult to harvest timber from this soil. Capability unit VIs–1.

Cohasset stony loam, 10 to 30 percent slopes (CgD).—This soil has more uneven slopes than other Cohasset soils. Angular rock fragments that range from about 3 to 36 inches in diameter occupy as much as 5 to 25 percent of the surface. The amount of rock in the profile increases with increasing depth. Depth to fractured volcanic rock varies, but it is dominantly from 36 to 48 inches. The stones interfere with harvesting of timber and also damage the trees that are harvested. Capability unit VIs–1.

Cohasset stony loam, moderately deep, 10 to 30 percent slopes, eroded (ChD2).—This soil is along ridgetops that were used as driveways for sheep and cattle. About 12 inches of the surface layer has been lost through erosion. Angular stones that range from 3 to nearly 36 inches in diameter are scattered on 5 to 25 percent of the surface. The available water holding capacity is moderate to low. Depth to partly weathered volcanic rock is 24 to 36 inches.

Included with this soil in mapping are small areas of Cohasset soils that are not eroded.

Timber is grown on this Cohasset soil, and some areas are used for loading timber. Trees on this soil grow less well than on the Cohasset soils that are not eroded, and the stands are not so dense. Capability unit VIs–7.

COHASSET GRAVELLY LOAMS

Profile of Cohasset gravelly loam on a slope of 30 percent that faces south; under a moderately dense stand of conifers (1 mile west and 1 mile south of Lassen Lodge or in the SE¼SE¼ of sec. 27, T. 29 N., R. 2 E.):[7]

O1 & O2—1 inch to 0, forest litter made up of fresh and partly decomposed needles and leaves; abrupt, smooth boundary.

A1—0 to 2 inches, brown (7.5YR 5/4) gravelly loam, dark reddish brown (5YR 3/4) when moist; moderate, medium, granular structure; soft when dry, friable when moist, nonsticky when wet; many fine roots; very porous; many, small, rounded, hard mineral pellets or shot with concentric rings; medium acid; abrupt, wavy boundary. 2 to 7 inches thick.

A3—2 to 8 inches, reddish-brown (5YR 4/4) gravelly loam, dark reddish brown (5YR 3/4) when moist; subangular blocky structure; slightly hard when dry, friable when moist, nonsticky when wet; many fine roots; very porous; many hard rounded pellets; medium acid; abrupt, wavy boundary. 5 to 10 inches thick.

B1t—8 to 24 inches, similar to the A3 horizon, except it is near clay loam in texture, has thin patchy clay films, and has fewer rounded pellets; clear, irregular boundary. 6 to 20 inches thick.

B21t—24 to 39 inches, yellowish-red (5YR 5/6) gravelly clay loam, yellowish red (5YR 5/6) when moist; subangular blocky structure; hard when dry, firm when moist, slightly sticky when wet; a few medium and coarse roots; many fine and medium pores; thin, nearly continuous clay films in pores and voids; highly weathered rock fragments in some places; medium acid; diffuse boundary. 15 to 30 inches thick.

B22t—39 to 54 inches +, similar to the B21t horizon, except the amount of rock fragments increases with depth; in some places the fragments are highly weathered.

The surface layer is generally brown or reddish-brown gravelly loam, but in some places it is sandy loam or silt loam that is slightly acid or medium acid. The subsoil is strong-brown, reddish-brown, or yellowish-red clay loam. It contains varying amounts of rock fragments. Depth ranges from 40 to 60 inches.

Cohasset gravelly loam, 10 to 30 percent slopes (CfD).—This soil has smooth, rounded slopes. About 10 to 25 percent of the soil is made up of angular gravel. Less than 2 percent of the surface is covered by large rocks, some of which are nearly 2 feet in diameter. The available water holding capacity is moderate. Depth of the soil ranges from 4 to 6 feet.

Included with this soil in mapping are areas of Aiken, Guenoc, and Supan soils.

Most areas of this Cohasset soil are used for timber, but a few cleared areas where irrigation water is available are used for apples, pears, and pasture. Capability unit IVe–4.

[5] This soil includes some soils shown as members of the Boomer series on advance sheets published by the University of California Agricultural Extension Service and the California Division of Forestry during the years 1953–59.

[6] This soil was shown as a member of the Boomer series on advance sheets published by the University of California Agricultural Extension Service and the California Division of Forestry during the years 1953–59.

[7] This soil and the other phase of Cohasset gravelly loam were shown as members of the Salminas series on advance sheets published by the University of California Agricultural Extension Service and the California Division of Forestry during the years 1953–59.

Cohasset gravelly loam, 30 to 50 percent slopes (CfE).—Because of its steep slopes, it is difficult to cultivate this soil and to harvest timber from it. Capability unit VIe–4.

Colluvial Land, Sedimentary Rocks

Colluvial land, sedimentary rocks (ClF) consists of areas of loose rock and soil material. Slopes are very steep. The rocks are of sandstone, shale, and mica schist. Most areas are in the mountains on the west side of the county and have a dense cover of hardwoods or shrubs.

Included in mapping are small areas of Hugo, Josephine, Los Gatos, Maymen, Sheetiron, and Tyson soils.

Little use is made of areas of Colluvial land, sedimentary rocks, other than to provide browse and cover for wildlife. Capability unit VIIIs–8.

Colluvial Land, Volcanic Rocks

Colluvial land, volcanic rocks (CkF) is made up of areas of loose rock and soil material. Slopes are very steep. The rocks are from volcanic flow or are volcanic breccia. Most areas are in the eastern part of the county. The vegetation is grass, hardwoods, shrubs, and conifers.

Included in mapping are areas of Iron Mountain, McCarthy, Supan, Toomes, and Windy soils.

Some areas of Colluvial land, volcanic rocks, are used for limited grazing. Timber has been harvested from a few areas. Capability unit VIIs–7.

Columbia Series

The Columbia series consists of nearly level to gently sloping, brown, well-drained, neutral soils that are medium textured to moderately coarse textured. These soils formed in alluvium from sedimentary, metamorphic, and igneous rocks. They are on recent flood plains along the Sacramento River and Cottonwood Creek. The vegetation is hardwoods, shrubs, and grass.

Row crops, field crops, and orchard crops grow well in most areas of these soils. The soils are generally easy to cultivate and are located where water is available for irrigation. In areas near the Sacramento River the soils are cut by partly abandoned stream channels, and in places near the river they are subject to overflow during winters of high rainfall. Flooding has been considerably reduced, however, since Shasta Dam was built. The dam is about 40 miles north of Red Bluff on the Sacramento River.

Profile of Columbia silt loam in a nearly level grazing area that is cut by an abandoned stream channel; under a dense growth of valley oaks, sycamores, California wild grapes, wild carrots, bull thistles, and annual and perennial grasses (about 1 mile south and 5 miles east of Kirkwood or east of the center of the NW¼NE¼NE¼ sec. 22, T. 23 N., R. 2 W.):

A1 and C1—0 to 26 inches, brown (10YR 5/3) silt loam, dark brown (10YR 4/3) when moist; massive; hard when dry, friable when moist, slightly sticky when wet; many fine and medium pores and holes left by roots and worms; many fine roots; neutral; clear, smooth boundary.

C2—26 to 72 inches +, brown (10YR 5/3) fine sandy loam, dark brown (10YR 4/3) when moist; massive; slightly hard when dry, friable when moist, nonsticky when wet; many fine and medium pores; a few fine roots, and a few large roots; neutral; this horizon is stratified with layers of sand that are 2 to 4 inches thick.

These soils range in color from brown and pale brown to grayish brown throughout. Where organic matter has accumulated on the surface, an A horizon has formed, and the surface soil is a little darker than the horizons below. Texture of the surface soil ranges from silt loam to loamy sand, and in places near the river the subsoil is gravelly. These soils are slightly acid to neutral in the surface soil and neutral to mildly alkaline in the subsoil. The lower part of the subsoil is very slightly calcareous in places.

Columbia fine sandy loam, 0 to 3 percent slopes (CmA).—This soil is on flood plains along the Sacramento River and Cottonwood Creek, and some areas are 100 acres or more in size. Most areas are nearly level and smooth and have been cut by abandoned stream channels in a few places. Drainage is good, runoff is very slow, and permeability is moderately rapid. The available water holding capacity and fertility are moderate. Plants growing in the greenhouse on this soil respond to fertilizer that contains nitrogen and phosphate. Streambank erosion is a hazard to areas that adjoin the main stream channel. The soil is easy to cultivate.

Included with this soil in mapping are small areas that have a gravelly subsoil and some areas of Zamora soils.

If this Columbia fine sandy loam is irrigated, alfalfa, beans, corn, milo, melons, sugarbeets, almonds, peaches, walnuts, and prunes are grown. Areas that are not clear of vegetation are used for grazing. Capability unit I–1.

Columbia fine sandy loam, moderately deep, 0 to 3 percent slopes (Cn).—This soil has a layer of gravel and sand at a depth of 30 to 40 inches but is otherwise similar to Columbia fine sandy loam, 0 to 3 percent slopes. In some places the gravelly and sandy layer is several feet thick. The areas are near the Sacramento River and are generally subject to overflow during winter when rainfall is high. Most areas are fairly smooth, but a few areas are cut by channels of abandoned streams.

Many kinds of crops grow well on this soil. The gravelly and sandy subsoil make this soil somewhat droughty. Irrigation runs should therefore be shorter and the water applied more frequently than on Columbia fine sandy loam, 0 to 3 percent slopes. Capability unit IIs–0.

Columbia fine sandy loam, 3 to 8 percent slopes (CmB).—This soil is in areas that are cut by several channels of abandoned streams. The surface is mostly smooth but is partly rounded in places cut by stream channels. Runoff is slow, and the erosion hazard is slight.

Crops grown on this soil are similar to those grown on Columbia fine sandy loam, 0 to 3 percent slopes. The areas must be leveled before they can be irrigated or before overhead sprinklers can be used. Capability unit IIe–1.

Columbia loam, 0 to 3 percent slopes (Co).—This soil is loam throughout the profile but is otherwise similar to Columbia fine sandy loam, 0 to 3 percent slopes. The available water holding capacity is high. Water moves through the soil at a moderate rate. Capability unit I–1.

Columbia loamy fine sand, 1 to 8 percent slopes (CpB).—Except for the texture of the surface soil, this soil is similar to Columbia fine sandy loam, 0 to 3 percent slopes. Water moves through it more rapidly than

through the Columbia fine sandy loams, and the soil holds less water.

This soil is too droughty for crops unless it is irrigated. Overhead sprinklers are needed for irrigating the soil. For most crops, fairly short intervals are needed between irrigations. Capability unit IIs–0.

Columbia silt loam, 0 to 3 percent slopes (CsA).—This soil is in large areas along the Sacramento River and Cottonwood Creek. The areas are far enough above the streams so that the soil is seldom affected by flooding. Most areas are smooth, though some areas are cut by channels of abandoned streams. This soil is well drained, runoff is very slow, and permeability is moderate. The available water holding capacity and fertility are high. There is no erosion. During irrigation the surface of the soil tends to seal over, and in some places it is difficult for water to move into the soil. Otherwise, this is one of the most productive soils in the county. If organic matter is mixed with the soil, it helps to control sealing.

Included with this soil in mapping are small areas of Columbia soils that have a surface layer of loam or a subsoil that is gravelly. Also included are a few small areas of Zamora soils.

If this Columbia soil is irrigated, many kinds of crops can be grown. A few areas have not been cleared, and these are used for grazing. Capability unit I–1.

Columbia silt loam, moderately deep, 0 to 3 percent slopes (Ct).—This soil is near the Sacramento River, and it is subject to overflow during winters of high rainfall. It has gravelly and sandy layers below a depth of 30 or 40 inches but is otherwise similar to Columbia silt loam, 0 to 3 percent slopes. Some areas are cut by abandoned channels of streams.

Many kinds of crops grow well on this soil. The gravelly and sandy layers in the subsoil reduce the water-holding capacity. This soil therefore requires more frequent irrigation than Columbia silt loam, 0 to 3 percent slopes. Capability unit IIs–0.

Columbia silt loam, 3 to 8 percent slopes (CsB).—This soil is cut by channels of abandoned streams but is otherwise similar to Columbia silt loam, 0 to 3 percent slopes. The crops grown are also similar. The area must be leveled before they are irrigated or before overhead sprinklers are used. Capability unit IIe–1.

Columbia complex, channeled (Cu).—This complex is near the main channels of the Sacramento River and Cottonwood Creek. It consists of various amounts of Columbia fine sandy loam, 0 to 3 percent slopes; Columbia fine sandy loam, moderately deep, 0 to 3 percent slopes; Columbia fine sandy loam, 3 to 8 percent slopes; Columbia loam, 0 to 3 percent slopes; Columbia silt loam, 0 to 3 percent slopes; Columbia silt loam, moderately deep, 0 to 3 percent slopes; and Columbia silt loam, 3 to 8 percent slopes. In places a gravelly or sandy layer occurs at various depths. All areas are cut by channels of abandoned streams or channels of active streams. Most areas are flooded for short periods during the winter.

All of the acreage of this complex is used for grazing, and the grazing capacity of many areas is very good. The quality of the forage in many areas is lowered by dense stands of valley oak, sycamore, and shrubs. In some areas the soils can be made suitable for cultivation by removing the vegetation and leveling the areas. Capability unit VIw–1.

Cone Series

The Cone series consists of deep, moderately steep to steep, well-drained to excessively drained, extremely gravelly soils formed in material from volcanic cinders. The surface soil is very thin and is very dark grayish brown. The subsoil is brown to light brown. These soils are slightly acid to neutral. They are on steep to rounded hills in the eastern part of the county. Elevations range from 1,000 to 5,000 feet. The vegetation is mostly dense stands of shrubs and conifers but includes some areas where timber is harvested.

Profile of Cone extremely gravelly sandy loam on a slope of 10 percent that faces west, under a dense stand of shrubs; part of the area has been removed for gravel; elevation of 2,500 feet (1 mile south of Paynes Creek, in the NE¼ of sec. 36, T. 29 N., R. 1 W.):

A1—0 to 3 inches, very dark grayish-brown (10YR 3/2) extremely gravelly sandy loam, very dark brown (10YR 2/2) when moist; strong, very fine, granular structure; soft when dry, very friable when moist, nonsticky when wet; a few fine roots; very porous; slightly acid; abrupt, smooth boundary. 2 to 6 inches thick.

AC—3 to 7 inches, dark-brown (7.5YR 4/2) very gravelly sandy loam, dark brown (7.5YR 3/2) when moist; strong, very fine, granular structure; soft when dry, very friable when moist, nonsticky when wet; fine roots common; slightly acid; gradual, smooth boundary. 6 to 10 inches thick.

C—7 to 70 inches +, brown (7.5YR 5/4) very gravelly sandy loam, reddish brown (5YR 4/4) when moist; strong, very fine, granular structure; soft when dry, very friable when moist, nonsticky when wet; neutral; depth to unweathered cinders ranges from 3 to about 9 feet.

In color the surface soil ranges from very dark grayish brown to dark brown, and the subsoil from brown, pale brown, or light brown to yellowish brown. The soils are reddish brown when moist. They are made up of 50 to 90 percent rounded volcanic cinders that have rough surfaces and are very porous. Most of the cinders are less than 1 inch in diameter, but a few are more than 3 inches. The partly weathered and unweathered cinders range from red to dark gray in color.

Cone extremely gravelly sandy loam, 10 to 30 percent slopes (CvD).—This soil is on smooth rounded slopes of volcanic cinder cones. Most of the areas are fairly small. Drainage is good, runoff is slow, and permeability is rapid. The available water holding capacity and fertility are low. There is no erosion hazard. Included with this soil in mapping are small areas of Inskip soils.

A few areas of Cone extremely gravelly sandy loam, 10 to 30 percent slopes, are used for timber; gravel is mined from some areas. The soil can support dense stands of vegetation, however, and most areas have a dense stand of shrubs. The shrubs have little value other than to protect the watershed and provide browse areas and cover for wildlife. Most areas of the soil adjoin areas used for pasture and range, and here the soil is best used for plants that provide feed for livestock. Nursery stock and similar specialty crops also can be grown. Capability unit IVe–4.

Cone extremely gravelly sandy loam, 30 to 50 percent slopes (CvE).—This soil has fairly smooth slopes that vary in length. Because of the steep slopes, it is not well suited to intensive management. In some areas timber is grown, but most areas have a dense cover of shrubs and oaks. Capability unit VIe–4.

Corning Series

In the Corning series are nearly level to gently sloping, well-drained, reddish, gravelly soils that formed in old alluvium. The alluvium was derived from sedimentary and metamorphic rocks of the Coast Range Mountains. The surface soil is yellowish-red gravelly loam, and the subsoil is red gravelly clay.

Corning soils are on high terraces west of the Sacramento River at elevations from 200 to 1,500 feet. A hummocky, or hogwallow, microrelief is characteristic of most areas. The vegetation is annual forbs and grasses.

Most areas of these soils are used for pasture and range or for dryfarmed grain. Because of a claypan in the subsoil, low fertility, and lack of water for irrigation, little intensive farming is done.

Profile of Corning gravelly loam formerly in dryfarmed grain but now used for grazing sheep; under annual forbs and grasses; elevation of 270 feet (about 3 miles south of Corning on the east side of U.S. Highway No. 99W, 0.6 mile north of the southwest corner of sec. 22, T. 23 N., R. 3 W.):

Ap—0 to 8 inches, yellowish-red (5YR 5/6) gravelly loam, yellowish red (5YR 4/6) when moist; massive; hard when dry, friable when moist, slightly sticky and slightly plastic when wet; many very fine roots; many very fine pores; strongly acid; gradual, smooth boundary.

A11—8 to 15 inches, yellowish-red (5YR 5/6) gravelly loam, red (2.5YR 4/6) when moist; massive; hard when dry, friable when moist, slightly sticky and slightly plastic when wet; medium acid; gradual, smooth boundary.

A12—15 to 21 inches, yellowish-red (5YR 5/6) gravelly loam, red (2.5YR 4/6) when moist; massive; hard when dry, friable when moist, slightly sticky and slightly plastic when wet; strongly acid; a very thin, bleached layer is immediately above the B2t horizon; abrupt, slightly wavy boundary.

B2t—21 to 29 inches, red (2.5YR 5/6) gravelly clay, red (2.5YR 5/6) when moist; massive; extremely hard when dry, extremely firm when moist, sticky and very plastic when wet; a few very fine roots and pores; moderately thick, continuous clay films on ped faces and in pores; very dense; strongly acid; clear, wavy boundary. 6 to 15 inches thick.

B3t—29 to 36 inches, yellowish-red (5YR 5/6) gravelly clay loam, red (2.5YR 4/6) when moist; massive; very hard when dry, very firm when moist, sticky and plastic when wet; a few very fine roots; a few very fine pores; moderately thick, continuous clay films in pores; strongly acid; clear, wavy boundary. 4 to 10 inches thick.

C1—36 to 45 inches, yellowish-red (5YR 5/6) gravelly sandy clay loam, red (2.5YR 4/6) when moist; massive; hard when dry, firm when moist, slightly sticky and plastic when wet; a few fine roots; a few very fine pores; thin, continuous clay films in pores; strongly acid; diffuse, smooth boundary. 6 inches to many feet thick.

C2—45 to 50 inches +, yellowish-red (5YR 5/6) gravelly sandy clay loam, red (2.5YR 4/6) when moist; slightly sticky and plastic when wet; a few fine roots; a few very fine pores; thin, continuous clay films in pores; strongly acid.

The A horizon is yellowish red, reddish yellow, or reddish brown. It is generally gravelly, but it ranges from sandy loam to loam in texture. The A11 and A12 horizons combined are 10 to 27 inches thick. The B2t horizon is red or yellowish-red, very dense clay that contains some gravel. Because of the hummocky microrelief, depth to the B2t horizon varies from place to place. In places a very thin, bleached layer lies between the A12 and the B2t horizons. The underlying C horizon is generally more gravelly than the B3t horizon. The soils are medium acid to strongly acid.

Corning gravelly loam, 0 to 3 percent slopes (CwA).—This soil is in fairly large areas that have long gentle slopes. The largest areas are on the tops of old terraces west of the Sacramento River. Because of the hummocky microrelief, the surface is generally uneven. The mounds are 5 to 20 feet in diameter, and they rise about 2 feet above the depressions.

Drainage is good, runoff is slow, and permeability is very slow. The available water holding capacity and fertility are low. The erosion hazard is moderate. Sheet erosion is slight to moderate in most areas. Most of the short drainageways have been cut by gullies; however, most of the gullies can be crossed with equipment used for cultivating.

Included with this soil in mapping are small areas of Redding, Red Bluff, and Newville soils.

Most areas of this Corning soil are in pasture and range used for grazing sheep, or they are rotated between grazing land and dryfarmed grain. Yields of dryfarmed grain are low under present management. Except for areas in dryfarmed grain, this soil has not been used intensively for agriculture, mainly because irrigation water is not available. The dense clay subsoil and fairly low fertility also limit the use of this soil for agriculture. If this soil is irrigated and is otherwise well managed, a number of crops can be grown successfully. Capability unit IVs–3.

Corning gravelly loam, 3 to 8 percent slopes (CwB).—This soil has an uneven surface because of small drainageways that cut through most of the areas. Most of the short drainageways are cut by gullies, which generally can be crossed with equipment used for cultivation. Sheet erosion is slight to moderate in most areas.

Included with this soil in mapping are areas of Newville and Redding soils.

This Corning soil is used as pasture and range for sheep or for dryfarmed grain. Capability unit IVe–3.

Corning-Newville gravelly loams, 3 to 10 percent slopes, eroded (CxB2).—This complex consists of Corning gravelly loam, 3 to 8 percent slopes, and Newville gravelly loam, 3 to 10 percent slopes, eroded. Either soil may occupy from 20 to 80 percent of any one area. Both parts, capability unit IVe–3.

Corning-Redding gravelly loams, 0 to 5 percent slopes (CyB).—This complex consists of Corning gravelly loam, 3 to 8 percent slopes, and Redding gravelly loam, 0 to 3 percent slopes. Either soil may occupy from 20 to 80 percent of any area. Corning part, capability unit IVe–3; Redding part, capability unit IVs–8.

Cortina Series

The Cortina series consists of nearly level, somewhat excessively drained to excessively drained soils. These soils formed in recent gravelly alluvium derived from sedimentary and metamorphic rocks. The rocks contain many pebbles of chert and quartzite. Cortina soils are brown to yellowish brown throughout. The surface layer is gravelly fine sandy loam, and the subsoil is extremely gravelly sand. The soils range from medium acid in the surface layer to neutral in the subsoil and substratum.

Cortina soils are along most of the streams west of the Sacramento River at elevations of 200 to 500 feet. They are generally on flood plains near active streams, but some of them are in channels of abandoned streams and along ridges. The vegetation is mostly annual grasses and forbs but includes some hardwoods and shrubs. Field crops, row crops, and orchard crops are grown on these soils under irrigation.

Profile of Cortina gravelly fine sandy loam in a nearly level area on a narrow flood plain used for pasture and range; under annual grasses, forbs, and blue oaks; elevation of 200 feet (1 mile south and 2 miles east of Kirkwood, near the center of the southwest quarter of sec. 17, T. 23 N., R. 2 W.):

A1—0 to 3 inches brown (10YR 5/3) gravelly fine sandy loam, dark brown (10YR 3/3) when moist; massive; slightly hard when dry, friable when moist, nonsticky when wet; many fine roots; medium acid; clear, smooth boundary. 0 to 3 inches thick.

C1—3 to 15 inches, yellowish-brown (10YR 5/4) very gravelly fine sandy loam, dark yellowish brown (10YR 4/4) when moist; massive; slightly hard when dry, friable when moist; many fine roots; very porous; slightly acid; abrupt, smooth boundary. 10 to 60 inches thick.

C2—15 to 72 inches +, yellowish-brown (10YR 5/4) extremely gravelly sand, dark yellowish brown (10YR 4/4) when moist; stratified with brown (10YR 5/3) to grayish-brown (10YR 5/2) very gravelly loam in the lower part of the horizon; single grain; loose when dry and moist; a few fine roots; very porous; slightly acid in the upper part and neutral in the lower part.

These soils are brown or pale brown to yellowish brown in color. The grayish-brown or light grayish-brown soils along Thomes and Stony Creeks probably formed in alluvium from metamorphic rock. The color of the soils is generally associated with that of the alluvium deposited by the streams. Most areas are along streams that dominantly receive alluvium from the Newville and associated soils.

These soils are gravelly to extremely gravelly throughout. In places the subsoil is coarse gravel. The soils range from medium acid to neutral in the surface layer to neutral in the subsoil and substratum.

Cortina gravelly fine sandy loam (Cz).—Most of this soil is in long narrow strips along stream channels. The surface is generally smooth, but the areas are cut by channels of abandoned streams in places. Drainage is somewhat excessive, runoff is very slow, and permeability is rapid.

The soil consists of about 15 to 75 percent of rounded gravel by volume. The gravel in the soil makes it difficult to prepare an adequate seedbed for some crops and also causes implements used in cultivating the soil to wear excessively.

Included with this soil in mapping are small areas of Arbuckle, Maywood, Orland, and Yolo soils.

If this Cortina soil is irrigated, alfalfa, milo, pasture, olives, almonds, and similar crops can be grown. The best method for applying irrigation water is by the use of overhead sprinklers. Areas where irrigation water is not available are used for pasture and range. Dryfarmed grain is grown in a few areas. Yields are low, however, unless rainfall is properly distributed. Capability unit IVs–4.

Cortina gravelly fine sandy loam, moderately deep (Czm).—This soil has a more gravelly subsoil but is otherwise similar to Cortina gravelly fine sandy loam. Coarse gravel that contains very little fine soil material is below a depth of 15 to 30 inches. Areas of this soil are close to areas of Riverwash.

If this soil is irrigated, alfalfa, olives, and almonds are grown. Crops that have shallow roots are seldom grown because the intervals between irrigations are too short. The soil is too porous, and it is too costly to irrigate other than by overhead sprinklers. In many places the soil is in fairly narrow strips along streams and is difficult to manage because it generally requires more water than adjacent soils. If irrigation water is not available, the soil is used for pasture and range; dryfarmed crops are not suitable. Capability unit IVs–4.

Cortina very gravelly fine sandy loam (Czs).—This soil is mostly in fairly small areas. It is 50 to 90 percent gravel by volume. Drainage is excessive, runoff is very slow, and permeability is very rapid. The fertility and available water holding capacity are low.

Alfalfa, olives, almonds, and similar deep-rooted crops grow well on this soil if it is irrigated. The soil is difficult to manage in many areas because the available water holding capacity is lower than that of adjacent soils. Irrigation water should be applied more frequently on this soil than on less gravelly soils. Overhead sprinklers are more efficient because the soil takes water too rapidly for other methods of irrigation. Dryfarmed crops are not suited to the soil because in spring it does not remain wet long enough after the last rain for a crop to mature. Shallow-rooted crops are also not suited, because the water required for irrigation is too great to make it profitable to grow them. If irrigation water is not available, the soil is used for pasture and range. Capability unit IVs–4.

Cortina complex (Czx).—This complex is near active streams. It consists of various amounts of Cortina gravelly fine sandy loam, Cortina very gravelly fine sandy loam, and Cortina gravelly fine sandy loam, moderately deep. In many places the soils are cut into small areas by stream channels, which generally have water in them in winter. In these places the areas are mostly less than 10 acres in size.

Included with these soils are areas of Riverwash and of Orland, Maywood, and Yolo soils.

Areas of the Cortina complex are subject to yearly flooding, and they are too small to be used intensively for agriculture. They are therefore used for pasture and range. In most areas the yields of forage are larger than on adjacent areas of Riverwash, and the quality is better. In a few places small acreages of soil are suited to cultivation. Capability unit VIw–1.

Dibble Series

The Dibble series consists of gently sloping to steep, well-drained soils that are moderately fine textured. These soils formed in material from yellowish-brown, massive siltstone. The surface layer is pale-brown, medium acid silt loam or silty clay loam. The subsoil is pale-brown, medium acid silty clay loam or silty clay. Dibble soils are underlain by yellow or brown, semiconsolidated, dense siltstone. They are on rounded low foothills west of the Sacramento River. The vegetation is grass or grass-oak. Most of these soils are used for pasture and range.

Profile of Dibble silty clay loam on a slope of 25 percent that faces east in a field used for grazing in winter

and spring; under grasses and blue oaks; elevation of 850 feet (15 miles west of Red Bluff and ¼ mile south of Reeds Creek Road, in the southwest corner of the NE¼SE¼ sec. 23, T. 27 N., R. 6 W.) :

A11—0 to 2 inches, pale-brown (10YR 6/3) silty clay loam, olive brown (2.5Y 4/4) when moist; weak, medium, platy structure; very hard when dry, friable when moist, slightly sticky when wet; many very fine roots and pores; medium acid; abrupt, smooth boundary. 1 to 2 inches thick.

A12—2 to 6 inches, pale-brown (10YR 6/3) silty clay loam, brown (10YR 4/3) when moist; massive; hard when dry, friable when moist, slightly sticky when wet; many very fine roots and pores; medium acid; clear, wavy boundary. 3 to 10 inches thick.

B1t—6 to 9 inches, pale-brown (10YR 6/3) clay loam, yellowish brown (10YR 5/4) when moist; massive; hard when dry, friable when moist, slightly sticky when wet; many very fine roots and pores; thin, discontinuous clay films, medium acid; gradual, irregular boundary. 1 to 4 inches thick.

B21t—9 to 17 inches, pale-brown (10YR 6/3) heavy clay loam, yellowish brown (10YR 5/4) when moist; moderate, coarse, subangular blocky structure; hard when dry, firm when moist, sticky when wet; a few very fine roots and pores; moderately thick, continuous clay films along old root channels; clay bridges throughout the pores; medium acid; gradual, irregular boundary. 3 to 10 inches thick.

B22t—17 to 24 inches, light yellowish-brown (10YR 6/4) clay loam, yellowish brown when moist; massive; hard when dry, firm when moist, sticky when wet; a few very fine roots and pores; thin clay films; medium acid; gradual, irregular boundary. 3 to 10 inches thick.

B3—24 to 34 inches, yellow (10YR 7/6) clay loam, yellowish brown (10YR 5/6) when moist; massive; slightly hard when dry, firm when moist, slightly sticky when wet; a few roots and pores; thin clay films along the walls of the larger root channels; medium acid; abrupt, wavy boundary. 3 to 10 inches thick.

R—34 inches +, yellow (10YR 8/8) semiconsolidated siltstone that is finely mottled with very pale brown (10YR 8/3); hard and brittle when dry; can be carved with knife.

In color the surface layer ranges from pale brown to yellowish brown, though it is brown in places. It is more yellow in the lower part of the subsoil than in the upper part. Texture of the surface layer ranges from silt loam to silty clay loam. The subsoil is clay loam or silty clay. These soils are generally medium acid throughout, but in some areas they are slightly acid in the surface soil and medium acid in the subsoil. Depth to the semiconsolidated siltstone ranges from 18 inches to about 48 inches, but it is generally about 36 inches.

Dibble silty clay loam, 10 to 30 percent slopes (DbD).—This soil is in fairly small areas that generally follow the contour of the slope. Drainage is good, runoff is medium, and permeability is moderately slow. The available water holding capacity and fertility are moderate.

Included with this soil in mapping are small areas of soil that has slopes of 5 to 10 percent. Also included are small areas of Newville soils.

This Dibble soil is used mostly for pasture and range, but a relatively small acreage is used for dryfarmed grain. Water is not available in many areas for irrigating crops. Capability unit IVe–5.

Dibble silty clay loam, 30 to 50 percent slopes (DbE).—This soil is used for pasture and range. Its steep slopes make it unsuited to intensive use for agriculture. Gully erosion is a hazard, and excessive grazing causes gullies to form. Capability unit VIe–5.

Dibble-gullied land complex, 10 to 30 percent slopes (DgD).—This complex consists of Dibble silty clay loam, 10 to 30 percent slopes, and of gullied areas. Most of the gullies are in short drainageways. They generally are narrow, have steep walls, and are spaced at intervals of 100 feet to nearly a quarter of a mile apart. Depth of the gullies ranges from 3 to 10 feet.

Cultivating areas of this complex is not practical because the gullies are too deep to be crossed with equipment used for cultivation. The areas are therefore used for pasture and range. Cattle and sheep grazing in the areas must either walk around the gullies or through them. Much time and effort are required to eliminate the gullies or even to control them once they have been cut. Practices that help control gullying are (1) decreasing the rate of runoff by leaving more plant cover on the soil; (2) increasing the water intake of the soil by growing more plants and larger ones or by chiseling on the contour; and (3) filling in the gullies and then reseeding and fertilizing them. Capability unit IVe–5.

Dibble-gullied land complex, 30 to 50 percent slopes (DgE).—This complex consists of Dibble silty clay loam, 30 to 50 percent slopes, and of gullied areas. Most areas are short and narrow and generally lie across the slope. Depth of the gullies ranges from 3 to 10 feet, and the gullies are spaced 100 feet or more apart.

Areas of this complex are too steep to be cultivated and are therefore used for pasture and range. Gullies interfere with grazing on these areas. The value of the forage is also decreased in some areas because of dense stands of blue oak. Capability unit VIe–5.

Dibble-Newville complex, 10 to 30 percent slopes (DnD).—This complex consists of Dibble silty clay loam, 10 to 30 percent slopes, and Newville gravelly loam, 10 to 30 percent slopes. From 50 to 80 percent of each area is Dibble soil, and the rest is Newville soil. Dibble part, capability unit IVe–5; Newville part, capability unit VIe–3.

Dibble-Newville complex, 30 to 50 percent slopes (DnE).—This complex consists of Dibble silty clay loam, 30 to 50 percent slopes, and Newville gravelly loam, 30 to 50 percent slopes. From 50 to 80 percent of each area is Dibble soil, and the rest is Newville soil. Dibble part, capability unit VIe–5; Newville part, capability unit VIe–3.

Dibble-Newville-gullied land complex, 10 to 30 percent slopes (DxD).—This complex consists of areas of Dibble silty clay loam and Newville gravelly loam that have slopes of 10 to 30 percent and are gullied. From 50 to 80 percent of each area is Dibble soil, and the rest is Newville soil. Dibble part, capability unit IVe–5; Newville part, capability unit VIe–3.

Dibble-Newville-gullied land complex, 30 to 50 percent slopes (DxE).—This complex consists of areas of Dibble silty clay loam and Newville gravelly loam that have slopes of 30 to 50 percent and are gullied. From 50 to 80 percent of each area is Dibble soil, and the rest is Newville soil. Dibble part, capability unit VIe–5; Newville part, capability unit VIe–3.

Dubakella Series

The Dubakella series consists of moderately steep to very steep, well-drained soils formed in material from serpentine and from associated ultrabasic rocks. The soils are shallow to moderately deep and are neutral. The surface soil is reddish-brown stony loam and clay loam that

grades to yellowish-brown very gravelly clay above the weathered parent rock. The soils are in the uplands in the western part of the county at elevations of 2,000 to 5,000 feet. The vegetation is conifers, hardwoods, and shrubs, and timber is harvested from these soils.

Profile of Dubakella stony loam on a slope of 28 percent that faces northeast; under an open stand of Jeffrey pine, sugar pine, and incense-cedar; elevation is 4,900 feet (about 35 miles west of Red Bluff, a fourth of a mile northeast of the southwest corner of the NW¼ sec. 28, T. 28 N., R. 9 W.):

O1 & O2—2 inches to 0, fresh, partly decomposed and decomposed pine needles; abrupt, smooth boundary. 1 to 3 inches thick.

A11—0 to 2 inches, reddish-brown (5YR 4/4) stony loam, dark reddish brown (5YR 3/4) when moist; strong, fine to medium subangular blocky structure; soft when dry, friable when moist, nonsticky and nonplastic when wet; many very fine roots; many very fine pores; neutral; abrupt, smooth boundary. 2 to 4 inches thick.

A12—2 to 11 inches, reddish-brown (5YR 4/5) stony clay loam, dark reddish brown (5YR 3/4) when moist; moderate, medium, subangular blocky structure that breaks to strong, fine, granular; slightly hard when dry, friable when moist, slightly sticky and slightly plastic when wet; many fine and medium roots; many fine pores; pebbles are subangular fragments of partly weathered serpentine rock; neutral; gradual, irregular boundary. 6 to 12 inches thick.

B2t—11 to 19 inches, yellowish-brown (10YR 5/4) very gravelly clay, dark yellowish brown (10YR 4/4) when moist; strong, medium, subangular blocky structure; slightly hard when dry, friable when moist, slightly sticky and slightly plastic when wet; plentiful very fine and fine roots and a few medium roots; many very fine and fine pores; a few thin, discontinuous clay films; angular pebbles are less weathered than in the A12 horizon; neutral; clear, irregular boundary. 6 to 10 inches thick.

R—19 inches +, bluish-green, hard, fractured and partly weathered serpentine rock; cracks filled with soil material similar to that in the B2t horizon; moderately thick, nearly continuous clay films and dark coatings on fracture planes.

The surface soil ranges from reddish brown to dark reddish brown in color. The subsoil is generally yellowish brown, but in places it is strong brown or brown. The soils are gravelly throughout, and in many places more than 2 percent of the surface has a cover of stones. The soils are neutral in the uppermost horizons and are neutral or mildly alkaline below. Depth ranges from 14 to 30 inches.

Dubakella stony loam, 10 to 30 percent slopes (DyD).—This soil is in fairly small areas on rounded ridgetops. Depth to fractured, weathered serpentine rock ranges from about 14 to 30 inches. Drainage is good, runoff is slow to medium, and permeability is moderate. The available water holding capacity and fertility are low. The ratio of magnesium to calcium is high and is not favorable for good growth of plants. Under present cover there is no erosion hazard.

Included with this soil in mapping are areas of Henneke, Sheetiron, and Neuns soils. Also included are areas of rock outcrops.

This Dubakella soil is used for timber; Jeffrey pine and incense-cedar are the dominant conifers. Growth of trees on this soil is moderately slow, mainly because of the unfavorable ratio of calcium to magnesium. Capability unit VIs–7.

Dubakella stony loam, 30 to 50 percent slopes (DyE).—This soil is mostly on the upper slopes of steep canyons. Angular fragments of rock are exposed over 5 to 50 percent of the surface. Under present cover there is no erosion hazard, except that which can occur in roadways, timber-loading areas, and similar excessively disturbed areas.

Included with this soil in mapping are small areas that have slopes of more than 50 percent.

Timber is grown on this Dubakella soil. Because of its steep slopes, it is more difficult to harvest timber from this soil than from the Dubakella soil on ridgetops. Capability unit VIs–7.

Elam Series

Soils of the Elam series are nearly level to gently sloping, are somewhat excessively drained, and are coarse textured. They formed in alluvium derived from areas of rhyolitic and andesitic rocks. These soils are in the mountains in the eastern part of the county along the edges of small valleys at elevations of 4,000 to 5,000 feet. They have a thin, dark-gray surface layer that grades to a light-gray subsoil. The soils are very gravelly and are medium acid. In places along the edges of meadows the water table is within 3 feet of the surface. The vegetation is various kinds of conifers, and the areas are used for timber.

Profile of Elam very gravelly loamy sand on a slope of 8 percent that faces southeast; under a moderately dense stand of various kinds of conifers and shrubs; elevation of 4,800 feet (2 miles south and 6.5 miles east of Mineral, in the southwest corner of the SE¼SE¼ sec. 31, T. 29 N., R. 5 E.):

O1 & O2—2 inches to 0, fresh needles and leaves that are decomposed in the lower part; abrupt, smooth boundary. ½ to 3 inches thick.

A11—0 to 2 inches, dark-gray (10YR 4/1) very gravelly loamy sand, black (10YR 2/1) when moist; strong, fine, granular structure; soft when dry, very friable when moist; many very fine roots and pores; strongly acid; abrupt, smooth boundary. ½ to 3 inches thick.

A12—2 to 5 inches, light brownish-gray (2.5Y 6/2) very gravelly loamy sand, dark grayish brown (2.5Y 4/2) when moist; strong, fine, granular structure; soft when dry, very friable when moist; many very fine roots and pores; medium acid; gradual, smooth boundary. ½ to 3 inches thick.

C1—5 to 20 inches, light-gray (10YR 7/2) very gravelly sandy loam, light brownish gray (10YR 6/2) when moist; strong, fine, granular structure; soft when dry, very friable when moist; many very fine roots and pores; medium acid; diffuse boundary. 10 to 15 inches thick.

C2—20 to 60 inches +, light-gray (10YR 7/2) very gravelly sandy loam, light brownish gray (10YR 6/2) when moist; single grain; loose when dry and moist; a few large roots; many fine pores; medium acid.

The A11 horizon ranges from grayish brown to very dark grayish brown or dark gray in color. The horizons below are generally light gray but in places are very pale brown or white. The texture of the A11 horizon ranges from gravelly sandy loam or fine sandy loam to very gravelly loamy sand. The C horizon is very gravelly sandy loam or very gravelly loam. The soils are typically medium acid.

Elam very gravelly loamy sand, 0 to 8 percent slopes (EgB).—This soil is on short fans at the base of fairly steep slopes. The surface of the soil is generally quite smooth. Depth is generally more than 5 feet. Drainage is somewhat excessive, runoff is very slow, and permeability is

rapid. Fertility and available water holding capacity are low.

This Elam soil is used for timber. The areas are suitable for homesites and campsites because of the smooth, gentle slopes and excellent drainage. Most areas are also near roads. A few areas have been mined for gravel. Capability unit IVe–4.

Elam very gravelly loamy sand, moderately deep, 0 to 8 percent slopes (EmB).—This soil has a cemented layer at a depth of 2 to 5 feet. The cemented layer is generally less than 6 inches thick, but it is very slowly permeable to water and roots. Below the cemented layer is very gravelly sandy loam.

Included with this soil in mapping are areas of Childs and Chummy soils.

This Elam soil is used for timber. Jeffrey pine and lodgepole pine are the conifers generally grown, but the lodgepole pine has little economic value at present. Some areas of this soil are suitable for development of campsites and homesites. Gravel is mined from some areas. Capability unit VIIs–4.

Elam very gravelly loamy sand, imperfectly drained variant, 0 to 3 percent slopes (Ew).—This soil has a water table at a depth of 2 to 5 feet. The water table limits penetration of plant roots.

Included with this soil in mapping are areas of Chummy soils.

Lodgepole pine, grasses and forbs, and azalea and other shrubs that tolerate wetness grow on this Elam soil. Lodgepole pine, however, has little economic value at present. Most areas have little economic value other than to provide cover and browse for wildlife. Capability unit VIIs–4.

Farwell Series

The Farwell series consists of nearly level, well-drained soils formed in alluvium. The alluvium was derived from basic igneous rocks, principally basalt and andesite. The surface layer is dark grayish brown and is slightly acid; the subsoil is grayish brown to brown and is calcareous. The soils are generally clay loam throughout, but the upper part of the subsoil contains more clay than the lower part. Farwell soils are on alluvial flood plains above the flood level of the present streams. A small area is in the southern part of the county, just east of the Sacramento River. All of the acreage is cultivated.

Profile of Farwell clay loam (about 6 miles east of the Tehama County line in Butte County, 0.15 mile north of the southwest corner of sec. 22, T. 21 N., R. 1 E., about 100 feet east of Dayton Road, about ¾ mile northeast of Dayton):

Ap—0 to 6 inches, dark grayish-brown (10YR 4/2) clay loam, very dark brown (10YR 2/2) when moist; weak, medium, subangular blocky structure; hard when dry, friable when moist, slightly sticky when wet; many very fine roots; many fine pores; slightly acid; abrupt, wavy boundary. 4 to 8 inches thick.

A3—6 to 23 inches, grayish-brown (10YR 5/2) clay loam, very dark grayish brown (10YR 3/2) when moist; massive; hard when dry, friable when moist, slightly sticky and plastic when wet; many fine roots and pores; neutral; clear, irregular boundary. 10 to 21 inches thick.

B2t—23 to 28 inches, grayish-brown (10YR 5/2) heavy clay loam, very dark brown (10YR 2/3) when moist; massive; hard when dry, friable when moist, sticky and plastic when wet; a few roots; a few fine pores; thin, discontinuous clay films in pores; mildly alkaline; abrupt, smooth boundary. 4 to 8 inches thick.

C1ca—28 to 32 inches, grayish-brown (10YR 5/2) heavy loam, dark brown (10YR 3/3) when moist; massive; slightly hard when dry, friable when moist, slightly sticky and plastic when wet; very few roots; a few fine pores; mildly alkaline; strongly calcareous; abrupt, smooth boundary. 3 to 10 inches thick.

C2—32 to 58 inches +, brown (10YR 5/3) heavy loam, dark brown (10YR 3/3) when moist; massive; slightly hard when dry, friable but slightly brittle when moist, nonsticky and nonplastic when wet; a few roots; a few fine pores; mildly alkaline; slightly calcareous.

The A horizon is dark grayish-brown or dark-brown loam or clay loam, and it is slightly acid or neutral. The B2t horizon is similar to the A horizon but is more clayey. In some places the B2t horizon contains lime, and the C1ca horizon is brittle and weakly cemented.

Farwell clay loam, 0 to 3 percent slopes (Fa).—This is the only Farwell soil mapped in the county. It occupies a fairly small acreage in the southern part of the county. In some places the subsoil is weakly cemented.

This soil is well drained. Runoff is slow, permeability is moderately slow, and the available water holding capacity is high.

Included with this soil in mapping are small areas of Los Robles and Vina soils.

All of this Farwell soil is cultivated, and alfalfa, corn, beans, sugarbeets, melons, and similar crops grow well. Prunes and walnuts are also grown, but the calcareous subsoil causes problems in nutrition for these crops. Capability unit IIs–5.

Forward Series

The Forward series consists of moderately steep, well-drained soils formed in rhyolitic tuff. The tuff is light-colored, moderately coarse textured to coarse textured material that is partly cemented into massive rock that has seams or cracks. The soils are sandy loam to loamy sand throughout. The surface layer is light brownish gray and grades to a pale-yellow subsoil. Forward soils range from slightly acid in the surface layer to strongly acid in the subsoil. They are on gently rounded hills in the northeastern part of the county. Elevations range from 2,000 to 4,000 feet. The vegetation is conifers, hardwoods, and shrubs. All areas are used for producing timber.

Profile of Forward sandy loam on a slope of 24 percent that faces east; in an area that has been logged but is now under a dense stand of conifers and shrubs; elevation of 3,800 feet (5½ miles east of Manton near the center of the SW¼SW¼ sec. 27, T. 30 N., R. 2E.):

O1 & O2—2 inches to 0 of fresh litter from pine and oak; partly decomposed in lower part.

A11—0 to 1 inch, grayish-brown (10YR 5/2) sandy loam, very dark brown (10YR 2/2) when moist; medium, granular structure; soft when dry, very friable when moist; a few very fine roots; many very fine pores; slightly acid; abrupt, wavy boundary. 1 to 3 inches thick.

A12—1 to 7 inches, light brownish-gray (10YR 6/2) sandy loam, dark grayish brown (10YR 4/2) when moist; weak, medium, subangular blocky structure; soft when dry, very friable when moist; many very fine and medium roots; many very fine pores; slightly acid; abrupt, wavy boundary. 4 to 8 inches thick.

B21—7 to 15 inches, very pale brown (10YR 7/3) sandy loam, pale brown (10YR 6/3) when moist; weak, medium,

subangular blocky structure; slightly hard when dry, very friable when moist; many very fine and fine roots; many very fine pores; medium acid; clear, irregular boundary. 6 to 10 inches thick.

B22—15 to 24 inches, pale-yellow (2.5Y 8/4) sandy loam, light yellowish brown (2.5Y 6/4) when moist; weak, medium, subangular blocky structure; slightly hard when dry, very friable when moist; a few medium and large roots throughout; a dense layer of very fine to coarse roots rests abruptly on the R horizon; strongly acid; abrupt, wavy boundary. 6 to 24 inches thick.

R—24 inches +, pale-yellow (2.5Y 8/4), firmly consolidated, massive, rhyolitic tuff that ranges from nearly white to pale yellow in color; the tuff is a wind-laid deposit that contains fine angular particles of volcanic ash and medium fragments of angular pumice; roots do not penetrate the tuff except along cracks, and water penetrates it very slowly.

The A horizon is dominantly light brownish gray. Because of its higher content of organic matter, the uppermost few inches are grayish brown to dark grayish brown. The B horizon is light gray, very pale brown, pale yellow, or white. Acidity generally increases with increasing depth. The A horizon ranges from slightly acid to medium acid, and the B horizon from medium acid to strongly acid. Texture ranges from sandy loam to loamy sand throughout. Depth to massive tuff generally is 20 to 40 inches. The concentration of roots on top of the tuff shows the depth to which most roots can penetrate. The tuff is easily cut, however, with a spade or an auger.

Forward sandy loam, 10 to 30 percent slopes (FoD).—This is the only Forward soil mapped in the county. It is on rounded hills in the northeastern part of the county. Depth to cemented tuff ranges from 20 to 40 inches.

This soil is well drained. Runoff is slow, permeability is rapid, and the available water holding capacity is low. The hazard of erosion is severe, and in a few areas sheet and gully erosion have occurred following fires, roadbuilding, or logging.

Included with this soil in mapping are small areas of Cohasset, Jiggs, and Manton soils.

This Forward soil is used for timber. Trees on this soil grow at a moderate rate, and the density of the stands is also moderate. Leaving some vegetation on areas of this soil helps control erosion. It also helps to maintain the growth rate of the trees and the density. Capability unit IVe–4.

Goulding Series

In the Goulding series are steep to very steep, excessively drained soils formed in material from metamorphosed volcanic rock. These soils are brown, are medium textured, and are slightly acid throughout. Most of the soils are stony and are less than 2 feet deep. Goulding soils are in the uplands in the western part of the county. Elevations range from 2,000 to 4,500 feet. The vegetation is shrubs.

Profile of Goulding stony loam on a slope of 48 percent that faces south; under a dense stand of chamise and wedgeleaf ceanothus; elevation of 3,200 feet (1.5 miles south and 1 mile west of Beegum in the SE¼NE¼ sec. 33, T. 29 N., R. 9 W.):

A—0 to 13 inches, brown (10YR 5/3) stony loam, dark brown (10YR 4/3) when moist: moderately strong, coarse, subangular blocky structure; hard when dry, friable when moist, nonsticky when wet; a few to many, fine and medium roots; many pores; the amount of pebbles and stones increases with increasing depth; slightly acid; abrupt, irregular boundary. 10 to 34 inches thick.

R—13 inches +, partly weathered, fractured, hard, grayish-green, metamorphosed, basic volcanic rock.

These soils range from brown to yellowish brown in color. In some places the subsoil is nearly reddish brown. In most areas the soils are stony loam throughout, but in places the deeper soils have a subsoil of reddish-brown clay loam. Depth ranges from 12 to 24 inches. Reaction is generally slightly acid throughout, but in some places the subsoil is nearly medium acid. Angular pieces of gravel and cobblestones are common in all areas.

Goulding stony loam, 30 to 50 percent slopes (GgE).—This soil is in mountainous areas in the western part of the county. Most areas are large and are cut by streams. Angular stones that range from 6 to 30 inches in diameter are scattered over 5 to 25 percent of the surface.

This soil is excessively drained. Runoff is medium to rapid, permeability is moderate, and fertility and available water holding capacity are low. The hazard of erosion is slight to moderate. Depth generally ranges from 12 to 24 inches, but in places it is as much as 36 inches.

Included with this soil in mapping are small areas of Henneke, Los Gatos, Maymen, and Stonyford soils.

This Goulding soil is covered with shrubs, which protect the watershed and provide cover and browse for wildlife. Capability unit VIIs–7.

Goulding stony loam, 50 to 65 percent slopes (GgF).—This very steep soil has a dense cover of shrubs, which protect the watershed and provide browse and cover for wildlife. The present use is probably the best for this soil. Capability unit VIIIs–8.

Guenoc Series

The Guenoc series consists of gently sloping to steep, well-drained soils formed in material from volcanic flow. The soils are moderately deep. The surface layer is reddish-brown, slightly acid loam that grades to a subsoil of reddish-brown, medium acid clay. These soils are in the foothills in the eastern part of the county at elevations of 1,000 to 3,000 feet. The vegetation is mostly grasses and forbs, but it includes a few scattered oaks and shrubs. Most of the Guenoc soils are used for pasture and range, but some of the less stony soils are used for grain, apples, and pasture.

Profile of Guenoc loam in a gently sloping area used for grazing; elevation of 1,400 feet (2 miles southwest of Manton in the NW¼SE¼ sec. 35, T. 30 N., R. 1 W.):

A1—0 to 2 inches, reddish-brown (5YR 4/3) loam, dark reddish brown (5YR 3/3) when moist; weak, medium, platy structure; slightly hard when dry, friable when moist, nonsticky when wet; many fine roots; many very fine pores; slightly acid; abrupt, wavy boundary. 1 to 4 inches thick.

B1t—2 to 16 inches, reddish-brown (5YR 4/4) clay loam, dark reddish brown (2.5YR 3/4) when moist; massive; slightly hard when dry, friable when moist, slightly sticky when wet; many fine roots; many fine pores; a few large rocks; slightly acid; clear, irregular boundary. 5 to 15 inches thick.

B2t—16 to 30 inches, reddish-brown (5YR 4/4) clay, dark reddish brown (5YR 3/3) when moist; massive; hard when dry, firm when moist, and sticky and plastic when wet; a few fine and medium roots; many very fine pores; moderately thick, continuous clay films in pores; stone content increases with increasing depth;

medium acid; abrupt, irregular boundary. 12 to 30 inches thick.

R—30 inches +, partly weathered basaltic rock that is well cracked in the upper part.

The A horizon ranges from dark reddish brown to reddish brown in color, but in some areas it is red. It ranges from loam to clay loam in texture, and it contains varying amounts of gravel. The B horizon ranges from reddish brown to dark red in color and from heavy clay loam to clay in texture. The soil is slightly acid in the surface layer and medium acid in the subsoil, but in places it is slightly acid throughout. Depth to parent rock varies within short distances, but generally the soils range from 20 to 40 inches in depth. Stones on the surface vary in size and amount.

Guenoc loam, 10 to 30 percent slopes (GnD).—This soil is on sloping ridges in the foothills in the eastern part of the county. The slopes are uneven and in places are less than 10 percent. Most areas have some large stones on them, but less than 5 percent of the surface is covered by stones. The amount of angular pebbles in the soil varies.

Drainage is good, runoff is slow to medium, and permeability is slow. The available water holding capacity and fertility are low. There is no erosion hazard. Plants growing in the greenhouse on this soil respond if fertilizer that contains nitrogen, phosphate, sulfur, and molybdenum is applied.

Included with this soil in mapping are small areas of Cohasset and Toomes soils.

This Guenoc soil is used mostly for pasture and range. A few small, gently sloping areas where irrigation water is available are used for apples and pears. Capability unit IVe–8.

Guenoc loam, 30 to 50 percent slopes (GnE).—Most areas of this soil have steep slopes that in many places are fairly short and uneven.

Included with this soil in mapping are small areas of Toomes soils and areas of Rock land.

This Guenoc soil is used for pasture and range. Grazing is limited in many areas by dense stands of shrubs and oaks. Capability unit VIs–8.

Guenoc stony loam, 10 to 30 percent slopes (GsD).—This soil has a cover of large stones 1 to 4 feet in diameter on 5 to 25 percent of the surface.

Because of the many stones on the surface, this soil is difficult to cultivate. It is therefore used for pasture and range. In places the value of the forage is reduced because of the dense stands of shrubs on some areas. Capability unit VIs–8.

Guenoc stony loam, 30 to 50 percent slopes (GsE).—Most areas of this soil have steep slopes that are uneven and short. Fragments of rock cover from 5 to 25 percent of the surface.

This soil is used for pasture and range. Because of the steep slopes, this soil is not so desirable for grazing as the less steep Guenoc soils. Many areas have a dense stand of shrubs and oaks, and these further limit the soils for grazing. Capability unit VIs–8.

Henneke Series

In the Henneke series are moderately steep to very steep, well-drained soils formed in material from serpentine rock, which has a low ratio of calcium to magnesium. The rock is massive but is cracked or highly shattered and in places it was moved about by landslips.

Henneke soils are brown and neutral throughout. The surface soil is stony loam, and the subsoil is gravelly clay loam. The soils are in the mountainous area in the western part of the county at elevations of 1,000 to 4,000 feet. All the areas have a cover of shrubs, which protect the watershed and provide habitats for wildlife.

Profile of Henneke stony loam on a slope of 40 percent that faces north; under a moderately dense stand of shrubs; elevation of 2,750 feet (5 miles west and 1 mile north of Paskenta, near the corner of sec. 27, T. 24 N., R. 7 W.):

AO—½ inch to 0, fresh and partly decomposed leaf litter from leather oak; many medium pebbles; abrupt, smooth boundary. 0 to 3 inches thick.

A1—0 to 3 inches, brown (7.5YR 4/3) stony loam, very dark brown (7.5YR 2/2) when moist; strong, medium, granular structure; soft when dry and moist, nonsticky when wet; a few fine roots; many fine and medium pores; neutral; abrupt, smooth boundary. 2 to 6 inches thick.

B1t—3 to 10 inches, brown (7.5YR 4/4) gravelly clay loam, dark brown (7.5YR 3/2) when moist; weak, medium, subangular blocky structure; slightly hard when dry, friable when moist, slightly sticky when wet; a few fine and medium roots; many fine pores; thin, continuous clay films; neutral; clear, irregular boundary. 4 to 10 inches thick.

B2t—10 to 19 inches, brown (7.5YR 4/4) very gravelly clay loam, dark brown (7.5YR 3/3) when moist; moderate, medium, subangular blocky structure; slightly hard when dry, firm when moist, sticky when wet; a few medium roots; a few fine pores; thin to thick, continuous clay films; some angular cobblestones; neutral; abrupt, irregular boundary. 6 to 12 inches thick.

R—19 inches +, broken, greenish-blue serpentine rock that becomes more massive with increasing depth; cracks filled with soil material from B2t horizon; thick clay films around rock fragments and in cracks.

In color the A horizon is brown, dark brown, very dark brown, strong brown, reddish brown, or dark reddish brown. In structure the surface layer is granular or subangular blocky, but in eroded places it is weak, platy. A thin layer of gravel and stone is on the surface, and in many places it is mixed with leaf litter from shrubs. The A horizon is loam or clay loam and is slightly acid to neutral. The B horizon is similar to the A horizon but is slightly darker or lighter in color. This horizon is subangular blocky to massive clay or clay loam and contains many angular pebbles and cobblestones. It is neutral to mildly alkaline.

Henneke stony loam, 30 to 65 percent slopes (HeE).—This soil is in the mountainous area in the western part of the county. Most areas are on steep to very steep slopes of canyons. The surface is uneven and in many areas contains numerous rock outcrops.

Drainage is good, runoff is rapid, and permeability is moderately slow. The available water holding capacity is low. Sheet erosion is slight to moderate in many places. Many kinds of plants grow poorly in this soil because the ratio of magnesium to calcium in the soil is unfavorable to plant growth.

Included with this soil in mapping are small areas of Dubakella, Goulding, Los Gatos, Maymen, and Stonyford soils.

Henneke stony loam, 30 to 65 percent slopes, has a moderately dense cover of shrubs. These protect the water-

shed and provide browse and cover for wildlife. Capability unit VIIIs–9.

Henneke stony loam, 10 to 30 percent slopes (HeD).—This soil is on ridgetops, mostly in long, narrow areas that are small in size. Capability unit VIIs–9.

Henneke stony loam, landslips, 30 to 65 percent slopes (HfE).—Most of this soil is in a mountainous area west and south of Paskenta. Elevation ranges from about 1,500 to 3,000 feet. Most areas are fairly large and are on steep to very steep slopes of canyons. The surface is uneven and has landslip areas and short steep slopes of partly cemented broken rock. In many places springs are in these areas. In most areas sheet and gully erosion is slight to moderate. Many kinds of plants grow on the soil, but they grow poorly because of the high ratio of magnesium to calcium.

This soil has a moderately dense cover of shrubs. The shrubs protect the watershed and provide browse and cover for wildlife. Capability unit VIIIs–9.

Henneke stony loam, landslips, 10 to 30 percent slopes (HfD).—This soil is on ridgetops. The areas are larger than those of Henneke stony loam, landslips, 30 to 65 percent slopes, and are less steep. Capability unit VIIIs–9.

Hillgate Series

The Hillgate series consists of nearly level, well-drained soils. These soils formed in old alluvium washed from soils developed in material from shale, sandstone, and soft siltstone. The surface soil is light yellowish-brown, massive, medium acid, and medium textured. It is underlain abruptly by a yellowish-brown subsoil that is massive, slightly acid to neutral, and fine textured. These soils are on low terraces, west of the Sacramento River at elevations of less than 1,000 feet. In most areas, pasture crops and row crops are grown. In some areas the vegetation is mostly grass and forbs but includes scattered oaks.

Profile of Hillgate loam in a nearly level area under dryfarmed barley at an elevation of 275 feet (2 miles north of the depot of the Southern Pacific Railroad at Corning, 200 feet south and 50 feet east of the northwest corner of sec. 11, T. 24 N., R. 3 W.):

Ap—0 to 5 inches, light yellowish-brown (10YR 6/4) loam, dark brown (10YR 4/3) when moist; massive; hard when dry, friable when moist, slightly sticky and slightly plastic when wet; many very fine roots and pores; medium acid; clear, smooth boundary. 4 to 8 inches thick.

A1—5 to 11 inches, light yellowish-brown (10YR 6/4) loam, dark brown (10YR 4/3) when moist; massive; hard when dry, friable when moist, slightly plastic when wet; abundant fine roots and pores; medium acid; clear, smooth boundary. 4 to 8 inches thick.

A3—11 to 17 inches, yellowish-brown (10YR 5/4) loam that is nearly clay loam, dark brown (10YR 4/3) when moist; massive; hard when dry, friable when moist, slightly sticky and slightly plastic when wet; a few very fine roots; many very fine tubular pores; some sand grains have dark coatings; medium acid; abrupt, smooth boundary. 3 to 8 inches thick.

B2t—17 to 39 inches, yellowish-brown (10YR 5/4) clay, dark brown (7.5YR 4/3) when moist; massive; extremely hard when dry, extremely firm when moist, very sticky and very plastic when wet; a few very fine roots; a few very fine pores but otherwise is very dense; clay films in voids; a few, fine, soft, dark, rounded grains; slightly acid; gradual, somewhat irregular boundary. 15 to 24 inches thick.

B3t—39 to 70 inches +, light yellowish-brown (2.5Y 6/4) light clay loam, light olive brown (2.5Y 5/4) when moist; yellowish-brown coatings in pores and in seams; massive; very hard when dry, firm when moist, sticky and plastic when wet; no roots; a few very fine pores but is more porous in the lower part; thick, continuous clay films in pores and in seams; clay films are thinner and less numerous in the lower part, which also contains more gravel that is coated with colloid: neutral.

The A horizon ranges from pale brown to light yellowish brown, hue 10YR. It ranges from loam to silt loam in texture, but it is gravelly in places. In areas that are not cultivated the upper 1 or 2 inches of the A horizon is darker colored and more porous than the lower part. In other areas the upper few inches of the A horizon has moderate, thin, platy structure. In places the A horizon is mottled with lighter colored (bleached) sandy soil material. The B2t horizon ranges from yellowish brown to brown or strong brown, hues of 10YR and 7.5YR, and is slightly redder when moist. These soils are medium acid in the A horizon and neutral or mildly alkaline in the B3t horizon. Lime is within 5 feet of the surface in some places.

Hillgate loam, 0 to 3 percent slopes (HgA).—This soil is in wide areas on low terraces west of the Sacramento River. The areas vary in size and shape from place to place but are fairly smooth. This soil is well drained. Runoff is slow, and permeability is slow to very slow. Available water holding capacity is low. Movement of water and roots through the soil is restricted by the dense subsoil. Crops on this soil respond to fertilizer that contains nitrogen and phosphate. There is little or no erosion.

Included with this soil in mapping are small areas of Tehama, Arbuckle, and Kimball soils.

Barley, oats, and wheat are grown without irrigation on this Hillgate soil. If irrigation water is available, milo, pasture, corn, beans, and olives are grown. Capability unit IIIs–3.

Hillgate loam, 3 to 8 percent slopes (HgB).—This soil is on the edges of terraces. Runoff is slow to medium, and the erosion hazard is moderate. This soil should be cultivated on the contour to help control erosion. Irrigation systems should be designed so as to prevent excessive runoff. Capability unit IIIe–3.

Hillgate loam, shaly substratum, 0 to 8 percent slopes (HhB).—This soil is moderately sloping in places and has hard shale at a depth of 3 to 5 feet, but it is otherwise similar to Hillgate loam, 0 to 3 percent slopes. It is in the small valley along the western edge of foothills in the western part of the county. Most areas are small and generally have uneven surfaces. Roots and water cannot penetrate the shale.

Included with this soil in mapping are small areas of Arbuckle and Tehama soils. The shallow Lodo and Millsholm soils, which formed in shale, are also included.

This Hillgate soil is used for pasture and range and for dryfarmed grain. Water is not available for irrigating the soil. Capability unit IIIe–3.

Hillgate gravelly loam, 0 to 3 percent slopes (Hk).—This soil is 10 to 20 percent rounded gravel but is otherwise similar to Hillgate loam, 0 to 3 percent slopes. Most of the areas are small and are on narrow terraces.

Included with this soil in mapping are small areas of Arbuckle and Tehama soils.

This Hillgate soil is used mostly for dryfarmed grains and shallow-rooted crops that are irrigated. Some areas,

however, are used for pasture and range. Capability unit IIIs–3.

Hillgate silt loam, 0 to 3 percent slopes (Hl).—Except for the texture of the surface soil, this soil is similar to Hillgate loam, 0 to 3 percent slopes. The silt loam texture makes this soil puddle readily if cultivated when wet, or if excessively cultivated when dry. In some places water flowing over the surface of the soil almost seals the surface but in others the water considerably reduces the rate at which the soil takes in water. Capability unit IIIs–3.

Hillgate-Lodo complex, 3 to 50 percent slopes (HmE).—This complex consists of Hillgate loam, shaly substratum, 0 to 8 percent slopes, and Lodo shaly loam, 30 to 65 percent slopes, eroded. The Hillgate soil is on low terraces, some of which are less than 10 acres in size and are several feet above the stream level. The soil material in which the Hillgate soil formed was deposited on the soil material in which the Lodo soils formed. From 50 to 80 percent of an area is Hillgate loam, shaly substratum, 0 to 8 percent slopes, and the rest is Lodo soil but includes small areas of Tehama and Millsholm soils. Hillgate part, capability unit IIIe–3; Lodo part, capability unit VIIs–7.

Hillgate-Millsholm complex, 3 to 30 percent slopes (HtD).—This complex consists of Hillgate loam, shaly substratum, 0 to 8 percent slopes, and Millsholm clay loam, 10 to 30 percent slopes. Most of the Hillgate soil is on small, low terraces that are irregular in shape and are several feet above the drainageway of the present stream. From 50 to 80 percent of an area is Hillgate soil; the rest is mainly Millsholm soil but includes small areas of Lodo and Tehama soils. Hillgate part, capability unit IIIe–3; Millsholm part, IVe–5.

Hugo Series

The Hugo series consists of well-drained soils formed in such sedimentary rock as conglomerate, sandstone, or shale. These sandy loams are medium acid throughout. The surface soil is grayish brown, and it grades to brown and light yellowish brown with increasing depth. Hugo soils are in mountainous areas in the eastern and western parts of the county at elevations from 3,000 to 5,000 feet. The vegetation is hardwoods, shrubs, and various kinds of conifers.

Profile of Hugo gravelly sandy loam on a slope of 50 percent that faces east; under a dense stand of conifers and hardwoods; elevation of 4,000 feet (just west of Beegum Peak, 500 feet west and 400 feet south of the northwest corner of sec. 4, T. 28 N., R. 9 W.):

O1 & O2—2 inches to 0, forest litter made up of fresh, decomposed leaves and needles; abrupt, smooth boundary.

A11—0 to 3 inches, grayish-brown (10YR 5/2) gravelly sandy loam, very dark grayish brown (10YR 3/2) when moist; strong, fine, granular structure; soft when dry, very friable when moist, nonsticky when wet; a few fine roots; very porous; medium acid; abrupt, smooth boundary. 2 to 4 inches thick.

A12—3 to 16 inches, brown (10YR 5/3) gravelly sandy loam, dark brown (10YR 4/3) when moist; strong, fine, granular structure in the upper part but is massive in the lower part; slightly hard when dry, friable when moist, nonsticky when wet; many fine roots; very porous; medium acid; gradual, irregular boundary. 10 to 15 inches thick.

B1—16 to 38 inches, light yellowish-brown (10YR 6/4) stony sandy loam, yellowish brown (10YR 5/4) when moist; massive; slightly hard when dry, friable when moist, slightly sticky when wet; a few roots; many fine pores; 5 to 10 percent angular stones that increase in amount with increasing depth; medium acid; diffuse boundary. 5 to 24 inches thick.

B2t—38 to 48 inches, light yellowish-brown (10YR 6/4) stony sandy clay loam, yellowish brown (10YR 5/4) when moist; massive; slightly hard when dry, friable when moist, slightly sticky when wet; medium acid; abrupt, irregular boundary. 10 to 20 inches thick.

R—48 inches +, weathered, fractured conglomerate rock; cracks extend several feet into the rock; material from the B2t horizon partly fills these cracks.

The uppermost part of the A horizon is grayish brown, dark brownish gray, or dark brown, and the lower part is brown, pale brown, or yellowish brown. The soils are slightly acid or medium acid. The B horizon is yellowish brown, light yellowish brown, or pale brown, and it is medium acid or strongly acid. In many places the lower horizons are stony, but the surface layer is stony in only a few places.

Hugo gravelly sandy loam, 50 to 65 percent slopes (HuF).—This steeply sloping soil is in mountainous areas in the western and eastern parts of the county. The soil is well drained. Runoff is rapid. The permeability, available water holding capacity, and fertility are moderate. The erosion hazard is very severe.

Included with this soil in mapping are small areas of the Cohasset, Josephine, Los Gatos, McCarthy, and Neuns soils.

This Hugo soil is used for producing timber. Because of the steep slopes, harvesting of timber is difficult. Capability unit VIIe–4.

Hugo gravelly sandy loam, 30 to 50 percent slopes (HuE).—This steeply sloping soil is near ridgetops. It is not so difficult to harvest timber from this soil as from Hugo gravelly sandy loam, 50 to 65 percent slopes. Capability unit VIe–4.

Hulls Series

The Hulls series consists of shallow to moderately deep, moderately steep to very steep, well-drained soils. These soils formed in material from metamorphic rocks, predominantly chlorite-sericite mica schist. These soils are light brownish gray to gray. They are gravelly, medium textured, and medium acid throughout. Hulls soils are in mountainous areas in the western part of the county at elevations of 2,000 to 4,000 feet. Landslips are common in most areas. Vegetation is mostly grasses and forbs but includes a few oaks. The soils are used for pasture and range.

Profile of Hulls gravelly loam on a slope of 60 percent that faces south in an area used for summer grazing; elevation of 3,000 feet (13 miles west of Paskenta, in the northeast part of SW¼SE¼ of sec. 6, T. 23 N., R. 8 W.):

A11—0 to 4 inches, light brownish-gray (2.5Y 6/2) gravelly loam, dark gray (2.5Y 4/2) when moist; massive; slightly hard when dry, friable when moist, slightly sticky and nonplastic when wet; abundant very fine roots; many very fine pores; aggregates and walls of pores have a silvery coating of fine mica; medium acid; abrupt, smooth boundary. 2 to 6 inches thick.

A12—4 to 7 inches, light brownish-gray (2.5Y 6/2) gravelly loam, dark gray (2.5Y 4/2) when moist; massive; slightly hard when dry, friable when moist, slightly sticky and nonplastic when wet; many fine pores; medium acid; clear, irregular boundary. 6 to 15 inches thick.

C1—7 to 23 inches, light-gray (2.5Y 7/2), angular, cobbly light sandy clay loam, dark grayish brown (2.5Y 4/2) when moist; massive; slightly hard when dry, friable when

moist, slightly sticky and slightly plastic when wet; a few very fine roots; a few very fine and fine pores; aggregates and walls of pores have a silvery coating of fine mica; medium acid; clear, irregular boundary. 6 to 12 inches thick.

C2 & R—23 inches +, mica schist that has quartz veins and is fractured and partly weathered; cracks are filled with soil material similar to the C1 horizon.

In color the A horizon ranges from gray to grayish brown or light brownish gray, and the C horizon from light gray to light grayish brown. The soils are generally medium acid throughout, but in places the subsoil is slightly acid. Texture ranges from loam or near silt loam to light sandy clay loam. The soils are gravelly or slightly gravelly in the surface layer, and the amount and size of the gravel increase with increasing depth. The gravel consists of angular fragments of schist and quartzite. Depth of the soils ranges from 10 to 30 inches.

Hulls gravelly loam, 30 to 50 percent slopes (HvE).—This soil is in mountainous areas in the western part of the county. Elevations range from about 1,500 feet to 4,000 feet. Most areas are on long slopes on the south sides of canyons. Slopes are uneven because of streams and landslips.

Drainage is good, permeability is moderate, and runoff is medium to rapid. The available water holding capacity is low, and fertility is moderate. Under the present cover of vegetation, erosion is slight.

Included with this soil in mapping are small areas of Los Gatos, Maymen, Tyson, and Sheetiron soils.

This Hulls soil is used for summer pasture and range. The forage is of good quality. Capability unit VIe–8.

Hulls gravelly loam, 10 to 30 percent slopes (HvD).—This soil is near ridgetops; most areas are less than 100 acres in size and have uneven slopes. Depth is nearly 30 inches, but in places it is as much as 48 inches. Generally this soil is deeper than the Hulls soils that have steeper slopes. Under present cover, runoff on this Hulls soil is slow to medium, and the erosion hazard is slight. Capability unit VIe–8.

Hulls gravelly loam, 50 to 65 percent slopes (HvF).—Most of this soil is on the lower slopes of canyons. The steep slopes make grazing difficult. Under the present cover, runoff is medium to very rapid and the erosion hazard is severe. Capability unit VIIe–8.

Inks Series

In the Inks series are well-drained soils formed in material from weakly consolidated rock. This rock is made up of sediments washed from areas of volcanic rocks, mainly basalt and andesite. Inks soils are brown or dark brown and are slightly acid to medium acid throughout. The surface soil is gravelly loam to cobbly loam, and the subsoil is gravelly clay loam to cobbly clay loam. Most areas are less than 2 feet deep.

These soils are on rounded hills and terrace breaks that are the dissected remnants of old terraces. They are east of the Sacramento River at elevations of 250 to 1,000 feet. The vegetation is mostly grasses and forbs but includes scattered oaks and shrubs. All areas are used for pasture and range.

Profile of Inks cobbly loam on a slope of 20 percent that faces southwest; under vegetation of annual grasses and forbs in an area used for grazing sheep; elevation of 600 feet (3 miles north of Dales in the SW¼NE¼ sec. 30, T. 29 N., R. 2 W.):

A1—0 to 6 inches, brown (10YR 5/3) cobbly loam, dark brown (10YR 3/3) when moist; massive; hard when dry, friable when moist, slightly sticky and nonplastic when wet; many very fine roots and pores; medium acid; clear, irregular boundary. 5 to 12 inches thick.

B1—6 to 10 inches, brown (10YR 5/3) very gravelly clay loam, dark brown (10YR 3/3) when moist; massive; hard when dry, friable when moist, sticky and slightly plastic when wet; many very fine roots and pores; thin, nearly continuous clay films in pores; medium acid; clear, irregular boundary. 3 to 6 inches thick.

B2t—10 to 13 inches, dark-brown (10YR 4/3) very gravelly clay loam, dark brown (10YR 3/3) when moist; massive; hard when dry, firm when moist, sticky and slightly plastic when wet; many very fine roots and pores; thin, continuous clay films in pores; medium acid; abrupt, irregular boundary. 2 to 6 inches thick.

R—13 inches +, partly weathered, weakly consolidated terrace deposits; a few roots in cracks.

The A1 horizon is brown, and except that it is darker, the color changes little with increasing depth. It is generally loam in texture, but the amount and size of gravel and rounded fragments of rock in it vary. The B2t horizon is generally clay loam, but in places it is light clay. Depth of the soils ranges from 10 to nearly 24 inches. The soils are generally slightly acid or medium acid throughout and tend to be less acid with increasing depth.

These soils range from nearly stone free to very cobbly, and the stones are basaltic or andesitic in origin. The degree of consolidation of the parent rock is reflected in the soils. Soils formed in material from the hard rock are shallower and stonier than those formed over the softer rock. On the other hand, areas of Rock land near the Inks soils are on rock strata that are more resistant to weathering.

Inks cobbly loam, 3 to 30 percent slopes (IcD).—This soil is on low rounded hills east of the Sacramento River. The areas are smooth, but rounded cobblestones cover 5 to 25 percent of the surface. This soil is well drained. The available water holding capacity and fertility are low. Permeability is moderate through the profile but is slow through the underlying material. Runoff is slow to medium. Depth of the soil ranges from 10 to 24 inches.

Included with this soil in mapping are small areas of Toomes and Tuscan soils.

All of this Inks soil is used for pasture and range. The quantity of the forage is small, and the quality is fair. Capability unit VIs–8.

Inks cobbly loam, 30 to 50 percent slopes (IcE).—This soil is similar to Inks cobbly loam, 3 to 30 percent slopes. Most areas have uneven slopes and are in long narrow stringers along terrace breaks. Cobblestones 3 to 10 inches in diameter and a few stones 10 to 24 inches in diameter cover 5 to 25 percent of the surface. Depth of the soil ranges from 10 to 24 inches.

Included with this soil in mapping are small areas of Tuscan soils and of Rock land.

This Inks soil is used for pasture and range. Because it has steeper slopes, it is less desirable for grazing than Inks cobbly loam, 3 to 30 percent slopes. Blue oaks are also more dense, particularly on the north slopes. Capability unit VIs–8.

Inskip Series

The Inskip series consists of moderately steep to steep, well-drained soils formed in material derived from dark, vesicular basalt of recent origin. The soils are gravelly silt loams and are slightly acid to neutral throughout. Rock outcrops are common. The surface layer is dark brown, and the subsoil is dark yellowish brown to brown. Depth to the basalt, which is highly fractured, is less than 4 feet. Inskip soils are on sloping lava flows and steep sides of volcanoes. Elevations range from 1,000 to 5,000 feet. The vegetation is shrubs, hardwoods, and conifers. Timber is harvested from some areas.

Profile of Inskip very rocky silt loam on a slope of 15 percent that faces northeast; under vegetation made up mostly of ponderosa pine but that includes hardwoods and shrubs; elevation of 1,750 feet (2 miles north of Paynes Creek in the SE¼NE¼ sec. 24, T. 29 N., R. 1 W.):

A11—0 to 3 inches, dark-brown (10YR 3/3) gravelly silt loam, very dark brown (10YR 2/2) when moist; weak, fine, granular structure; soft when dry, very friable when moist; many very fine roots and pores; angular fragments of basalt of various sizes make up 20 to 50 percent of the volume; slightly acid; clear, smooth boundary. 2 to 8 inches thick.

A12—3 to 10 inches, dark yellowish-brown (10YR 4/4) gravelly silt loam, dark brown (10YR 3/4) when moist; weak, fine, granular structure; soft when dry, very friable when moist; many very fine and fine roots; many very fine pores; about 50 percent by volume is rock fragments; neutral; gradual, smooth boundary. 7 to 15 inches thick.

C—10 to 33 inches, yellowish-brown (10YR 5/4) gravelly silt loam, dark brown (7.5YR 3/4) when moist; weak, very fine, granular structure; soft when dry, friable when moist; a few fine roots; very porous; more than 50 percent by volume is rock fragments; neutral; gradual, smooth boundary. 10 to 24 inches thick.

R—33 inches +, fractured, vesicular, basaltic lava; soil material similar to that in the C horizon partly fills the interstices; surfaces of fractured rock are weathered and yellowish brown; a few large roots; many feet thick.

The A horizon is dark brown or brown to very dark brown. At lower elevations the subsoil is yellowish brown, but at higher elevations it grades from brown to reddish brown. Depth at lower elevations ranges from 10 to 36 inches, and at higher elevations from 30 to 50 inches. Rock fragments that range from 3 to more than 36 inches in diameter cover from 10 to 50 percent of the surface. Lava outcrops are also common in some areas.

Inskip very rocky silt loam, 10 to 30 percent slopes (IkD).—Most of this soil is along Mill Creek. The surface is uneven because of angular stones. Many of the stones are more than 1 foot in diameter, but some are more than 3 feet. Rock outcrops cover 10 to 50 percent of the surface. This soil is well drained. There is little or no runoff. Permeability is moderate, and the available water holding capacity and fertility are moderate to low. Depth of the soil ranges from 10 to 36 inches.

Included with this soil in mapping are small areas of Cone soils. Also included are many small areas of Rock land.

Most areas of this Inskip soil are covered by dense stands of hardwoods and shrubs, which provide cover and browse for wildlife, but timber is harvested from some areas. Because of stones on the surface, this soil is difficult to manage. Capability unit VIs–7.

Inskip very rocky silt loam, 30 to 50 percent slopes (IkE).—This steeply sloping soil is on the sides of volcanoes in many places. Included with this soil are small areas of Cone soils and areas of Rock land.

Harvesting timber from this Inskip soil is more difficult than from less sloping Inskip soils. Capability unit VIs–7.

Inskip very rocky silt loam, moderately deep, 10 to 30 percent slopes (ImD).—This soil is on material weathered from recent volcanic flows. The areas are in the eastern part of the county at elevations of 4,000 to 5,000 feet. Depth ranges from 30 to 50 inches.

Included with this soil in mapping are areas of Rock land and small areas of Cohasset, Cone, and Lyonsville soils.

Ponderosa pine, sugar pine, Douglas-fir, white fir, and incense-cedar are harvested from this Inskip soil. Rocks on the surface make logging difficult. Capability unit VIs–7.

Inskip very rocky silt loam, moderately deep, 30 to 50 percent slopes (ImE).—Because of its steep slopes, it is difficult to harvest timber from this soil. Capability unit VIIs–4.

Iron Mountain Series

The Iron Mountain series consists of gently sloping to very steep, dark grayish-brown, excessively drained, medium-textured and moderately coarse textured soils that are slightly acid throughout. These soils formed in material from cemented volcanic breccia. Most areas are very shallow and rocky. Iron Mountain soils are on the steep slopes of canyons in mountainous areas. They are in the eastern part of the county at elevations ranging from 1,000 to 8,000 feet. The vegetation is shrubs, forbs, and grasses, which are used to a limited extent for pasture and range.

Profile of Iron Mountain rocky sandy loam on a slope of 42 percent that faces east; formerly under an open stand of shrubs and annual grasses and forbs; elevation of 3,800 feet (2½ miles southwest of Black Rock in the SE¼ of sec. 20, T. 27 N., R. 3 E.):

A1—0 to 9 inches, dark grayish-brown (10YR 4/2) sandy loam, dark brown (10YR 3/3) when moist; moderate, medium, subangular blocky structure; slightly hard when dry, friable when moist; many very fine roots and pores; a few subrounded pebbles; slightly acid; abrupt, irregular boundary. 3 to 19 inches thick.

R—9 inches +, cemented volcanic breccia that is impervious to both roots and water.

These soils are generally dark grayish brown in color but range to dark brown or grayish brown. Depth is mostly 8 to 10 inches but ranges from a few inches to 19 inches. Areas of exposed bedrock and various amounts of angular gravel and cobblestones are commonly associated with these soils. The underlying breccia is not uniform in color but is generally gray or bluish gray, and the hardness and the amount of rock fragments in it also vary.

Iron Mountain rocky sandy loam, 10 to 30 percent slopes (IrD).—The profile of this soil is similar to the one described for the series. Most areas have a very uneven surface because of drainageways that have cut through the soil into the hard parent rock. A number of the areas are several hundred acres in size. Depth of the soil is mostly 8 to 10 inches. Drainage is excessive, runoff is slow to

medium, and permeability is moderately rapid. The available water holding capacity and fertility are low.

Included with this soil in mapping are small areas of Cohasset, McCarthy, and Supan soils and areas of Rock land.

Iron Mountain rocky sandy loam, 10 to 30 percent slopes, supports a fairly sparse stand of low-quality forage for cattle during the summer. The vegetation also protects the watershed and provides habitats and browse for wildlife. Capability unit VIIs–7.

Iron Mountain rocky sandy loam, 30 to 50 percent slopes (IrE).—This soil is like the soil described for the series. It supports a sparse cover of low-quality forage for summer grazing for livestock. The vegetation also protects the watershed and provides habitats and browse for wildlife. Capability unit VIIs–7.

Iron Mountain rocky sandy loam, 50 to 65 percent slopes (IrF).—Except for its steeper slopes, this soil is similar to Iron Mountain rocky sandy loam, 10 to 30 percent slopes. Capability unit VIIs–7.

Iron Mountain stony loam, 30 to 50 percent slopes (IsE).[8]—Except for the texture of the surface soil, this soil is similar to Iron Mountain rocky sandy loam, 30 to 50 percent slopes. Capability unit VIIs–7.

Iron Mountain-Supan complex, 30 to 50 percent slopes (IxE).—This complex consists of Iron Mountain rocky sandy loam, 30 to 50 percent slopes, and Supan stony loam, 30 to 50 percent slopes. Either soil may occupy from 40 to 60 percent of any one area. Iron Mountain part, capability unit VIIs–7; Supan part, capability unit VIs–8.

Jiggs Series

In the Jiggs series are sloping to steep, somewhat excessively drained soils formed in material from hard rhyolitic rock from volcanic flow. The surface soil is thin, medium acid, grayish-brown stony sandy loam. The subsoil is light-gray, medium acid, gravelly sandy loam. These soils grade to fractured and somewhat weathered rhyolite at a depth of about 2 feet. They are on mountainous uplands in the eastern part of the county Elevations range from 3,000 to 5,000 feet. The vegetation is mostly various kinds of conifers, which are harvested for timber.

Profile of Jiggs stony sandy loam on a slope of 13 percent that faces west; under a stand of ponderosa pine, Douglas-fir, and incense-cedar; elevation of 4,200 feet (5½ miles north of Lassen Lodge in the SE¼ sec. 30, T. 31 N., R. 3 E.):

O1 & O2—1 inch to 0, forest litter; the uppermost part is fresh and matted needles, leaves, and small twigs; grades to a thin layer of partly decomposed organic matter; abrupt, smooth boundary. 1 to 2 inches thick.

A11—0 to 2 inches, grayish-brown (10YR 5/2) stony sandy loam, very dark brown (10YR 2/2) when moist; moderate, medium, granular structure; soft when dry, friable when moist; a few very fine roots; very porous; medium acid; abrupt, wavy boundary. 1 to 3 inches thick.

A12—2 to 6 inches, light brownish-gray (10YR 6/2) stony coarse sandy loam, brown (10YR 4/3) when moist; moderate, medium, granular structure; soft when dry, friable when moist; many roots; very porous; medium acid; clear, wavy boundary. 3 to 9 inches thick.

C1—6 to 20 inches, light-gray (10YR 7/2) gravelly coarse sandy loam, grayish brown (10YR 5/2) when moist; weak, medium, subangular blocky structure; slightly hard when dry, friable when moist; many roots; many very fine to medium pores; medium acid; clear, irregular boundary. 9 to 20 inches thick.

C2 & R—20 inches +, weathered and fractured hard rhyolitic rock; the cracks in the rock are partly filled with soil material similar to that in the C1 horizon; a few medium and large roots extend to an undetermined depth; many feet thick.

The A1 horizon ranges from dark grayish brown to pale brown in color and is generally stony sandy loam or near stony loamy sand. There are coarse grains of sand in many places, and round, dark-colored concretions or pellets are in a few places. The A1 horizon grades to the C1 horizon, which ranges from pale brown to light gray or white in color. It is medium acid to strongly acid. Depth of the soils generally ranges from 20 to 30 inches. In places the soils are as deep as 40 inches, but in others they are as shallow as 10 inches. Stony, shallow soils that have some rock outcrops are on the steeper, south-facing slopes.

Jiggs stony sandy loam, 10 to 30 percent slopes (JgD).—This soil is on partly rounded ridgetops in the eastern part of the county. Many areas are more than 100 acres in size. Except for rocks, the surface is smooth. Angular rocks 3 to 36 inches in diameter cover 5 to 25 percent of the surface.

This soil is somewhat excessively drained. Runoff is slow to medium, and permeability is rapid. The available water holding capacity and fertility are low. The erosion hazard is moderate. Logging should be carefully done to help control erosion.

Included with this soil in mapping are areas of Cohasset, Forward, and Lyonsville soils. Areas of rock outcrops are also included.

Jiggs stony sandy loam, 10 to 30 percent slopes, is used for timber. Trees grow well on this soil, and the density of the stands is good. Capability unit VIs–7.

Jibbs stony sandy loam, 10 to 30 percent slopes, eroded (JgD2).—This soil is on rounded ridgetops in the eastern part of the county. Angular stones cover 10 to 50 percent of the surface. The soil has been excessively disturbed by logging; consequently, 4 to 12 inches of the surface soil has been removed by sheet and gully erosion. In places patches of bedrock are exposed where the soil has been removed by logging. The erosion hazard is moderate.

Included with this soil in mapping are small areas of Cohasset, Forward, and Lyonsville soils.

This Jiggs soil is used for timber, but the density of the stands and the rate of tree growth have been reduced by erosion. Capability unit VIIs–4.

Jiggs stony sandy loam, 30 to 50 percent slopes (JgE).—This soil is on the sides of deep canyons. It is more difficult to harvest timber from these steeper slopes than from the Jiggs soils that have less steep slopes. The erosion hazard is severe. Capability unit VIs–7.

Jiggs stony sandy loam, 30 to 50 percent slopes, eroded (JgE2).—This soil has steeper slopes than Jiggs stony sandy loam, 10 to 30 percent slopes, eroded. The erosion hazard is severe. It is also more difficult to harvest timber from this soil. Capability unit VIIs–4.

[8] This soil was shown as a member of the Bonner series on advance sheets published by the University of California Agricultural Extension Service and the California Division of Forestry during the years 1953–59.

Jiggs stony sandy loam, 50 to 65 percent slopes (JgF).—This soil is on the slopes of deep canyons. The erosion hazard is very severe if the vegetation is removed. The very steep slopes make it difficult to harvest timber from this soil. Capability unit VIIs–1.

Jiggs stony sandy loam, 50 to 65 percent slopes, eroded (JgF2).—This soil is steeper than Jiggs stony sandy loam, 10 to 30 percent slopes, eroded. In many places the erosion hazard is very severe. The very steep slopes make it difficult to harvest timber from this soil. Capability unit VIIs–1.

Josephine Series

The Josephine series consists of deep, moderately steep to very steep, well-drained, reddish-brown soils that formed in material from hard sedimentary and metamorphic rocks. The surface layer is medium acid and medium textured, and the subsoil is strongly acid and moderately fine textured. Josephine soils are in mountainous areas in the western part of the county at elevations of 3,000 to 5,000 feet. The vegetation is various kinds of conifers and hardwoods. These soils are used for timber.

Profile of Josephine gravelly loam on a slope of 42 percent that faces east; under a dense stand of mostly various kinds of conifers but that includes black oaks and shrubs; elevation of 4,300 feet (7 miles west and 2 miles north of Paskenta, in the south-central part of the NE¼SE¼ sec. 19, T. 24 N., R. 7 W.):

O—1 inch to 0, matted, fresh to decomposed litter from conifers and oaks; abrupt, smooth boundary. 1 to 3 inches thick.

A1—0 to 4 inches, brown (7.5YR 5/2) gravelly loam, dark brown (7.5YR 4/2) when moist; moderate, medium, subangular blocky structure; slightly hard when dry, friable when moist, nonsticky when wet; very porous; many roots; a few small rounded concretions; medium acid; clear, smooth boundary. 3 to 10 inches thick.

A3—4 to 15 inches, brown (7.5YR 5/2) gravelly loam, dark brown (7.5YR 4/2) when moist; moderate, medium, subangular blocky structure; slightly hard when dry, friable when moist, nonsticky when wet; very porous; many roots; thin, continuous clay films in many of the pores; medium acid; clear, irregular boundary. 7 to 13 inches thick.

B2t—15 to 38 inches, reddish-brown (5YR 5/4) gravelly clay loam, reddish brown (5YR 4/4) when moist; moderate, medium, subangular blocky structure; hard when dry, friable when moist, slightly sticky and plastic when wet; very porous; pores contain continuous clay films; the thickest clay films in the soil are in the lower part of this horizon; many roots; strongly acid; diffuse boundary. 18 to 30 inches thick.

B3t—38 to 50 inches, yellowish-red (5YR 5/8) very gravelly clay loam, yellowish red (5YR 5/6) when moist; common, medium, distinct, dark reddish-brown (5YR 3/4) and brown (7.5YR 5/4) mottles; massive; hard when dry, friable when moist, slightly sticky when wet; a few fine pores; a few roots; continuous clay films in pores but less than in the B2t horizon; strongly acid; abrupt, very irregular boundary. 6 to 18 inches thick.

R—50 inches +, weathered but hard, light-gray mica schist; cracks are filled with material from the B3t horizon.

In color the surface layer ranges from brown to reddish brown. The B horizon is reddish brown to brown, and it is mottled with brown and yellowish red. The substratum is yellowish red, and it is mottled with red to brown. These soils range from slightly acid to medium acid in the surface soil and from medium acid to strongly acid in the subsoil. In places the surface soil is gravelly, but the subsoil is generally gravelly to very gravelly. Depth of the soils ranges from a little less than 2 feet to more than 5 feet.

Josephine gravelly loam, 30 to 50 percent slopes (JoE).—This soil is on the upper slopes of steep canyons in mountainous areas in the western part of the county. Most areas have a smooth surface, and many are more than 100 acres in size. The soil is well drained. Runoff is rapid, and permeability is moderate. The available water holding capacity and fertility are moderate to high. The erosion hazard is severe.

Included with this soil in mapping are small areas of Los Gatos, Maymen, Tyson, Sheetiron, and Hugo soils.

This Josephine soil is used for timber, but the steep slopes make it difficult to harvest timber from the soil. Care is required when logging is done to avoid accelerating runoff. Capability unit VIe–4.

Josephine gravelly loam, 10 to 30 percent slopes (JoD).—This soil is on ridgetops. It is not so steep but is otherwise similar to Josephine gravelly loam, 30 to 50 percent slopes. This soil is used for trees. The trees grow well, and the density of the stands is good. Apples are grown in a few places. In areas where the vegetation has been removed, the erosion hazard is moderate. Capability unit IVe–4.

Josephine gravelly loam, 30 to 50 percent slopes, eroded (JoE2).—This soil has lost several inches of surface soil through erosion but is otherwise similar to Josephine gravelly loam, 30 to 50 percent slopes. Depth of the soil ranges from 20 to 40 inches.

Timber is grown on this soil, but the density of the stands and the rate of tree growth are less than on the Josephine soil that is not eroded. The steep slopes make it difficult to harvest timber from this soil. Capability unit VIe–4.

Josephine gravelly loam, 50 to 65 percent slopes, eroded (JoF2).—This soil is on the walls of deep canyons. Its slopes are very steep, but it is otherwise similar to Josephine gravelly loam, 30 to 50 percent slopes. Depth of the soil ranges from 20 to 40 inches.

It is difficult to harvest timber from this soil because of the very steep slopes. In areas where several inches of surface soil has been removed through erosion, the rate of tree growth has been reduced. Capability unit VIIe–4.

Josephine-Sheetiron gravelly loams, 10 to 30 percent slopes (JsD).—This complex consists of Josephine gravelly loam, 10 to 30 percent slopes, and Sheetiron gravelly loam, 10 to 30 percent slopes. From 50 to 80 percent of each area is Josephine soil, and the rest is Sheetiron soil. Both parts, capability unit IVe–4.

Josephine-Sheetiron gravelly loams, 30 to 50 percent slopes (JsE).—This complex consists of Josephine gravelly loam, 30 to 50 percent slopes, and Sheetiron gravelly loam, 30 to 50 percent slopes. From 50 to 80 percent of each area is Josephine soil, and the rest is Sheetiron soil. Both parts, capability unit VIe–4.

Keefers Series

The Keefers series consists of nearly level to gently sloping, well-drained soils formed in old alluvium. The alluvium was derived from basic igneous rocks, mainly

basalt and andesite. These soils characteristically have a surface soil of dark-brown to grayish-brown, slightly acid loam, and a subsoil of brown, slightly acid to neutral very cobbly clay. They are on old stream terraces and flood plains east of the Sacramento River. Elevations range from 200 to 1,000 feet. Most areas are used for pasture and range. The vegetation is mostly annual grasses and forbs, but it includes scattered oaks.

Profile of Keefers loam on a nearly level stream terrace in a field used for grazing sheep; under annual grasses and forbs; elevation of 250 feet (1 mile northeast of Los Molinos High School, in the NW¼SW¼SW¼ sec. 10, T. 25 N., R. 2 W.) :

A11—0 to 3 inches, dark-brown (10YR 3/3) loam, dark brown (7.5YR 3/4) when moist; weak, thin, platy structure; hard when dry, friable when moist, slightly sticky when wet; many very fine roots and pores; medium acid; abrupt, smooth boundary. 1 to 3 inches thick.

A12—3 to 16 inches, brown (7.5YR 5/4) gravelly loam, dark brown (7.5YR 3/4) when moist; massive; hard when dry, friable when moist, slightly sticky when wet; many fine roots and pores; slightly acid; clear, smooth boundary. 4 to 8 inches thick.

B1—16 to 24 inches, brown (7.5YR 5/4) cobbly clay loam, dark brown (7.5YR 3/4) when moist; massive but breaks to subangular blocky structure; hard when dry, friable when moist, sticky when wet; many fine roots and pores; slightly acid; abrupt, smooth boundary. 4 to 8 inches thick.

B2t—24 to 51 inches, reddish-brown (5YR 4/3) very cobbly clay, dark reddish brown (5YR 3/3) when moist; massive; very hard when dry, firm when moist, very sticky and plastic when wet; a few very fine roots; many, very fine to fine, irregular pores; moderately thick, continuous clay films in pores; slightly acid to neutral; gradual, irregular boundary. 20 to 30 inches thick.

B3t—51 to 68 inches +, yellowish-red (5YR 4/6) cobbly clay loam, dark reddish brown (5YR 3/4) when moist; massive; very hard when dry, firm when moist, very sticky and plastic when wet; a few very fine roots; many very fine to fine pores; neutral.

The color of the surface soil ranges from dark brown to grayish brown, but in a few areas it grades toward reddish brown. The color of the subsoil is generally reddish brown. In some places the surface soil is gravelly or cobbly, but the subsoil is always very cobbly. These soils range from medium acid to slightly acid in the surface soil and slightly acid to neutral in the subsoil. An unrelated cemented substratum underlies most areas at a depth that ranges from 3 to 6 feet or more. Except along cracks, the substratum is impervious to roots and water.

Keefers loam, 0 to 3 percent slopes (Kf).—This soil is on low terraces on the east side of the Sacramento River. Areas of this soil have a smooth surface and vary considerably in size and shape. The soil is well drained. Runoff is slow, and permeability also is slow. The clay subsoil restricts the movement of roots and water through the soil. The available water holding capacity and fertility are moderate. There is no erosion hazard.

Included with this soil in mapping are small areas of Tuscan, Anita, and Los Robles soils.

If irrigation water is available, pasture, corn, beans, and olives grow well on this Keefers soil. Other areas are used for pasture and range or for dryfarmed grain. Capability unit IIIs–3.

Keefers loam, moderately deep, 0 to 3 percent slopes (Km).—This soil has a cemented layer at a depth of 2 to 4 feet. This layer causes a perched water table to form in the soil during the winter and during the summer in areas where too much irrigation water accumulates.

If this soil is irrigated, shallow-rooted crops, such as pasture, can be grown. Crops that are injured by a high water table do not grow well. In some areas dryfarmed grain is grown, but most areas are used for pasture and range. Capability unit IIIs–3.

Keefers cobbly loam, moderately deep, 0 to 3 percent slopes (Kc).—This soil is on low terraces east of the Sacramento River. Most areas are parallel to the stream channels and are long and narrow. The soil has a smooth surface, but streambank erosion is a serious hazard. Cobblestones 3 to 10 inches in diameter cover 5 to 20 percent of the surface. A cemented layer, which occurs at a depth of 3 to 5 feet, causes a high water table that injures the roots of some plants for short periods during the winter. Except along cracks, water and plant roots cannot penetrate cemented layer.

Included with this soil in mapping are small areas of Tuscan, Anita, and Los Robles soils.

All of this Keefers soil is used for pasture and range. Cobblestones make it impractical to cultivate this soil. Capability unit VIs–8.

Keefers complex, channeled (Kn).—The soils in this complex are cut by stream channels but are otherwise similar to Keefers cobbly loam, moderately deep, 0 to 3 percent slopes. The channels have water in them most of the winter, but they are dry during the summer. All of the acreage is used for pasture and range. Capability unit VIw–1.

Kimball Series

In the Kimball series are nearly level to gently sloping, well-drained soils formed in old alluvium from sedimentary rock. The surface soil is brown, slightly acid loam, and the subsoil is reddish-brown, medium acid clay. These soils are on terraces west of the Sacramento River at elevations from 200 to 500 feet. The vegetation is mostly annual grasses and forbs but includes scattered oaks. Field crops, row crops, and some orchard crops grow well on these soils.

Profile of Kimball loam under annual grasses and forbs in an area that has not been cultivated for a few years and is along the railroad (1¾ miles north of the Southern Pacific Railroad depot at Corning in the southwest corner of the NW¼NW¼ sec. 11, T. 24 N., R. 3 W.) :

Ap1—0 to 3 inches, brown (10YR 5/3) loam, dark brown (10YR 4/3) when moist; massive; hard when dry, friable when moist, slightly sticky when wet; many fine roots and pores; slightly acid; abrupt, smooth boundary. 0 to 4 inches thick.

Ap2—3 to 6 inches, brown (7.5YR 5/5) loam, dark brown (7.5YR 4/4) when moist; massive; hard when dry, friable when moist, slightly sticky when wet; many fine roots and pores; medium acid; abrupt, smooth boundary. 6 to 10 inches thick.

B1t—6 to 11 inches, brown (7.5YR 5/4) clay loam, dark brown (7.5YR 3/4) when moist; massive; hard when dry, friable when moist, slightly sticky when wet; a few fine roots; many fine and medium pores; thin, discontinuous clay films in pores; medium acid; abrupt, smooth boundary. 4 to 8 inches thick.

B2t—11 to 21 inches, reddish-brown (5YR 5/4) clay, reddish brown (5YR 4/4) when moist; massive; very hard when dry, very firm when moist, very sticky and plastic when wet; a few fine roots; a few fine pores;

thick, continuous clay films; medium acid; clear, wavy boundary. 8 to 18 inches thick.

B3t—21 to 55 inches+, light yellowish-brown (2.5Y 6/4) clay loam, light olive brown (2.5Y 5/4) when moist; massive; hard and brittle when dry, firm when moist, sticky when wet; a few fine roots; a few fine pores; slightly acid; gravel is common; cracks are filled with yellowish-red (5YR 4/6) clay, dark red (2.5YR 3/6) when moist; the clay is oriented and appears to have moved into the cracks from the B2t horizon.

The surface layer is brown, light brown, and yellowish red in places, and the subsoil is reddish brown or red. The lower part of the subsoil is yellowish brown, light yellowish brown, or olive yellow. The surface layer is slightly acid to medium acid, and the subsoil ranges from medium acid to slightly acid.

Kimball loam, 0 to 3 percent slopes (KpA).—This soil is on terraces west of the Sacramento River at elevations from about 300 feet to 1,000 feet. Areas of the soil are quite variable in size and shape. The surface is smooth.

This soil is well drained. The available water holding capacity is moderate. The subsoil of dense clay is at a depth of 10 to 20 inches and is penetrated slowly by roots and water. There is no erosion hazard. Crops on this soil respond to fertilizer that contains nitrogen and phosphate.

Included with this soil in mapping are small areas of Corning, Hillgate, Moda, and Perkins soils.

Corn, milo, beans, olives, and pasture grow well in areas of this Kimball soil if irrigation water is available. Other areas are used for dryfarmed grain or for pasture and range. Capability unit IIIs–3.

Kimball loam, 3 to 8 percent slopes (KpB).—This gently sloping soil is on remnants of terraces and on slopes around the edges of terraces. Runoff is slow to medium, and the hazard of sheet and gully erosion is slight to moderate.

Included with this soil in mapping are areas of Hillgate and Perkins soils.

Most areas of Kimball loam, 3 to 8 percent slopes, are used for dryfarmed grain or for pasture and range. A small acreage in olives is irrigated on the contour, and a small acreage in pasture grass and clover is sprinkler irrigated. If irrigation is done by allowing water to flow over the surface, leveling or contouring is needed. Capability unit IIIe–3.

Kimball gravelly loam, 0 to 3 percent slopes (KoA).—Most areas of this soil are on the tops of terraces. This soil is 10 to 20 percent rounded quartzite gravel, but it is otherwise similar to Kimball loam, 0 to 3 percent slopes. Depth of the surface soil (a gravelly loam) to the subsoil of gravelly clay ranges from 10 to 20 inches.

Included with this soil in mapping are areas of Perkins soils.

If irrigation water is available, milo, olives, and pasture grass and clover are grown on this Kimball soil. Other areas are used for dryfarmed pasture and range or for grain. The gravel in the soil interferes somewhat with preparing a seedbed. It also causes much wear to equipment used for cultivation. Capability unit IIIs–3.

Kimball gravelly loam, 3 to 8 percent slopes (KoB).—This gently sloping soil is on remnants of terraces and around the edges of terraces. It is 10 to 20 percent gravel and is steeper but is otherwise similar to Kimball gravelly loam, 0 to 3 percent slopes. Runoff is slow to medium. Sheet and gully erosion is slight to moderate.

Most areas of this soil are used for dryfarmed grain or for pasture and range. A few areas in pasture are sprinkler irrigated. In areas where leveling or contouring is not feasible, sprinkler irrigation is required. The gravel in the soil interferes with cultivation and causes much wear to equipment used in cultivating the soil. Capability unit IIIe–3.

Laniger Series

In the Laniger series are nearly level to steep, well-drained soils formed in material from rhyolitic tuff. This tuff is massive, light colored, and brittle and is very slowly permeable to water. The Laniger soils are brown to dark grayish brown, are medium acid to slightly acid, and are fine sandy loam throughout. Depth varies, but the soils are mostly moderately deep. The soils are on rounded hills and steep scarps in the eastern and western parts of the county at elevations of 250 to 1,500 feet. The vegetation is mostly annual grasses and forbs but includes some oaks and shrubs. All of the acreage is used for pasture and range.

Profile of Laniger fine sandy loam on a slope of 2 percent that faces north in an area used for grazing in winter and spring; under annual grasses, forbs, and oaks; elevation of 250 feet (4 miles northeast of Vina in the SE¼SW¼-NW¼ sec. 32, T. 25 N., R. 1 W.):

A11—0 to 1 inch, dark grayish-brown (10YR 4/2) fine sandy loam, very dark brown (10YR 2/2) when moist; weak, medium, granular structure; soft when dry, very friable when moist; contains much partly decomposed organic material and many very fine roots; very porous; medium acid; abrupt, smooth boundary. 0 to 1 inch thick.

A12—1 to 9 inches, grayish-brown (10YR 5/2) fine sandy loam, dark brown (10YR 3/3) when moist; weak, medium, subangular blocky structure; slightly hard when dry, friable when moist; many very fine roots and very fine pores; medium acid to slightly acid; clear, wavy boundary. 4 to 10 inches thick.

B21—9 to 16 inches, grayish-brown (10YR 5/2) fine sandy loam, dark brown (10YR 3/3) when moist; weak, medium, subangular blocky structure; slightly hard when dry, friable when moist; many very fine roots and very fine pores; slightly acid; clear, wavy boundary. 4 to 10 inches thick.

B22—16 to 34 inches, brown (10YR 5/3) fine sandy loam, dark yellowish brown (10YR 3/4) when moist; weak, medium, subangular blocky structure; slightly hard when dry, friable when moist; porous: a few roots; slightly acid; abrupt, irregular boundary. 5 to 20 inches thick.

R—34 inches +, light-colored rhyolitic tuff that contains some fragments of pumice; firmly cemented.

The color of the surface layer is brown, grayish brown, or dark grayish brown, and that of the subsoil is grayish brown, brown, pale brown, or light brownish gray. The soils range from slightly acid to medium acid. Depth varies considerably within short distances because of irregular weathering of the parent material.

Laniger fine sandy loam, 0 to 8 percent slopes (LaB).—Most of this soil is about 4 miles northeast of Vina. The areas are at an elevation of about 350 feet and are less than 100 acres in size.

This soil is well drained. Runoff is slow, and permeability is rapid. The available water holding capacity and fertility are low to moderate, depending on depth of the

soil. Depth to dense, cemented tuff ranges from 15 to 36 inches. Except along cracks, roots and water penetrate this tuff very slowly. The erosion hazard is slight.

Included with this soil in mapping are small areas of Inks and Tuscan soils.

Most areas of this Laniger soil are too uneven and too shallow to be used intensively for agriculture. All of the soil is therefore used for pasture and range. Some areas were used as feeding sites during winter. In such areas excessive trampling by livestock has exposed the soil to wind and caused blowouts to form. Capability unit IVe–8.

Laniger fine sandy loam, 8 to 30 percent slopes (LaD).—This soil is on moderately steep, rounded hills and on ledges around breaks of terraces. Depth to the massive tuff ranges from 15 to 30 inches. The erosion hazard is moderate to severe.

Included with this soil in mapping are areas of Newville and Tuscan soils. This Laniger soil is used for pasture and range. In most areas the slopes are short and too uneven for the soil to be used intensively for agriculture. Capability unit VIe–8.

Laniger fine sandy loam, 30 to 50 percent slopes (LaE).—This soil is on the strata of tuff that are exposed on the slopes of terrace breaks. The erosion hazard is severe. The soil is used for pasture and range. Capability unit VIe–8.

Laniger fine sandy loam, deep, 0 to 8 percent slopes (LbB).—This soil is on low rounded hills that have somewhat uneven slopes. It is deeper to the massive tuff but is otherwise similar to Laniger fine sandy loam, 0 to 8 percent slopes. Depth to the massive tuff ranges from 30 to 48 inches.

Included with this soil in mapping are small areas of Tuscan soils.

This Laniger soil is used for pasture and range. In areas where irrigation water is available, it is suited to specialty crops. The hazard of erosion increases in cultivated areas. Capability unit IVe–8.

Lodo Series

In the Lodo series are moderately steep to very steep, somewhat excessively drained soils. These soils formed in material from hard, dark-gray shale that weathers and cracks to fine, angular gravel. They are pale-brown, slightly acid shaly loam throughout.

The available water holding capacity and fertility are low. Permeability is moderate, and runoff is medium to rapid. The erosion hazard is moderate on slopes of 10 to 30 percent but severe on steeper slopes. Depth to partly weathered and fractured shale ranges from 6 to 10 inches on slopes of 30 to 65 percent but is as much as 12 inches where slopes are 10 to 30 percent. Except along cracks, roots and water penetrate the shale to a limited depth.

Lodo soils are in foothills and mountainous areas in the western part of the county. The size and shape of the areas vary considerably. In places the areas are as small as 10 acres or less, and in other places they are as large as 500 acres. Slopes vary in length, and in many places are cut by short streams. In most places small patches of shale are exposed. In places small areas of the Millsholm and Millsap soils and of Rock land are within areas of the Lodo soils.

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The vegetation is mostly a sparse cover of grasses and forbs but includes a few scattered oaks and shrubs. Lodo soils are used for pasture and range. Yields of forage are better on slopes of 10 to 30 percent than on steeper slopes, and the quality is better.

Soils of the Lodo series are mapped only as undifferentiated units with the Maymen soils or as complexes with the Millsholm and Hillgate soils. The Maymen, Millsholm, and Hillgate soils are described under their respective series.

Profile of Lodo shaly loam on a slope of 15 percent that faces south in a field used for grazing cattle in winter and spring; under a cover of annual grasses and forbs and blue oaks and shrubs (1½ miles north of Cold Fork in the SE¼NE¼ sec. 18, T. 27 N., R. 7 W.):

A1—0 to 7 inches, pale-brown (10YR 6/3) shaly loam, brown (10YR 5/3) when moist; weak, coarse, subangular blocky structure; soft when dry, very friable when moist, nonsticky when wet; many fine roots; many fine and medium pores; 20 to 30 percent of the soil is fine, angular shale fragments; slightly acid.

R—7 inches +, fractured dark-gray shale.

These soils are pale brown, brown, or grayish brown in color, but they appear darker because of the dark-gray shale fragments they contain. They range from slightly acid to neutral. Depth of the soils varies within short distances.

Lodo and Maymen shaly loams, 30 to 65 percent slopes, eroded (LdE2).—This mapping unit consists of Lodo shaly loam, 30 to 65 percent slopes, eroded, and of Maymen gravelly loam, 30 to 65 percent slopes (fig. 3). Either soil may occupy from 40 to 60 percent of any one area. The soils are in mountainous areas, and some areas are more than 500 acres in size.

The erosion hazard is severe to very severe on the Lodo and Maymen soils. Depth to partly weathered, fractured rock ranges from 6 to 10 inches in the Lodo soil but is 6 to 20 inches in the Maymen. Roots and water penetrate the shale underlying the Lodo soil to a limited depth, except along cracks in the shale. Penetration of the hard, fairly dense rock underlying the Maymen soil is slow.

Except in areas where the soil is deeper, yields of annual grasses and forbs used for forage are very low on the Lodo soil. The large amount of shale fragments in the soil and shallowness of the soil to shale reduce yields. Dense stands of brush cover the Maymen soil. Both parts, capability unit VIIIs–8.

Lodo and Maymen shaly loams, 10 to 30 percent slopes, eroded (LdD2).—This mapping unit consists of Lodo shaly loam, 10 to 30 percent slopes, eroded, and Maymen gravelly loam, 10 to 30 percent slopes. Either soil may occupy from 40 to 60 percent of any one area. Both soils, capability unit VIIs–7.

Lodo-Millsholm complex, 10 to 30 percent slopes (LfD).—This complex consists of Lodo shaly loam, 10 to 30 percent slopes, eroded, and Millsholm clay loam, 10 to 30 percent slopes. Either soil may occupy from 40 to 60 percent of any one area. The areas are 10 acres or less in size in many places. Lodo part, capability unit VIIs–7; Millsholm part, capability unit IVe–5.

Lodo-Millsholm complex, 30 to 50 percent slopes (LfE).—This complex consists of Lodo shaly clay loam, 30 to 65 percent slopes, eroded, and Millsholm clay loam, 30 to 50 percent slopes. Either soil may occupy from 40 to 60 percent of any one area. Each area is 10 acres or less in size.

Figure 3.—An open stand of Digger pine and a sparse cover of grass on Lodo and Maymen shaly loams, 30 to 65 percent slopes, eroded.

Lodo part, capability unit VIIs–7; Millsholm part, capability unit VIe–5.

Lodo-Millsholm complex, 50 to 65 percent slopes (LfF).—This complex consists of Lodo shaly loam, 30 to 65 percent slopes, eroded, and Millsholm clay loam, 50 to 65 percent slopes. Either soil may occupy from 40 to 60 percent of any one area. In many places the areas are 10 acres or less in size. Lodo part, capability unit VIIIs–8; Millsholm part, capability unit VIIe–5.

Los Gatos Series

In the Los Gatos series are steep to very steep, well-drained soils formed in material from such sedimentary and metamorphic rocks as shale, conglomerate, and schist. These soils are moderately shallow to hard rock. The surface soil is brown, slightly acid, and medium textured. The subsoil is brown but grades toward reddish brown. It is medium acid and moderately fine textured. Los Gatos soils are on mountain slopes in the western part of the county at elevations of 1,000 to 4,000 feet. The vegetation is dense shrubs.

Profile of Los Gatos gravelly loam on a slope of 35 percent that faces east; under a dense stand of shrubs; elevation of 2,100 feet (2 miles south and 1 mile west of Cold Fork near the center of SE¼ sec. 31, T. 27 N., R. 7 W.):

A1—0 to 4 inches, brown (10YR 5/3) gravelly loam, dark brown (7.5YR 4/4) when moist; moderate, medium, granular structure; slightly hard when dry, friable when moist, slightly sticky when wet; many fine and medium roots; many fine pores; slightly acid; abrupt, smooth boundary. 3 to 6 inches thick.

B1t—4 to 10 inches, brown (10YR 5/3) gravelly loam near clay loam, dark brown (7.5YR 4/4) when moist; moderate, medium, subangular blocky structure; hard when dry, friable when moist, sticky when wet; a few fine and medium roots; many fine pores; thin, discontinuous clay films in pores and on rocks; medium acid; clear, irregular boundary. 6 to 10 inches thick.

B2t—10 to 20 inches, brown (7.5YR 5/3) very gravelly heavy loam, reddish brown (5YR 4/4) when moist; moderate, medium, subangular blocky structure; hard when dry, firm when moist, sticky and plastic when

wet; a few medium roots; a few fine pores; thin, continuous clay films in pores and around rocks; medium acid; abrupt, smooth boundary. 6 to 12 inches thick.

R—20 inches +, fractured and weathered sandstone; soil material from the B2t horizon fills the spaces between the rocks.

The A horizon is brown to grayish-brown, hue 10YR or 7.5YR, loam or clay loam and is gravelly in places. This horizon is generally slightly acid and granular, but the uppermost inch or two has weak, thin, platy structure that is most noticeable when the soil is dry. The B horizon is brown to reddish brown, hue 7.5YR or 5YR. It is generally medium acid gravelly or stony clay loam. Depth of the soils ranges from 15 to 30 inches.

Los Gatos gravelly loam, 30 to 50 percent slopes (LgE).—This soil is on slopes of canyons and ridges in the western part of the county. Some areas are large and have long slopes. Rock outcrops and streams that cut through the areas make the surface uneven.

This soil is well drained. Permeability is moderate. The available water holding capacity and fertility are moderate to low. Runoff is rapid, and the erosion hazard is severe. Depth to partly weathered and fractured rock ranges from about 15 to 30 inches.

Included with this soil in mapping are small areas of Josephine, Maymen, Parrish, and Tyson soils.

The dominant shrubs on this Los Gatos soil are chamise, wedgeleaf ceanothus, whiteleaf manzanita, common manzanita, California scrub oak, interior live oak, California laurel, and mountain-mahogany. These shrubs protect the watershed and provide cover and browse for wildlife. Capability unit VIIe–8.

Los Gatos gravelly loam, 50 to 65 percent slopes (LgF).—This soil has steeper slopes but is otherwise similar to Los Gatos gravelly loam, 30 to 50 percent slopes. It is on the lower part of slopes. Depth ranges from 15 to 25 inches. Runoff is very rapid, and the erosion hazard is very severe. Capability unit VIIe–8.

Los Gatos-Maymen gravelly loams, 30 to 65 percent slopes (LhE).—This complex consists of Los Gatos gravelly loam, 30 to 50 percent slopes, and Maymen gravelly loam, 30 to 65 percent slopes. Either soil may occupy from 40 to 60 percent of any one area. Los Gatos part, capability unit VIIe–8; Maymen part, capability unit VIIIs–8.

Los Robles Series

The Los Robles series consists of nearly level, well-drained soils formed in alluvium derived from such basic igneous rocks as basalt and andesite. These soils are brown to dark brown and are slightly acid to neutral throughout. The surface layer is loam to light clay loam, and there is a slight increase in the amount of clay in the subsoil. Los Robles soils are on flood plains east of the Sacramento River at elevation of 200 to 500 feet. Most of the areas are cultivated.

Profile of Los Robles clay loam on a nearly level flood plain; under an orchard of prunes; elevation of 250 feet (¼ mile east of Dairyville in the SW¼SE¼ sec 5, T. 26 N., R. 2 W.):

Ap—0 to 6 inches, dark-brown (10YR 4/3) light clay loam, very dark brown (10YR 2/2) when moist; subangular blocky structure; hard when dry, firm when moist, sticky and plastic when wet; many very fine roots; a few fine pores; slightly acid; abrupt, smooth boundary. 4 to 10 inches thick.

B2t—6 to 20 inches, dark-brown (10YR 4/3) clay loam, very dark brown (10YR 2/2) when moist; massive; very hard when dry, firm when moist, sticky and plastic when wet; many roots; many fine and medium pores; thin, nearly continuous clay films in most pores; neutral; gradual, wavy boundary. 15 to 25 inches thick.

B3t—20 to 44 inches, dark-brown (10YR 4/3) clay loam, dark brown (10YR 3/3) when moist; massive; hard when dry, firm when moist, sticky and plastic when wet; many fine roots; many pores; thin, discontinuous clay films in pores; neutral; gradual, wavy boundary. 20 to 30 inches thick.

C—44 to 60 inches+, brown (10YR 5/3) clay loam, dark brown (10YR 3/3) when moist; massive; a few roots; many fine pores; neutral.

In color the soils are brown, dark brown, or dark grayish brown throughout the profile. The surface soil is generally slightly darker colored than the horizons below. These soils are slightly acid or neutral in the surface soil to neutral or mildly alkaline in the subsoil and substratum. The texture of the surface soil is loam or clay loam, but that of the subsoil is clay loam or heavy clay loam. In some places lime is present in the substratum.

Los Robles clay loam, 0 to 3 percent slopes (Lk).—This soil has a surface layer of clay loam but is otherwise similar to Los Robles loam, 0 to 3 percent slopes. Because of the texture of the surface layer, this soil is more difficult to manage than the Los Robles loam. Also, water penetrates the soil at a moderately slow rate, and the soil puddles more readily and is more difficult to cultivate. A plowpan forms readily in this soil if it is cultivated when too wet, or if it is cultivated too frequently, and further reduces the rate of water penetration.

Included with this soil in mapping are small areas of Vina and Berrendos soils.

If this Los Robles soil is irrigated, alfalfa, pasture grasses, legumes, sugarbeets, beans, almonds, and prunes grow well. Some areas are in dryfarmed barley. Capability unit I–1.

Los Robles clay loam, moderately deep, 0 to 3 percent slopes (Lm).—This soil is in areas along the edges of alluvial fans adjacent to the Tuscan soils. The areas are smooth on the surface and in many places are long, narrow, and fairly small. A cemented layer similar to that underlying the Tuscan soils is at a depth of 3 to 4 feet. This layer is very slowly permeable to roots and water. In areas where too much irrigation water is applied, water stands in the soil above the cemented layer for short intervals during winter and summer. Fertility is moderate, and there is no erosion hazard.

Included with this soil in mapping are small areas of Berrendos, Molinos, and Vina soils.

If this Los Robles soil is irrigated, beans, sugarbeets, melons, corn, milo, and pasture plants grow well. Walnuts, peaches, and similar orchard crops also grow on this soil. Some areas are in dryfarmed grain and pasture and range. Capability unit IIIs–8.

Los Robles cobbly loam, moderately deep, 0 to 3 percent slopes (Ln).—This soil has rounded cobblestones 3 to 10 inches in diameter on 5 to 20 percent of the surface. These stones interfere with cultivation. All of the acreage of this soil is used for pasture and range. Capability unit IVs–3.

Los Robles loam, 0 to 3 percent slopes (Lo).—All of this soil is on flood plains of streams east of the Sacra-

mento River. The size and shape of the areas vary from place to place. The surface of the soil is smooth.

This soil is well drained. Runoff is very slow, and permeability is moderately slow. The available water holding capacity is high, and fertility is moderate. Depth of the soil is more than 6 feet except in areas adjoining the Tuscan soils, which are underlain by the cemented substratum of the Tuscan soils at a depth of about 48 inches.

Included with this soil in mapping are small areas of Vina and Molinos soils.

If this Los Robles soil is irrigated, alfalfa, pasture, sugarbeets, beans, walnuts, almonds, prunes, and peaches grow well. Some areas are in dryfarmed barley, and a few areas are used for pasture and range. Capability unit I–1.

Lyonsville Series

In the Lyonsville series are sloping to very steep, moderately deep, well-drained soils. These soils formed in material from such volcanic rocks as hard, light-colored dacite and rhyolite. The surface soil is pale-brown, medium acid sandy loam. The subsoil is very pale brown, strongly acid sandy clay loam. These soils are gravelly or stony throughout, and the content of stone increases with increasing depth.

Runoff is generally slow. The hazard of erosion ranges from none to moderate. Depth to broken and partly weathered rock ranges from 20 to 40 inches. Roots and water readily penetrate the rock to a depth of many feet.

Lyonsville soils are in mountainous areas in the eastern part of the county at elevations of 4,000 to 6,000 feet. The size and shape of the areas vary considerably, and some areas of gravelly sandy loam, where the slope ranges from 10 to 30 percent, are more than 500 acres in size. Many streams flow through the areas and make the surface uneven. In places rocks outcrop. Various kinds of conifers, hardwoods, and shrubs make up the vegetation.

Soils of the Lyonsville series are mapped only as undifferentiated units with the Cohasset or the Jiggs soils. The Cohasset and Jiggs soils are described under their respective series.

Profile of Lyonsville gravelly sandy loam on a slope of 38 percent that faces north; under a fairly dense stand of conifers, hardwoods, and shrubs; elevation of 5,000 feet (2½ miles west and ½ mile south of the junction of State Highways 32 and 36, near the center of sec. 19, T. 28 N., R. 5 E.):

O1 & O2—8 inches to 0, fresh and partly decomposed pine and fir needles and leaves of shrubs; abrupt, smooth boundary. 2 to 6 inches thick.

A11—0 to 3 inches, pale-brown (10YR 6/3) gravelly sandy loam, very dark brown (10YR 2/2) when moist; strong, very fine, granular structure; soft when dry, very friable when moist, nonsticky when wet; many very fine roots; very porous; medium acid; clear, wavy boundary. 1 to 3 inches thick.

A12—3 to 8 inches, very pale brown (10YR 7/3) gravelly sandy loam, dark brown (10YR 3/3) when moist; strong, very fine, granular structure; slightly hard when dry friable when moist; many roots; very porous; strongly acid; clear, wavy boundary. 3 to 8 inches thick.

A3—8 to 12 inches, very pale brown (10YR 7/3) gravelly sandy loam, brown (10YR 5/3) when moist; moderate, medium, subangular blocky structure; hard when dry, friable when moist, slightly sticky when wet; a few large roots; very porous; strongly acid; abrupt, irregular boundary. 2 to 6 inches thick.

B2t—12 to 38 inches, very pale brown (10YR 7/4) gravelly sandy clay loam, light yellowish brown (10YR 6/4) when moist; massive; hard when dry, friable when moist, slightly sticky when wet; a few large roots; very porous; the rock content increases with depth; strongly acid; 15 to 30 inches thick.

R—38 inches +, partly weathered dacite or rhyolite rock that is nearly white, light gray, or pinkish gray; the rock is broken into large stones, which allow water and roots to penetrate many feet into the rock.

The surface soil is pale brown, brown, or dark grayish brown; the subsoil is very pale brown, light gray, light brown, or pinkish gray. The soils are gravelly or stony throughout. In most places concretions occur, and they are most common in the A horizons. The surface soil is generally coarse sandy loam, and the subsoil is sandy clay loam or sandy loam. The soils range from slightly acid to medium acid in the surface soil to medium acid or strongly acid in the subsoil.

Lyonsville and Cohasset soils, 10 to 30 percent slopes (LsD).—This mapping unit consists of Lyonsville gravelly sandy loam, 10 to 30 percent slopes, and of Cohasset loam, 10 to 30 percent slopes. Either soil may make up from 20 to 80 percent of any one area. These soils are on ridges in mountainous areas.

For the Lyonsville soil runoff is slow to medium, and permeability is moderate. The erosion hazard is moderate, and the available water holding capacity and fertility are also moderate. For characteristics of the Cohasset soil, see description of that soil under the Cohasset series.

Timber is produced on these soils. Ponderosa pine, sugar pine, Douglas-fir, white fir, and incense-cedar are the dominant conifers. Squawcarpet, dogwood, deerbrush ceanothus, pine-mat manzanita, whitethorn ceanothus, black oak, and canyon oak are common in many places. Lyonsville part, capability unit IVe–4; Cohasset part, capability unit IVe–1.

Lyonsville and Cohasset stony soils, 10 to 30 percent slopes (LtD).—This mapping unit consists of Lyonsville stony sandy loam, 10 to 30 percent slopes, and of Cohasset stony loam, 10 to 30 percent slopes. Either soil may make up from 20 to 80 percent of any given area. These stony soils are on ridges in mountainous areas. Stones 3 to 36 inches in diameter cover 10 to 50 percent of the surface of the Lyonsville soil and 5 to 25 percent of the Cohasset.

These soils are used for timber. The density of the timber and the rate of its growth are good to fair. The rocks on the areas interfere with logging. They slow equipment working over the areas and damage trees that are felled. Both parts, capability unit VIs–7.

Lyonsville and Jiggs gravelly sandy loams, 10 to 30 percent slopes (LvD).—This unit consists of Lyonsville gravelly sandy loam, 10 to 30 percent slopes, and of Jiggs gravelly sandy loam, 10 to 30 percent slopes. Either soil may occupy from 20 to 80 percent of any one area. Runoff is slow to medium. The erosion hazard is moderate. Both parts, capability unit IVe–4.

Lyonsville and Jiggs gravelly sandy loams, 30 to 50 percent slopes (LvE).—This unit consists of Lyonsville gravelly sandy loam, 30 to 50 percent slopes, and of Jiggs gravelly sandy loam, 30 to 50 percent slopes. The hazard of erosion is severe.

Steep slopes make it difficult to harvest timber from these soils. Both parts, capability unit VIe–4.

Lyonsville and Jiggs gravelly sandy loams, 50 to 65 percent slopes (LvF).—This unit consists of Lyonsville gravelly sandy loam, 50 to 65 percent slopes, and of Jiggs gravelly sandy loam, 50 to 65 percent slopes. Either soil may occupy from 20 to 80 percent of any one area. The hazard of erosion is very severe.

Because of the very steep slopes, it is difficult to harvest timber from these soils. Both parts, capability unit VIIe–4.

Lyonsville and Jiggs stony sandy loams, 10 to 30 percent slopes (LyD).—This unit consists of Lyonsville stony sandy loam, 10 to 30 percent slopes, and of Jiggs stony sandy loam, 10 to 30 percent slopes. Either soil may occupy from 20 to 80 percent of any one area. Stones 3 to 36 inches in diameter cover 10 to 50 percent of the surface of the Lyonsville soil and 5 to 25 percent of the Jiggs. Both parts, capability unit VIs–7.

Lyonsville and Jiggs stony sandy loams, 30 to 50 percent slopes (LyE).—This mapping unit consists of Lyonsville stony sandy loam, 30 to 50 percent slopes, and of Jiggs stony sandy loam, 30 to 50 percent slopes. Either soil may occupy 20 to 80 percent of any one area.

Steep slopes make it difficult to harvest timber from these soils. Both parts, capability unit VIs–7.

Lyonsville and Jiggs stony sandy loams, 50 to 65 percent slopes (LyF).—This mapping unit consists of Lyonsville stony sandy loam, 50 to 65 percent slopes, and of Jiggs stony sandy loam, 50 to 65 percent slopes. Either soil may occupy 20 to 80 percent of any one area.

The very steep slopes make it difficult to harvest timber from these soils. Both parts, capability unit VIIs–1.

Manton Series

The Manton series consists of deep to very deep, well-drained soils formed in material from softly consolidated andesitic tuff. The soils are brown and medium acid throughout. The surface soil is sandy loam, and the subsoil is loam. These soils are in a fairly small area in the northeastern part of the county under conifers, hardwoods, and shrubs.

Profile of Manton sandy loam in a gently sloping area; under conifers, hardwoods, and shrubs; elevation of 3,500 feet (5.5 miles east and 2 miles south of Manton near the southwest corner of sec. 34, T. 30 N., R. 2 E.):[9]

O1 & O2—2 inches to 0, forest litter made up of fresh to decomposed needles and leaves.

A1—0 to 10 inches, brown (10YR 5/3) sandy loam, dark brown (10YR 3/3) when moist; moderate, medium, granular structure; soft when dry, very friable when moist, nonsticky and nonplastic when wet; a few very fine roots; very porous; medium acid; gradual, irregular boundary. 5 to 15 inches thick.

A3—10 to 22 inches, yellowish-brown (10YR 5/4) sandy loam, dark yellowish brown (10YR 4/4) when moist; moderate, medium, subangular blocky structure; slightly hard when dry, very friable when moist, nonsticky and nonplastic when wet; many roots; medium acid; gradual, irregular boundary. 6 to 12 inches thick.

B2t—22 to 36 inches, strong-brown (7.5YR 4/6) loam, strong brown (7.5YR 4/4) when moist; moderate, medium, subangular blocky structure; hard when dry, friable when moist, slightly sticky and slightly plastic when wet; a few roots; very porous; medium acid; gradual, irregular boundary. 10 to 20 inches thick.

B3—36 to 56 inches, light yellowish-brown (10YR 6/4) loam, yellowish brown (10YR 5/4) when moist; moderate, medium, subangular blocky structure; slightly hard when dry, friable when moist, slightly sticky and slightly plastic when wet; a few roots; very porous; medium acid; diffuse boundary. 10 to 30 inches thick.

C—56 inches +, light yellowish-brown (10YR 6/4) weathered tuff; massive and slightly brittle.

The surface layer ranges from brown to grayish brown in color, and from sandy loam to nearly loam in texture. It is medium acid to slightly acid. The uppermost 1 to 3 inches of this horizon is generally the darkest. In color the B horizon ranges from strong brown to reddish brown or yellowish red, and in texture, from loam to light sandy clay loam. Some areas are slightly gravelly. Depth to softly consolidated tuff ranges from 4 to 6 feet.

Manton sandy loam, 10 to 30 percent slopes (MaD).—This is the only Manton soil mapped in the county. It is on broad ridgetops about 2 miles south of Digger Butte in the northeastern part of the county. The surface is uneven because of streams that cut through the areas. Depth to weathered volcanic tuff ranges from 4 to 6 feet.

This soil is well drained, and it is readily penetrated by roots and water. Runoff is slow to medium, and permeability is moderately rapid. The available water holding capacity and fertility are moderate to high. The hazard of erosion is moderate. It is moderate to severe, however, in some small included areas where slopes range from 30 to 50 percent.

Included with this soil in mapping are small areas of Forward and Jiggs soils.

All of the areas of this Manton soil are used for timber. Douglas-fir, ponderosa pine, white fir, and incense-cedar are the conifers that are dominant. Shrubs and trees commonly grown on the soil are squawcarpet, common and whiteleaf manzanita, deerbrush ceanothus, black oak, and canyon live oak. Capability unit IVe–4.

Masterson Series

The Masterson series consists of moderately steep, well-drained, medium-textured soils. These soils formed in material from such metamorphic rocks as mica schist that contains seams of quartzite. The soils are gravelly to very gravelly throughout. They have a dark-brown surface layer and a brown subsoil that is light yellowish brown in the lower part. These soils are slightly acid in the surface layer but are strongly acid in the subsoil. The Masterson soils are on ridgetops in the western part of the county at elevations of more than 5,000 feet. The dominant trees are white fir.

Profile of Masterson gravelly loam on a slope of 25 percent that faces north; under an open stand of white fir; elevation of 6,200 feet (100 yards west of Howell Summit west of the center of the SE¼NE¼ sec. 16, T. 24 N., R. 8 W.):

O1 & O3—2 inches to 0, fresh, decomposed litter from white fir; the lower part is matted; abrupt, smooth boundary. 1 to 2 inches thick.

A1—0 to 3 inches, dark-brown (10YR 4/3) gravelly loam, very dark grayish brown (10YR 3/2) when moist; strong, fine, granular structure; soft when dry, friable when moist, nonsticky when wet; a few fine roots; very porous; gravel is platy schist and angu-

[9] This soil was shown as Forward sandy loam, brown phase, on advance sheets published by the University of California Agricultural Extension Service and the California Division of Forestry during the years 1953–59.

lar fragments of quartzite; slightly acid; clear, irregular boundary. 3 to 8 inches thick.

B2t—3 to 19 inches, brown (7.5YR 4/4) gravelly loam, dark brown when moist; moderate, medium, subangular blocky structure that breaks to strong, fine, granular; slightly hard when dry, friable when moist; nonsticky when wet; many roots; very porous; strongly acid; clear, irregular boundary. 8 to 20 inches thick.

C1—19 to 37 inches, light yellowish-brown (10YR 6/4) very gravelly loam, yellowish brown (10YR 5/6) when moist; strongly acid; moderate, medium, subangular blocky structure that breaks to strong, fine, granular; slightly hard when dry; friable when moist; nonsticky when wet; a few roots; very porous; strongly acid; abrupt, very irregular boundary. 12 to 30 inches thick.

R—37 inches +, broken, partly weathered, light-colored, hard schist; in places roots of medium size penetrate the rock to a depth of many feet.

The surface layer is brown or dark brown. The upper part of the subsoil is brown or yellowish brown, and the lower part is brownish yellow or light yellowish brown. Texture of the surface layer is sandy loam or loam, and that of the subsoil is loam or loam near clay loam. The soils are gravelly or very gravelly and have cobblestones in places. The surface soil is slightly acid or medium acid, and the subsoil is medium acid or strongly acid. Depth to partly weathered rock ranges from 20 to 48 inches.

Masterson gravelly loam, 10 to 30 percent slopes (MbD).—This is the only Masterson soil mapped in the county. It is on the more nearly level ridges on top of the Coast Range Mountains in the western part of the county. The ridgetops are partly rounded and have an uneven surface because of drainageways that cut through the areas. Depth to broken and weathered schist is 20 to 40 inches.

This soil is well drained. Runoff is slow to medium, and permeability is moderately rapid. The available water holding capacity and fertility are moderate to low, depending on the soil depth. The erosion hazard is moderate.

Included with this soil in mapping are small areas of Sheetiron and Yollabolly soils.

This Masterson soil is used for timber. White fir is dominant, but a few sugar pine and Douglas-fir trees grow in the area. In a few places at elevations of more than 6,000 feet, red fir is dominant. Christmas trees are harvested from a few areas. Campsites and homesites are located in several gently sloping areas because springs flow along the lower edges of this soil. Capability unit IVe–4.

Maymen Series

The Maymen series consists of steep to very steep, shallow, somewhat excessively drained soils. These soils formed in material from such sedimentary and metamorphic rocks as hard sandstone, shale, and mica schist. The soils are brown, medium textured, and slightly acid throughout.

These soils are moderately permeable. The available water holding capacity and fertility are low. Runoff is medium to rapid, and the erosion hazard is moderate. Depth to broken and partly weathered rock ranges from 6 to 20 inches, but some areas of gravelly loam, where the slope ranges from 10 to 30 percent, are likely to be deeper in places. The rock is hard and relatively dense, and roots and water penetrate it slowly.

Maymen soils are under a dense cover of shrubs in narrow, mountainous areas in the western part of the county at elevations of 1,000 to 4,000 feet. Most of the areas vary considerably in size and shape, and some areas of gravelly loam, where the slope ranges from 30 to 65 percent, are more than 500 acres in size. The areas are cut by streams. Deep canyons have formed, and the surface is therefore uneven. In places rocks outcrop. In places small areas of Los Gatos and Parrish soils and of Rock land are within areas of Maymen soils.

Soils of the Maymen series are mapped only as undifferentiated units with the Lodo soils or as complexes with the Los Gatos soils. The Lodo and Los Gatos soils are described under their respective series.

Profile of Maymen gravelly loam on a slope of 30 percent that faces south; under a dense stand of shrubs; elevation of 2,100 feet (2½ miles south and 1 mile west of Cold Fork, near the center of the SE¼ sec. 31, T. 27 N., R. 7 W.):

A11—0 to 1 inch, brown (10YR 5/3) gravelly loam, dark brown (10YR 3/3) when moist; weak, thick, platy structure; slightly hard when dry, very friable when moist, nonsticky when wet; many fine roots and pores; a few angular fragments of shale; slightly acid; abrupt, smooth boundary. 1 to 2 inches thick.

A12—1 to 7 inches, brown (10YR 5/3) gravelly loam, dark brown (10YR 3/3) when moist; medium, subangular blocky structure; slightly hard when dry, very friable when moist, nonsticky when wet; slightly acid; abrupt, irregular boundary. 5 to 18 inches thick.

R—7 inches +, partly weathered, fractured, hard, gray shale.

In color the soils are brown, pale brown, light brownish gray, or light gray throughout, but in places the surface horizon is thin and darker colored. The soils range from slightly acid to medium acid. The texture ranges from loam to sandy loam and in places is gravelly, shaly, or stony.

Maymen and Lodo gravelly loams, 30 to 65 percent slopes (MbgE).—This mapping unit consists of Maymen gravelly loam, 30 to 65 percent slopes, and of Lodo shaly loam, 30 to 65 percent slopes, eroded. Either soil may make up from 20 to 80 percent of any one area. These soils are in mountainous areas in the western part of the county.

The erosion hazard is severe to very severe. Depth to broken and partly weathered rock ranges from 6 to 20 inches in the Maymen soil but is 6 to 10 inches in the Lodo. Roots and water penetrate the hard, fairly dense rock underlying the Maymen soil very slowly. Penetration of the shale underlying the Lodo soil is limited, except along cracks in the shale.

Chamise, wedgeleaf ceanothus, and common manzanita are dominant on the Maymen soil. These shrubs protect the watershed and provide cover and browse for wildlife. Except in areas where the soil is deeper, yields of annual grasses and forbs on the Lodo soil are very low. Both parts, capability unit VIIIs–8.

Maywood Series

The Maywood series consists of nearly level, well-drained soils formed in recent alluvium. The alluvium was derived mainly from softly consolidated sedimentary rocks. Maywood soils are pale brown, medium textured, and neutral or slightly acid throughout. They are on flood plains west of the Sacramento River at elevations that range from 200 to 500 feet. Nearly all of the acreage is cultivated.

Profile of Maywood silt loam, on the railroad right-of-way on a nearly level, narrow flood plain along an active stream; under annual grasses and forbs; elevation of 250 feet (0.7 mile south of the Corning Depot of the Southern Pacific Railroad, 800 feet north of the southwest corner of sec. 23, T. 24 N., R. 3 W.):

A1—0 to 14 inches, pale-brown (10YR 6/3) silt loam, dark brown (10YR 4/3) when moist; massive; slightly hard when dry, friable when moist, nonplastic and nonsticky when wet; many fine roots and pores; slightly acid; diffuse boundary. 5 to 15 inches thick.

C—14 to 62 inches, pale-brown (10YR 6/3) loam, dark brown (10YR 4/3) when moist; massive; slightly hard when dry, friable when moist, nonplastic and nonsticky when wet; many fine roots to a depth of about 40 inches, but few below that depth; many fine pores; strata of silt loam, fine sandy loam, and very gravelly sandy loam occur; gravel consists of quartzite and chert; a few fine and medium, faint, reddish-brown mottles are in the layers of silt loam; slightly acid; several feet thick.

These soils range from pale brown to light yellowish brown in color. In many places they contain stratified material that ranges from loam to silt loam or fine sandy loam in texture or is gravelly in the lower part. Maywood soils range from slightly acid to neutral.

Maywood loam, 0 to 3 percent slopes (Me).—This soil is on recent flood plains along fairly short streams west of the Sacramento River. The surface is smooth. Most areas are long and narrow, are less than 100 acres in size, and generally are parallel to active streams. In some areas there is a layer of gravel at a depth of 4 feet or more.

This soil is well drained. Permeability is moderate, and runoff is slow. The available water holding capacity is high, and fertility is moderate. There is no erosion hazard, except in some places near active streams where streambanks are eroding. Some areas are flooded for short periods during the winter.

Included with this soil in mapping are small areas of Cortina and Yolo soils.

Alfalfa, pasture, milo, corn, beans, sugarbeets, almonds, walnuts, peaches, and olives grow well on this Maywood soil if irrigation water is available. Dryfarmed grain and pasture and range are grown in a few areas. Capability unit I–1.

Maywood fine sandy loam, 0 to 3 percent slopes (Mc).—This soil is mainly fine sandy loam throughout but is otherwise similar to Maywood loam, 0 to 3 percent slopes. Permeability is moderately rapid, and the available water holding capacity is moderate. It is easier to prepare a seedbed in this Maywood soil than in Maywood loam, but the crops on this soil need more frequent irrigation. Capability unit I–1.

Maywood fine sandy loam, moderately deep, 0 to 3 percent slopes (Md).—This soil is mainly fine sandy loam to a depth of 20 to 48 inches. Below this depth it is gravelly sand. The gravelly subsoil holds less water and makes the soil somewhat droughty. Consequently, crops on this soil require more frequent irrigation than crops on Maywood loam. Capability unit IIs–0.

Maywood silt loam, 0 to 3 percent slopes (Mh).—This soil has a surface soil of silt loam but is otherwise similar to Maywood loam, 0 to 3 percent slopes. Most areas are silt loam to a depth of at least 5 feet, but in a few places gravel is at a depth below 4 feet. Water penetrates this soil more slowly than the Maywood loam. The surface tends to seal over if water splashes on it or flows across the surface. Adding organic matter or returning crop residues to this soil every year helps to keep the surface from sealing. Capability unit I–1.

MAYWOOD LOAMS, HIGH TERRACE

The Maywood loam, high terrace, soils are on nearly level flood plains west of the Sacramento River at elevations of 200 to 500 feet. They are well-drained, medium-textured soils formed in alluvium from sedimentary rock, mostly from the softly consolidated Tehama formation. The Newville, Dibble, and related soils also formed in material from this formation.

These soils have a pale-brown, slightly acid surface soil. The subsoil contains slightly more clay than the surface soil, is neutral, and in places has reddish-brown mottles. Nearly all of the acreage is cultivated.

Profile of Maywood loam, high terrace, in a nearly level area formerly used for dryfarmed grain; elevation of about 300 feet (2 miles west of Gerber near the center of the NE¼NW¼ sec. 15, T. 25 N., R. 3 W.):[10]

Ap—0 to 10 inches, pale-brown (10YR 6/3) loam, dark brown (10 YR 4/3) when moist; massive but breaks to subangular blocky structure; very hard when dry, friable when moist, nonsticky when wet; many fine roots; many fine medium pores; slightly acid; clear, smooth boundary. 4 to 10 inches thick.

C1—10 to 25 inches, similar to the Ap horizon, except it is more porous and has a few, thin, patchy clay films; gradual, smooth boundary. 10 to 20 inches thick.

C2—25 to 46 inches, light yellowish-brown (10YR 6/4) fine sandy loam, nearly a sandy clay loam, dark yellowish brown (10YR 4/4) when moist; massive; very hard when dry, friable when moist; sticky when wet; a a few fine roots; pores are fewer and finer than in the C1 horizon; thin, patchy clay films more numerous than in the C1 horizon; neutral; gradual, smooth boundary. 15 to 25 inches thick.

C3—46 to 58 inches +, light yellowish-brown (10YR 6/4) fine sandy loam, nearly a sandy clay loam, dark yellowish brown (10YR 4/4) when moist; massive; hard when dry, friable when moist, slightly sticky when wet; a few fine roots and pores; thin, patchy clay films; neutral.

These soils range from pale brown to light yellowish brown in color throughout. In areas that have never been cultivated or that have not been cultivated for several years, the first inch or more of the A horizon is brown and the structure is weak, thin, platy. In places reddish-brown mottles are in the subsoil. The mottles indicate that here drainage was formerly poor. In places, however, for short periods during years of high rainfall, drainage is poor. In these places the substratum, which is at a depth of 8 to 15 feet, is dense and softly consolidated and temporarily causes poor drainage. The surface soil ranges from medium acid to slightly acid, and the subsoil, from slightly acid to neutral. In most places the soils are not gravelly, but in some areas they are slightly gravelly, particularly where they are near the Arbuckle soils.

Maywood loam, high terrace, 0 to 3 percent slopes (Mf).—This soil is along many of the shorter streams west of the Sacramento River. Many of the areas are less than 100 acres in size and are long and narrow.

[10] This high terrace soil was shown as McClure loam and silt loam on advance sheets published by the University of California Agricultural Extension Service and the California Division of Forestry during the years 1953–59.

Drainage is good. Runoff is very slow, and permeability and fertility are moderate. Greenhouse plants growing in this soil respond if fertilizer that contains nitrogen and phosphate is added.

Included with this soil in mapping are areas of Arbuckle, Hillgate, and Tehama soils.

Alfalfa, corn, beans, milo, olives, prunes, and walnuts are grown on this Maywood soil if irrigation water is available. Other areas are used for dryfarmed grain and for pasture and range. Capability unit I–1.

Maywood loam, moderately well drained, 0 to 3 percent slopes (Mg).[11]—Except that it is moderately well drained, this soil is similar to Maywood loam, high terrace, 0 to 3 percent slopes. It has soft but very slowly permeable siltstone at a depth of 8 to 15 feet, which retards drainage.

A perched water table forms in this soil during winters of high rainfall and during the summer in areas where excessive irrigation water accumulates. In places, therefore, deep-rooted crops are injured. Most crops grow well on this soil if it is properly irrigated. Capability unit I–1.

McCarthy Series

In the McCarthy series are moderately steep to very steep, well-drained soils. These soils formed in material from volcanic breccia, which is composed of rocks of basalt and andesite cemented with tuffaceous material. The soils are moderately deep, moderately coarse textured, slightly acid to medium acid, and granular throughout. The surface soil is dark brown, and the subsoil is brown and rests on weathered breccia. McCarthy soils are in mountainous areas in the eastern part of the county. Elevations range from 2,000 to 6,000 feet. Various kinds of conifers grow on these soils.

Profile of McCarthy sandy loam on a slope of 40 percent that faces east; under a dense stand of mixed conifers; elevation of 3,800 feet (2 miles south of Mill Creek on Ponderosa Way in the NW¼ sec. 29, T. 27 N., R. 3 E.) :

O1 & O2—1 inch to 0, forest litter consisting of needles, leaves, and small twigs that are more matted and decomposed in the lower part than in the upper part; abrupt, smooth boundary. 1 to 2 inches thick.

A11—0 to 3 inches, dark-brown (7.5YR 3/4) sandy loam, dark brown (7.5YR 3/2) when moist; strong, medium, granular structure; soft when dry, friable when moist; many very fine roots; very porous; many, brown, rounded, hard concretions; slightly acid; clear, smooth boundary. 2 to 4 inches thick.

A12—3 to 16 inches, brown (7.5YR 4/4) gritty and somewhat gravelly sandy loam, dark brown (7.5YR 3/4) when moist; strong, medium, granular structure; soft when dry, very friable when moist; many roots; very porous; many concretions; medium acid; gradual, smooth boundary. 6 to 16 inches thick.

B2—16 to 28 inches, strong-brown (7.5YR 5/6) very gravelly sandy loam, dark brown (7.5YR 3/5) when moist; moderate, medium, subangular blocky structure; slightly hard when dry, friable when moist; many roots; very porous; a few iron concretions; coarse rock fragments in places; gravel content increases with increasing depth; medium acid; gradual, smooth boundary. 6 to 16 inches thick.

R—28 inches +, pale-brown (10YR 6/3) volcanic breccia that is weathered enough to absorb water and to be penetrated by coarse roots to a depth of several feet.

The A horizon ranges from dark grayish brown to brown or reddish brown in color. The B2 horizon is brown, strong brown, or reddish brown. Throughout the profile the texture is sandy loam. The amount of gravel in the profile varies, but it generally increases with increasing depth. These soils are neutral or slightly acid in the A horizon, and they are slightly acid or medium acid below.

McCarthy sandy loam, 30 to 50 percent slopes (MkE).—This soil is on slopes of canyons in mountainous areas in the eastern part of the county. Many of the areas are fairly large, and the surface is uneven in many places because of rock outcrops and short drainageways. Depth to partly weathered rock is 20 to 40 inches.

This soil is well drained. Runoff is medium to rapid, and permeability is moderately rapid. The available water holding capacity is low, and fertility is moderate. The underlying rock is porous and fractured; roots and water can therefore penetrate it to a depth of many feet. Under present cover there is no erosion hazard.

Included with this soil in mapping are small areas of Cohasset, Jiggs, and Iron Mountain soils.

This McCarthy soil is used for timber. Most areas are on north-facing slopes where the dominant conifers are Douglas-fir and white fir but include some sugar pine. In addition to these conifers, ponderosa pine grows in areas near the top of ridges and on south-facing slopes. Deerbrush ceanothus, squawcarpet, dogwood, greenleaf manzanita, black oak, and canyon live oak are the chief shrubs and hardwoods. Capability unit VIe–4.

McCarthy sandy loam, 10 to 30 percent slopes (MkD).—This soil is less steep but is otherwise similar to McCarthy sandy loam, 30 to 50 percent slopes. It is therfore easier to harvest timber from this soil. Small areas have rocks 10 to 30 inches in diameter on 5 to 50 percent of the surface. Capability unit IVe–4.

McCarthy sandy loam, 50 to 65 percent slopes (MkF).—This soil is steeper but is otherwise similar to McCarthy sandy loam, 30 to 50 percent slopes. Because of the very steep slopes, it is difficult to harvest timber from this soil. Capability unit VIIe–4.

McCarthy stony sandy loam, 30 to 50 percent slopes (MmE).—This soil has stones 3 to 60 inches in diameter on 5 to 50 percent of the surface but is otherwise similar to McCarthy sandy loam, 30 to 50 percent slopes. The stones interfere with logging because they slow equipment moving over the area and damage falling trees. Capability unit VIs–7.

McCarthy stony sandy loam, 50 to 65 percent slopes (MmF).—This soil is steeper and has more stones on the surface but is otherwise similar to McCarthy sandy loam, 30 to 50 percent slopes. Stones 3 to 60 inches in diameter cover 5 to 50 percent of the surface. The stones interfere with logging because they slow equipment moving over the area and damage falling trees. In addition, the very steep slopes make it very difficult to harvest trees from this soil. Capability unit VIIs–1.

McCarthy-Iron Mountain complex, 30 to 50 percent slopes (MnE).—This complex consists of McCarthy stony sandy loam, 30 to 50 percent slopes, and Iron Mountain rocky sandy loam, 30 to 50 percent slopes. Either soil

[11] This soil was shown as McClure loam, imperfectly drained, on advance sheets published by the University of California Agricultural Extension Service and the California Division of Forestry during the years 1953–59.

may occupy from 20 to 80 percent of any one area. McCarthy part, capability unit VIs–7; Iron Mountain part, capability unit VIIs–7.

Millrace Series

The Millrace series consists of nearly level, somewhat excessively drained soils formed in alluvium derived from basic volcanic rock. These soils have a dark-brown, moderately coarse textured surface soil and a brown, coarse-textured subsoil. They are neutral throughout. In many areas the surface soil is noncobbly, but the subsoil is cobbly, and in places it is very gravelly. Millrace soils are on narrow flood plains east of the Sacramento River at an elevation of 200 to 1,000 feet. The vegetation is mostly grasses and forbs but includes scattered oaks. Some areas are cultivated.

Profile of Millrace gravelly fine sandy loam in a nearly level area under annual grasses and forbs; elevation of 240 feet (5 miles north of Los Molinos and 0.5 mile east of U.S. Highway 99E in the NE¼NE¼ sec. 21, T. 26 N., R. 2 W.):

A11—0 to 6 inches, dark-brown (10YR 3/3) gravelly fine sandy loam, very dark brown (10YR 2/2) when moist; weak, medium, subangular blocky structure; slightly hard when dry, friable when moist; many fine roots and pores; neutral; clear, wavy boundary. 3 to 8 inches thick.

A12—6 to 22 inches, brown (10YR 4/3) cobbly and very gravelly coarse sandy loam, dark brown (10YR 3/3) when moist; moderate, medium, subangular blocky structure; slightly hard when dry, friable when moist; many fine roots and pores; neutral; clear, wavy boundary. 10 to 40 inches thick.

C—22 to 60 inches +, brown (7.5YR 4/3) cobbly and very gravelly loamy sand, dark brown (7.5YR 3/3) when moist; massive; slightly hard when dry, friable when moist, slightly sticky when wet; a few very fine roots; very porous; thin clay films on sand, gravel, and cobblestones; cobblestones, gravel, and sand are rounded fragments of basalt and andesite; neutral.

The color of the surface soil is generally dark brown but ranges from brown to dark grayish brown. The color of the subsoil is brown, but it grades toward reddish brown. The amount of gravel and cobblestones in the surface is variable, but the subsoil is generally very gravelly and cobbly. Unrelated cemented layers underlie some areas at a depth of 5 to 8 feet.

Millrace gravelly fine sandy loam, 0 to 3 percent slopes (Mp).—This soil occupies areas east of the Sacramento River. Most areas are long and narrow and parallel to stream channels. The surface is smooth, and the uppermost 6 to 12 inches of the soil is gravelly fine sandy loam.

This soil is somewhat excessively drained. Runoff is very slow, and permeability is very rapid. The available water holding capacity and fertility are low. Except on the banks of active streams, there is no erosion hazard.

Included with this soil in mapping are small areas of Vina, Molinos, and Los Robles soils.

In areas of this Millrace soil that are irrigated, pasture, milo, corn, alfalfa, walnuts, prunes, and almonds are grown. The soil is droughty because of cobblestones in the substratum, and it is therefore used for pasture and range if irrigation water is not available. Capability unit IVs–4.

Millrace cobbly fine sandy loam, 0 to 3 percent slopes (Mo).—This soil has cobblestones on the surface but is otherwise similar to Millrace gravelly fine sandy loam, 0 to 3 percent slopes. The surface layer is 5 to 15 percent rounded cobblestones that range from 3 to 10 inches in diameter. The lower part of the subsoil is 70 to 80 percent cobblestones.

This soil dries out rapidly, and all the areas are used for pasture and range. Capability unit IVs–4.

Millrace complex, channeled (Mr).—This complex consists of areas of Millrace gravelly fine sandy loam, 0 to 3 percent slopes, and Millrace cobbly fine sandy loam, 0 to 3 percent slopes, that have been cut by stream channels. The content of gravel and cobblestones in the soils varies considerably.

Included with these soils in mapping are areas of Riverwash and areas of Vina, Molinos, and Los Robles soils.

This complex is used for pasture and range. Most areas are too small to be cultivated. Soils in this complex are difficult to cultivate because of the uneven surface and variable amounts of cobblestones. Capability unit VIw–1.

Millsap Series

In the Millsap series are moderately deep, well-drained soils formed in material from hard, dark-colored sandstone and shale. These soils are brown and neutral to slightly acid. They have a medium-textured surface soil and a fine-textured subsoil. Millsap soils are on foothills in the western part of the county at elevations of 500 to 2,000 feet. The cover is mostly grasses and forbs but includes oaks and shrubs. These soils are used for pasture and range.

Profile of Millsap loam on a slope of 35 percent that faces south; under grasses, forbs, and scattered oaks; elevation of 1,400 feet (1.5 miles east of Cold Fork in the SW¼NW¼ sec. 27, T. 27 N., R. 7 W.):

A1—0 to 2 inches, grayish-brown (10YR 5/2) loam, very dark brown (10YR 3/2) when moist; moderate, medium, platy structure; hard when dry, friable when moist, nonsticky when wet; many fine roots and pores; slightly acid; abrupt, wavy boundary. 0 to 3 inches thick.

A3—2 to 9 inches, brown (10YR 5/3) clay loam, dark brown (10YR 4/3) when moist; moderate, medium, subangular blocky structure; hard when dry, firm when moist, slightly sticky when wet; many fine roots and pores; thin patchy clay films in pores; many angular fragments of sandstone rock at a depth of 6 to 10 inches; slightly acid; irregular boundary. 5 to 12 inches thick.

B2t—9 to 31 inches, brown (10YR 5/3) clay, dark brown (10YR 4/3) when moist; strong, very coarse, prismatic structure; extremely hard when dry, very firm when moist, very sticky when wet; continuous clay films in pores and over aggregate faces; many fine pores; a few fine roots; slightly acid; irregular boundary. 10 to 30 inches thick.

B3t—31 to 39 inches, a mixture of material from the B2t horizon and hard, partly weathered, fine-grained fragments of sandstone.

R—39 inches +, hard, fine-grained sandstone that is fractured and partly weathered.

The color of the surface layer is brown or pale brown, although the uppermost part is generally darker. The subsoil is brown or is brown that grades toward reddish brown. These soils are generally slightly acid throughout, but in places are medium acid in the surface soil and neutral in the subsoil. Depth of the soils ranges from 20 to 48 inches but is generally 30 to 36 inches. In some

areas the soils are more than 5 percent angular fragments of rock.

Millsap loam, 30 to 50 percent slopes (MsE).—This moderately deep soil is on rounded hills in the western part of the county. The surface is uneven because of streams and rock outcrops.

This soil is well drained. Runoff is rapid, and permeability is slow. The surface layer, a loam to clay loam 10 to 15 inches thick, overlies a clayey subsoil. Roots and water penetrate the clayey subsoil slowly. Broken, partly weathered sandstone is at a depth of 24 to 36 inches. Angular fragments of sandstone, some of which are nearly 3 feet in diameter, cover 5 percent of the surface in places and in other places nearly 10 percent. The available water holding capacity and fertility are low, and the erosion hazard is severe.

Included with this soil in mapping are small areas of Millsholm, Sehorn, and Lodo soils. All of this Millsap soil is used for pasture and range. The quality of the forage is fair. The value of the forage is decreased in most areas because a fairly dense stand of blue oak, Digger pine, common manzanita, and wedgeleaf ceanothus grows on the areas. Capability unit VIe–3.

Millsap loam, 10 to 30 percent slopes (MsD).—This soil is along ridges and benchlike areas near steeper slopes but is otherwise similar to Millsap loam, 30 to 50 percent slopes. Seeding, fertilizing, removal of trees, and similar management practices are easier to apply in pastures on this soil. Also, cattle cause less trailing. Runoff is medium. The erosion hazard is moderate. Capability unit IVe–3.

Millsap loam, 50 to 65 percent slopes (MsF).—This soil has steeper slopes but is otherwise similar to Millsap loam, 30 to 50 percent slopes. It is on the walls of deep canyons. In many areas stands of trees and shrubs are very dense. Runoff is very rapid, and the erosion hazard is very severe. Cattle trails are well entrenched on the contour across these areas, and some of the trails cause landslips during wet winters. This soil has low value for pasture and range because it is difficult for cattle to graze on the very steep slopes. Capability unit VIIe–3.

Millsholm Series

The Millsholm series consists of hilly to steep soils formed in material from sandstone, shale, and conglomerate. These soils are brown to pale brown, moderately coarse textured to moderately fine textured, and slightly acid to neutral throughout. They are shallow and well drained, and are near rock outcrops in many places. Millsholm soils are in foothills in the western part of the county at elevations of 500 to 2,000 feet. The vegetation is grasses or blue oaks and grasses. Most of the acreage is used for pasture and range.

Profile of Millsholm clay loam on a slope of 35 percent that faces south; area is under grasses and blue oaks and is used by cattle for winter grazing; elevation of 1,200 feet (4 miles north and 1 mile west of Cold Fork in the NE¼ sec. 6, T. 27 N., R. 7 W.):

A1—0 to 2 inches, yellowish-brown (10YR 5/4) light clay loam, dark brown (10YR 3/3) when moist; weak, thick, platy structure; slightly hard when dry, friable when moist, slightly sticky when wet; many fine roots and pores; neutral; abrupt, wavy boundary. 1 to 3 inches thick.

A12—2 to 9 inches, yellowish-brown (10YR 5/4) clay loam, dark brown (10YR 4/3) when moist; moderate, coarse, subangular blocky structure; hard when dry, firm when moist, sticky when wet; many fine roots; many fine and medium pores; neutral; gradual, irregular boundary. 5 to 10 inches thick.

C1—9 to 14 inches, yellowish-brown (10YR 5/4) clay loam, dark brown (10YR 4/3) when moist; moderate, coarse, subangular blocky structure; hard when dry, firm when moist, sticky when wet; slightly acid; clear, irregular boundary. 4 to 8 inches thick.

C2—14 to 16 inches, light yellowish-brown (10YR 6/4) very gravelly clay loam, dark yellowish brown (10YR 4/4) when moist; massive; hard when dry, firm when moist, sticky when wet; a few fine roots; many fine and medium pores; thin, continuous clay films in pores and around rocks; slightly acid; abrupt, irregular boundary. 2 to 10 inches thick.

R—16 inches +, hard, dark-gray shale that is partly weathered to a light-brown color on the exposed faces and is fractured and broken to a depth of several feet.

The color of the surface layer ranges from yellowish brown to pale brown or brown, and the subsoil is about the same range in color or is a little lighter. These soils range from neutral to slightly acid throughout. In most areas rock outcrops are common.

Millsholm clay loam, 10 to 30 percent slopes (MtD).—This soil is on low rounded hills. It has a somewhat uneven surface because of short streams that cut the areas and a few rock outcrops. This soil is one of the most important soils for pasture and range in the western part of the county in areas that are underlain by hard sandstone. Some of the areas are more than 1,000 acres in size.

This soil is well drained. Runoff is medium, and permeability is moderate. The available water holding capacity and fertility are low. The platy surface soil, common in many areas, slows the movement of water into the soil and also restricts penetration of roots. Depth to hard, brown, partly weathered sandstone ranges from 12 to 30 inches but is predominantly about 15 inches. Roots and water penetrate this rock slowly. The erosion hazard is moderate.

Included with this soil in mapping are small areas of Lodo, Millsap, and Sehorn soils.

This Millsholm soil is used for pasture and range and for dryfarmed grain. Desirable annual grasses and forbs are the dominant range plants. In excessively grazed areas, however, undesirable grasses and forbs are dominant and sheet erosion is evident in places. In some areas this soil is too shallow to hold enough moisture for plants, especially during years of low rainfall. Dryfarmed grain is grown in a few areas, but in most areas the soil is too shallow to consistently produce good yields. In addition, uneven slopes, and in places stones on the surface, interfere with cultivation. Capability unit IVe–5.

Millsholm clay loam, 30 to 50 percent slopes (MtE).—Most of this soil is on the steep slopes of rounded hills in the western part of the county, but a small acreage is in the deep canyons of Deer, Mill, and Antelope Creeks east of the Sacramento River. The surface is uneven because of short streams and rock outcrops. Depth of the soil to partly weathered sandstone ranges from 12 to 30 inches. Sandstone fragments, some of which are 3 feet wide, cover 1 to 10 percent of the surface in places. Runoff is medium to rapid, and the erosion hazard is severe.

Included with this soil in mapping are small areas of Lodo, Millsap, and Sehorn soils.

All of this Millsholm soil is used for pasture and range, mostly for cattle, but sheep also graze the areas. The density of stands of blue oaks on this soil varies. On slopes that face north, blue oaks cover 50 to 80 percent of the area, and on slopes that face south, they cover 10 to 50 percent of the area. A few areas have been cleared of oaks, and in these areas the forage is generally of greater value. Capability unit VIe–5.

Millsholm clay loam, 50 to 65 percent slopes (MtF).—This soil has very steep, irregular slopes, but it is otherwise similar to Millsholm clay loam, 30 to 50 percent slopes.

Areas of this soil are used for pasture and range. The erosion hazard is very severe. Capability unit VIIe–5.

Millsholm rocky sandy loam, 30 to 50 percent slope (MuE).—This soil is on partly rounded hills in the western part of the county. It formed in material from hard conglomerate. Stones, some of which are nearly 3 feet in diameter, are scattered over 1 to 10 percent of the surface. Runoff is rapid, and the erosion hazard is severe.

Included with this soil in mapping are rock outcrops and small areas of Sehorn soils.

All of this Millsholm soil is used for pasture and range. Capability unit VIIs–7.

Millsholm rocky sandy loam, 50 to 65 percent slopes (MuF).—This soil has steeper slopes but is otherwise similar to Millsholm rocky sandy loam, 30 to 50 percent slopes. Runoff is very rapid, and the erosion hazard is very severe.

All of this soil is used for pasture and range, though the very steep slopes make it difficult for cattle and sheep to graze the areas. Capability unit VIIs–7.

Millsholm-Millsap complex, 10 to 30 percent slopes (MvD).—This complex consists of Millsholm clay loam, 10 to 30 percent slopes, and Millsap loam, 10 to 30 percent slopes. Either soil may occupy from 20 to 80 percent of any one area. Millsholm part, capability unit IVe–5; Millsap part, capability unit IVe–3.

Millsholm-Millsap complex, 30 to 50 percent slopes (MvE).—This complex consists of Millsholm clay loam, 30 to 50 percent slopes, and Millsap loam, 30 to 50 percent slopes. Either soil may occupy from 20 to 80 percent of any one area. Millsholm part, capability unit VIe–5; Millsap part, capability unit VIe–3.

Millsholm-Millsap complex, 50 to 65 percent slopes (MvF).—This complex consists of Millsholm clay loam, 50 to 65 percent slopes, and Millsap loam, 50 to 65 percent slopes. Either soil may occupy from 20 to 80 percent of any one area. Millsholm part, capability unit VIIe–5; Millsap part, capability unit VIIe–3.

Moda Series

In the Moda series are nearly level to gently sloping, well-drained soils that are moderately deep to an indurated hardpan. These soils formed in old alluvium derived from sedimentary rock. The surface soil is yellowish brown, medium textured, and slightly acid. The subsoil is brown that grades toward reddish brown and is neutral and is moderately fine to fine textured. Moda soils are on terraces, mainly west of the Sacramento River at elevations of 250 to 500 feet. All the acreage has been cultivated.

Profile of Moda loam in a nearly level area under oat hay; elevation of 280 feet (1.5 miles west and 0.5 mile south of Proberta near the center of the SE¼ sec. 28, T. 26 N., R. 3 W.) :

A1—0 to 15 inches, yellowish-brown (10YR 5/4) loam, dark yellowish brown (10YR 4/4) when moist; weak, granular structure; hard when dry, friable when moist, slightly sticky when wet; many fine roots and pores; slightly acid; abrupt, wavy boundary. 10 to 20 inches thick.

B2t—15 to 30 inches, brown (7.5YR 5/4) clay, dark brown (7.5YR 4/4) when moist; coarse, prismatic structure; very hard when dry, very firm when moist, very sticky and plastic when wet; a few fine roots and pores; thick, continuous clay films around aggregates and in pores; neutral; abrupt, smooth boundary. 3 to 15 inches thick.

Cm—30 to 34 inches, brown (7.5YR 5/4), indurated iron-silica hardpan; the upper part of this horizon is most cemented; clear, irregular boundary. 4 inches to several feet thick

C—34 inches +, light yellowish-brown (10YR 6/6) loam, yellowish brown (10YR 5/6) when moist; massive; hard when dry, friable when moist, slightly sticky when wet; a few fine pores; mildly alkaline.

The color of the surface soil is brown, light brown, yellowish brown, or light reddish brown, but the color of the subsoil is brown or is brown that grades toward reddish brown or yellowish red. The surface soil is loam or fine sandy loam. The subsoil ranges from clay to clay loam. Depth to the hardpan ranges from 15 to 32 inches, and the less deep soils have a surface soil near fine sandy loam and a subsoil of clay loam. Thickness of the hardpan varies from place to place. In some places the substratum is consolidated to a depth of many feet, but in others it is a few inches thick.

Moda loam, 0 to 3 percent slopes (Mx).—Most areas of this soil are on low terraces south of Red Bluff. A small area is across the Sacramento River from Red Bluff, and another small area is in the district of Bend. All areas have a fairly smooth surface.

The soil is well drained. Runoff is slow, and permeability is very slow. The hardpan restricts the movement of water and roots through the soil. The available water holding capacity and fertility are low. The erosion hazard is slight.

Included with this soil in mapping are small areas of Kimball, Perkins, and Corning soils.

If this Moda soil is irrigated, pasture, milo, corn, and olives grow well. Other areas are used for barley, oats, and pasture and range. Capability unit IIIs–3.

Moda gravelly loam (Mw).—This soil is 10 to 20 percent rounded gravel but is otherwise similar to Moda loam, 0 to 3 percent slopes. Also, the two soils have similar uses. The gravel causes extra wear to cultivation equipment and interferes with preparation of a seedbed. Capability unit IIIs–3.

Molinos Series

The Molinos series consists of well-drained to somewhat excessively drained, moderately coarse textured soils that are mostly nearly level. These soils formed in recent alluvium derived from basic igneous rocks, mainly basalt and andesite. Molinos soils are dark grayish brown and neutral. In many places they contain some gravel in the subsoil or throughout the profile. These soils are along active streams east of the Sacramento River at elevations of 200 to 1,000 feet. More than half of the acreage is cultivated.

Profile of Molinos fine sandy loam on a nearly level flood plain; under annual grasses and forbs; elevation of 250 feet (3 miles south of Los Molinos and ½ mile east of U.S. Highway 99E near the center of the SE¼NW¼ of sec. 35, T. 25 N., R. 2 W.):

A—0 to 17 inches, dark grayish-brown (10YR 4/2) fine sandy loam, very dark grayish brown (10YR 3/2) when moist; massive; slightly hard when dry, very friable when moist, nonsticky and nonplastic when wet; many fine roots; many fine pores; neutral; gradual, wavy boundary. 10 to 20 inches thick.

AC—17 to 40 inches, dark grayish-brown (10YR 4/2) fine sandy loam; massive; soft when dry, very friable when moist, nonsticky and nonplastic when wet; a few fine roots; many fine pores; contains thin layers of fine sand and gravel; neutral; abrupt, wavy boundary. 20 to 30 inches thick.

C—40 inches +, dark-brown (10 YR 4/3) very gravelly and cobbly sandy loam; massive; soft when dry, very friable when moist, nonsticky and nonplastic when wet; many fine and medium pores; most of the rounded rock fragments are dark gray and andesitic; mildly alkaline.

The color throughout is generally dark grayish brown, but in places the color of the C horizon is a little lighter than that of the surface layer. Many of the small areas along active streams have gravel or cobblestones throughout the profile or in the lower horizons. Texture ranges from sandy loam or fine sandy loam to near loamy sand.

Molinos fine sandy loam (My).—This soil is on the most recent deposits of alluvium of major streams east of the Sacramento River. Many of the areas are less than 100 acres in size and make up long narrow stringers parallel to these streams. The soil is well drained to somewhat excessively drained. Runoff is very slow, and permeability is moderately rapid. The available water holding capacity and fertility are moderate. There is no erosion hazard, except in a few areas along streambanks.

If Molinos fine sandy loam is irrigated, alfalfa, milo, corn, beans, sugarbeets, pasture, melons, almonds, walnuts, prunes, peaches, and grapes grow well. Other areas are used for pasture and range and for dryfarmed grain. Capability unit I–1.

Molinos fine sandy loam, moderately deep over clay (Mz).—This soil was deposited over a soil similar to Berrendos clay but otherwise is similar to Molinos fine sandy loam. Depth of the fine sandy loam to the clay is 20 to 40 inches. Water penetrates the fine sandy loam faster than the clay and therefore stands in the soil overlying the clay for short periods following irrigation or periods of high rainfall.

Included with this soil in mapping are areas of Vina soils and Molinos soils that are deeper than 60 inches to clay.

If this Molinos soil is irrigated, pasture, corn, sugarbeets, milo, beans, and similar crops grow well. Capability unit IIIs–3.

Molinos fine sandy loam, deep over gravel (Mzd).—Most of this soil is in long, narrow areas, fairly close to active streams. The soil has a very gravelly subsoil at a depth of 36 to 60 inches but is otherwise similar to Molinos fine sandy loam. Water drains from this soil moderately rapidly.

Included with this soil in mapping are areas of Vina soils.

Crops grown on this Molinos soil are similar to those grown on Molinos fine sandy loam. Irrigation water should be applied more frequently on this soil, however, and the runs should be shorter. Capability unit IIs–0.

Molinos fine sandy loam, moderately deep over gravel (Mzm).—This soil is underlain by a gravelly substratum at a depth of 18 to 36 inches, but it is otherwise similar to Molinos fine sandy loam. One area about 100 acres in size is along Deer Creek, but other areas are less than 50 acres in size. Water drains through this soil moderately rapidly.

Included with this soil in mapping are areas of Vina soils.

Irrigated pasture, alfalfa, and row crops are grown on this Molinos soil. Since this soil is droughty, crops growing on it must be irrigated frequently. Overhead sprinklers are best to use for irrigating. Capability unit IIs–0.

Molinos fine sandy loam, deep over rock (Mzr).—This soil has an unrelated cemented layer at a depth of 36 to 60 inches but is otherwise similar to Molinos fine sandy loam. This layer is impervious to water. In places a perched water table occurs during winters of high rainfall and during the summer because of the accumulation of excess irrigation water. This water table fluctuates considerably. It is lacking in some areas, and in others the water table is at a depth of 2 feet.

Included with this soil in mapping are areas of Vina soils.

Irrigated pasture is grown on most of this Molinos soil, though alfalfa and row crops are grown in some areas. Orchard crops do not grow well on this soil. Capability unit IIs–8.

Molinos gravelly fine sandy loam (Mzs).—This soil has a surface soil that is 10 to 20 percent rounded gravel and a subsoil that is generally more gravelly, but it is otherwise similar to Molinos fine sandy loam. Depth of the soil is more than 60 inches.

Included with this soil in mapping are areas of Vina and Millrace soils.

The same crops are grown on this Molinos soil as are grown on Molinos fine sandy loam. Irrigation water is required more frequently on this soil than on the nongravelly Molinos soils, because this soil holds less water. Also, the gravel causes cultivation equipment to wear excessively. Capability unit IIs–4.

Molinos complex, channeled (Mzt).—This complex consists of variable proportions of any of the Molinos soils. The soils are along active streams, and stream channels have cut them into fairly small areas. All areas are subject to flooding. In most places texture and depth of the soils vary from place to place.

Included with these soils in mapping are areas of Millrace and Vina soils.

Most of the soils in this complex are used for pasture and range. Only a few areas are large enough to be used intensively for agriculture. Capability unit VIw–1.

Myers Series

In the Myers series are nearly level, well-drained soils formed in alluvium derived chiefly from sedimentary rock. These soils are clay throughout. They have a dark grayish-brown, slightly acid surface soil and a brown, mildly alkaline, calcareous subsoil. Myers soils are in narrow valleys in the western part of the county at eleva-

tions of 500 to 1,500 feet. The vegetation is annual grasses and forbs.

Profile of Myers clay (in Colusa County, about 4½ miles southwest of Williams, ¼ mile north and 150 feet east of the southwest corner of sec. 33, T. 15 N., R. 3 W.) :

A1—0 to 25 inches, dark-brown (10YR 4/3) clay, dark grayish brown (10YR 4/2) when moist; massive; very hard when dry, firm when moist, sticky and plastic when wet; many roots and pores; many slickensides and pressure faces; slightly acid to neutral in the lower part; gradual, smooth boundary. 10 to 30 inches thick.

C—25 inches +, brown (10YR 5/3) clay, dark brown when moist; massive; a few roots and pores; a few slickensides and pressure faces; mildly alkaline; slightly calcareous but contains a few, soft, small concretions of lime; gradual, smooth boundary.

The surface layer is generally dark brown, but in some places it is brown or grayish brown. The C horizon is brown, dark brown, or yellowish brown. These soils are slightly acid or neutral in the surface layer and are mildly alkaline or moderately alkaline in the C horizon. The C horizon is generally calcareous, but in places it is only intermittently calcareous. Slickensides and pressure faces are common at a depth of about 10 to 40 inches.

Myers clay, 0 to 3 percent slopes (Mzy).—This is the only Myers soil mapped in the county. It is in small areas or in long, narrow stringers in narrow valleys in the western part of the county. The surface is smooth.

This soil is well drained. Runoff and permeability are slow. The available water holding capacity is high, and fertility is moderate. Except in places along streambanks, there is no erosion hazard.

Included with this soil in mapping are areas of Zamora, Sehorn, and Yolo soils and areas that have slopes of 3 to 10 percent.

This Myers soil is used for dryfarmed grain and for pasture and range. Capability unit IIIs–5.

Nacimiento Series

In the Nacimiento series are gently sloping to steep, well-drained soils that formed in softly consolidated material chiefly from siltstone. The surface soil is light brownish gray, and the subsoil is light gray. These soils are calcareous silty clay loam throughout. They are on rounded foothills (fig. 4) west of the Sacramento River at elevations of 300 to 1,500 feet. Most areas have been cultivated.

Profile of Nacimiento silty clay loam on a slope of 32 percent that faces west, in an area used for grain (3.5 miles east of Flournoy, near the center of the NE¼SW¼ SE¼ sec. 33, T. 24 N., R. 5 W.) :

A1—0 to 12 inches, light brownish-gray (2.5Y 6/2) silty clay loam, dark grayish brown (2.5Y 4/2) when moist; strong, subangular blocky structure; hard when dry, friable when moist, slightly sticky when wet; many fine roots; many fine and medium pores; lime fragments throughout; strongly calcareous; mildly alkaline; clear, smooth boundary. 10 to 20 inches thick.

C1ca—12 to 25 inches, light-gray (2.5Y 7/2) silty clay loam, grayish brown (2.5Y 5/2) when moist; strong, subangular blocky structure; hard when dry, friable when moist, slightly sticky when wet; a few fine roots; many fine and medium pores; segregated lime and lime fragments throughout; strongly calcareous; moderately alkaline; gradual, wavy boundary. 12 to 50 inches thick.

C2—25 inches +, similar to C1ca horizon but is semiconsolidated; can be cut with a shovel but is brittle; contains variable amounts of hard, nearly white seams of lime; mildly alkaline.

The color of the surface layer is generally light brownish gray, but in places it is grayish brown or pale brown. The subsoil is light gray, pale yellow, or nearly white. In areas that are not cultivated, the surface layer is 1 to 2 inches thick and is nearly a dark grayish brown. These soils are always calcareous throughout, and generally most of the carbonates are concentrated in the lower part of the C horizon. Depth to the C horizon of semiconsolidated material is 24 to 60 inches. The degree of consolidation in this material varies from place to place. In some areas the material offers little or no resistance to an auger or spade, but in other areas it is hard and brittle.

Nacimiento silty clay loam, 10 to 30 percent slopes (NaD).—This moderately sloping to strongly sloping soil is on low foothills in the western part of the county. Many areas are more than 100 acres in size. The surface of the soil is smooth.

This soil is well drained. Runoff is medium, and permeability is slow. The available water holding capacity and fertility are moderate. The erosion hazard is also moderate.

Included with this soil in mapping are areas of Altamont and Newville soils.

Barley is grown on this Nacimiento soil in rotation with a crop used for grazing sheep or cattle. After the areas are grazed 2 to 4 years, barley is grown 1 year. Yields of forage are large, and the quality is very good. In many areas the dominant plants are burclover, soft chess, and wild oats. Capability unit IVe–5.

Nacimiento silty clay loam, 30 to 50 percent slopes (NaE).—This soil generally has smooth rounded slopes and is cut by many short drainageways. In the area south of Elder Creek and north of Flournoy, the underlying siltstone is fairly hard. Depth of the soil in this area averages about 15 inches. Runoff is rapid, and the erosion hazard is severe.

Included with this soil in mapping are areas of Newville and Dibble soils.

Nearly all of this Nacimiento soil is used for pasture and range. Yields of forage are large, and the quality is generally very good. Grain is grown in some areas that have slopes ranging from 30 to 35 percent. If these areas are cultivated, they are likely to erode, and the value of the soil for grain will be reduced. Capability unit VIe–5.

Nacimiento silty clay loam, 10 to 30 percent slopes, eroded (NaD2).—Areas of this soil are quite variable in size and shape. In some places as much as 12 inches of the surface soil has been removed through erosion, particularly on the upper edges of slopes where fragments of soft limestone are exposed. In most places narrow, steep-walled gullies, 3 to 8 feet deep, have cut into the areas. These gullies cannot be crossed with equipment used for cultivation.

Included with this soil in mapping are areas of Newville and Altamont soils.

This Nacimiento soil is used for dryfarmed grain and for pasture and range. Yields of grain are low in areas where the subsoil, which contains much lime, is exposed. Areas that are excessively grazed or are trampled by live-

Figure 4.—A Nacimiento silty clay loam in a field from which barley has recently been harvested.

stock and left bare in winter are subject to accelerated erosion. Capability unit IVe–5.

Nacimiento silty clay loam, 30 to 50 percent slopes, eroded (NaE2).—This soil has steeper slopes but is otherwise similar to Nacimiento silty clay loam, 10 to 30 percent slopes, eroded. Runoff is rapid, and the erosion hazard is severe. All of the acreage is used for pasture and range. Capability unit VIe–5.

Nacimiento-Newville complex, 3 to 10 percent slopes (NhB).—This complex consists of Nacimiento silty clay loam, 3 to 10 percent slopes, and Newville gravelly loam, 3 to 10 percent slopes. Either soil may occupy from 40 to 60 percent of any one area. Nacimiento part, IIIe–5; Newville part, IVe–3.

Nacimiento-Newville complex, 10 to 30 percent slopes (NhD).—This complex consists of Nacimiento silty clay loam, 10 to 30 percent slopes, and Newville gravelly loam, 10 to 30 percent slopes. Either soil may occupy from 40 to 60 percent of any one area. Included with these soils in mapping are small areas of Altamont clay, terrace, soils. Nacimiento part, capability unit IVe–5; Newville part, capability unit VIe–3.

Nacimiento-Newville complex, 10 to 30 percent slopes, eroded (NhD2).—This complex consists of Nacimiento silty clay loam, 10 to 30 percent slopes, eroded, and Newville gravelly loam, 10 to 30 percent slopes, eroded. Either soil may occupy from 40 to 60 percent of any one area. Included with these soils in mapping are small areas of Altamont clay, terrace, soils. Nacimiento part, capability unit IVe–5; Newville part, capability unit VIe–3.

Nacimiento-Newville complex, 30 to 50 percent slopes (NhE).—This complex consists of Nacimiento silty clay loam, 30 to 50 percent slopes, and Newville gravelly loam, 30 to 50 percent slopes. Either soil may occupy from 40 to 60 percent of any one area. Included with these soils in mapping are areas of Altamont clay, terrace, soils. Nacimiento part, capability unit VIe–5; Newville part, capability unit VIe–3.

Nacimiento-Newville complex, 30 to 50 percent slopes, eroded (NhE2).—This complex consists of Nacimiento silty clay loam, 30 to 50 percent slopes, eroded, and Newville gravelly loam, 30 to 50 percent slopes, eroded. Either soil may occupy from 40 to 60 percent of any one area. Included with these soils in mapping are areas of Altamont

clay, terrace, soils. Nacimiento part, capability unit VIe–5; Newville part, capability unit VIe–3.

Nacimiento-Altamont complex, 3 to 10 percent slopes (NcB).—This complex consists of Nacimiento silty clay loam, 3 to 10 percent slopes, and Altamont clay, terrace, 3 to 10 percent slopes. Either soil may occupy from 30 to 70 percent of any one area. Both parts, capability unit IIIe–5.

Nacimiento-Altamont complex, 10 to 30 percent slopes (NcD).—This complex consists of Nacimiento silty clay loam, 10 to 30 percent slopes, and Altamont clay, terrace, 10 to 30 percent slopes. Either soil may occupy from 30 to 70 percent of any one area. Both parts, capability unit IVe–5.

Nacimiento-Altamont complex, 10 to 30 percent slopes, eroded (NcD2).—This complex consists of Nacimiento silty clay loam, 10 to 30 percent slopes, eroded, and Altamont clay, terrace, 10 to 30 percent slopes. Either soil may occupy from 30 to 70 percent of any one area. Both parts, capability unit IVe–5.

Nacimiento-Altamont complex, 30 to 50 percent slopes, eroded (NcE2).—This complex consists of Nacimiento silty clay loam, 30 to 50 percent slopes, eroded, and Altamont clay, terrace, 30 to 50 percent slopes. Either soil may occupy from 30 to 70 percent of any one area. Both parts, capability unit VIe–5.

Nanny Series

The Nanny series consists of nearly level to gently sloping, well-drained soils formed in alluvium derived mostly from andesitic rock. The surface soil is dark grayish-brown stony loam, and the subsoil is brown gravelly loam near clay loam. The soils are slightly acid to medium acid and are generally more than 5 feet deep. They are on alluvial fans in the eastern part of the county at elevations of 4,000 to 6,000 feet. The vegetation is various kinds of conifers.

Profile of Nanny stony loam on a gently sloping fan; under various kinds of conifers and an understory of shrubs; elevation of 4,600 feet (1,500 feet northwest of the junction of California Highways 36 and 32, near the center of the SW¼SE¼ sec. 16, T. 28 N., R. 5 E.) :

A1—0 to 5 inches, dark grayish-brown (10YR 4/2) stony loam, very dark grayish brown (10YR 3/2) when moist; strong, fine, granular structure; soft when dry and moist; a few very fine roots; many pores; slightly acid; abrupt, smooth boundary. 3 to 6 inches thick.

A3—5 to 12 inches, brown (10YR 4/3) stony loam, dark brown (10YR 3/3) when moist; massive; slightly hard when dry, friable when moist; a few very fine and fine roots; very porous; slightly acid; clear, smooth boundary. 3 to 8 inches thick.

B2t—12 to 31 inches, brown (7.5YR 5/4) gravelly heavy loam, dark brown (7.5YR 3/4) when moist; massive; slightly hard when dry, friable when moist; a few very fine and fine roots; very porous; medium acid; clear, wavy boundary. 15 to 24 inches thick.

C—31 to 60 inches, light yellowish-brown (10YR 6/4) gravelly loam, dark yellowish brown (10YR 4/4) when moist; massive; nearly soft when dry, friable when moist; a few roots; very porous; medium acid.

The color of the surface layer is brown to grayish brown, but the B2 horizon is yellowish brown, reddish yellow, or strong brown. The soils are slightly acid to medium acid. In places weakly cemented layers are at a depth of 36 to 60 inches.

Nanny stony loam, 0 to 8 percent slopes (NkB).—This soil is in fairly small areas along the edges of high mountain valleys in the eastern part of the county. The soil is well drained. Runoff is slow, and permeability is moderately rapid. The available water holding capacity and fertility are moderate. The erosion hazard is slight.

Included with this soil in mapping are small areas of Childs and Elam soils.

All of this Nanny soil is in timber. The areas are excellent for homesites and campsites because of their location and gentle slopes. Capability unit VIs–7.

Nanny stony loam, moderately deep, 0 to 8 percent slopes (NmB).—This soil has a cemented layer at a depth of 20 to 40 inches but is otherwise similar to Nanny stony loam, 0 to 8 percent slopes. This layer is slowly permeable to water, and roots cannot penetrate it except along cracks. The uses of the two soils are similar, but trees grow more slowly on this soil. Capability unit VIs–7.

Neuns Series

The Neuns series consists of well-drained soils that are moderately steep to very steep. These soils formed in material from metamorphic volcanic rock. They have a pale-brown, medium acid surface soil and a very pale brown subsoil that is medium acid to strongly acid. Neuns soils are moderately deep and in many places are gravelly sandy loam throughout. They are in the western part of the county at elevations of 3,000 to 6,000 feet. The vegetation is various kinds of conifers.

Profile of Neuns stony loam on a slope of 40 percent that faces north; under a moderately dense stand of various kinds of conifers; elevation of 4,300 feet (1 mile southwest of Tedoc Gap, near the center of NW¼NE¼ sec. 31, T. 28 N., R. 9 W.) :

O1 & O2—2 inches to 0, forest litter made up of fresh to partly decomposed pine needles; abrupt, smooth boundary. 1 to 2 inches thick.

A11—0 to 2 inches, pale-brown (10YR 6/3) stony loam, dark brown (10YR 4/3) when moist; strong, fine, granular structure; soft when dry, very friable when moist, nonsticky when wet; a few fine roots; medium acid; abrupt, smooth boundary. 1 to 3 inches thick.

A12—2 to 10 inches, pale-brown (10YR 6/3) stony loam, dark brown (10YR 4/3) when moist; strong, fine, granular structure; soft when dry, very friable when moist, nonsticky when wet; a few fine and medium roots; medium acid; clear, irregular boundary. 6 to 12 inches thick.

B2—10 to 17 inches, very pale brown (10YR 7/4) stony gravelly sandy loam, dark yellowish brown (10YR 4/4) when moist; strong, fine, granular structure; slightly hard when dry, friable when moist, nonsticky when wet; a few roots one-half inch in diameter, and a few fine roots; very porous; strongly acid; clear, irregular boundary. 6 to 50 inches thick.

R—17 inches +, fractured, hard rock with many deep cracks that are filled with soil material from the B2 horizon; the rock is metamorphosed, igneous greenstone; the unweathered rock is greenish gray in color.

The color of the surface layer is dark grayish brown or pale brown, and the color of the subsoil is very pale brown, yellowish brown, or light brown. In most places the soils are medium acid to strongly acid, but in some places they are medium acid in the surface soil and strongly acid in the subsoil. The soils are gravelly sandy loam or stony loam throughout and contain varying amounts of angular cobblestones and other stones.

Neuns stony loam, 10 to 30 percent slopes (NnD).—This soil is along ridgetops in the western part of the county. The size and shape of the areas vary considerably. The surface of the soil is cut by streams. Angular fragments 3 inches to nearly 3 feet in diameter are scattered over 5 to 25 percent of the surface. Depth to fractured bedrock ranges from 15 to 40 inches, but it is generally 20 to 30 inches.

This soil is well drained. Runoff is slow, and permeability is moderately rapid. The available water holding capacity and fertility are low. The erosion hazard is moderate.

Included with this soil in mapping are small areas of Sheetiron and Dubakella soils.

Ponderosa pine, sugar pine, white fir, Douglas-fir, and incense-cedar are grown on this Neuns soil. Capability unit VIs–7.

Neuns stony loam, 30 to 50 percent slopes (NnE).—This soil is steeper but is otherwise similar to Neuns stony loam, 10 to 30 percent slopes. Because of the steep slopes, it is difficult to harvest timber from this soil. Capability unit VIs–7.

Neuns stony loam, 50 to 65 percent slopes (NnF).—This soil is steeper but is otherwise similar to Neuns stony loam, 10 to 30 percent slopes. Because of the very steep slopes, it is difficult to harvest timber from this soil. Capability unit VIIs–1.

Neuns stony loam, deep, 50 to 65 percent slopes (NoF).—This soil has steeper slopes and is deeper but is otherwise similar to Neuns stony loam, 10 to 30 percent slopes. Depth to fractured rock is 40 to 60 inches. Because of the very steep slopes, it is difficult to harvest timber from this soil. Capability unit VIIs–1.

Neuns-Dubakella complex, 30 to 50 percent slopes (NpE).—This complex consists of Neuns stony loam, 30 to 50 percent slopes, and Dubakella stony loam, 30 to 50 percent slopes. Either soil may occupy from 30 to 70 percent of any one area. Both parts, capability unit VIs–7.

Newville Series

In the Newville series are nearly level to very steep, well-drained soils formed in softly consolidated sediment. These sediments are from conglomerate and siltstone of the Tehama formation. The soils have a surface soil that is brown to yellowish brown, slightly acid, and gravelly. The subsoil is strong-brown to reddish-brown gravelly clay that is slightly acid to neutral. These soils are on rounded foothills in the northwestern part of the county at elevations of 300 to 2,000 feet (fig. 5). The vegetation is mostly annual grasses and forbs but includes some blue oaks. Some areas of these soils are cultivated, but most areas are used for pasture and range.

Profile of Newville gravelly loam on a slope of 30 percent that faces southwest; under vegetation made up mostly of annual grasses and forbs but partly of blue oaks; elevation of 925 feet (14 miles west of Red Bluff in the NE¼ sec. 22, T. 27 N., R. 6 W.):

A1—0 to 9 inches, yellowish-brown (10YR 5/4) gravelly loam, dark yellowish brown (10YR 4/4) when moist; the uppermost 1 to 2 inches has weak to moderate, medium, platy structure, but the structure below is subangular blocky; hard when dry, friable when moist, slightly sticky when wet; many fine roots; many fine pores; slightly acid; clear, irregular boundary. 6 to 20 inches thick.

B1—9 to 13 inches, strong-brown (7.5YR 5/6) gravelly clay loam, dark brown (7.5YR 4/4) when moist; subangular blocky structure; hard when dry, friable when moist, slightly sticky when wet; a few fine roots; very porous; a few patchy clay films; slightly acid; clear, irregular boundary. 2 to 6 inches thick.

B2t—13 to 20 inches, strong-brown (7.5YR 5/6) gravelly clay, dark brown (7.5YR 4/4) when moist; massive; hard when dry, friable when moist, slightly sticky when wet; thick, continuous clay films in pores and around the gravel; a few fine pores; slightly acid; gradual, irregular boundary. 5 to 20 inches thick.

B3t—20 to 56 inches +, strong-brown (7.5YR 5/6) very gravelly sandy clay loam; massive; slightly hard when dry, friable when moist, slightly sticky when wet; many irregular pores; clay films on walls of pores and voids; neutral.

The surface soil is yellowish brown, pale brown, or brown in color. Its texture is generally gravelly loam, but in places it is nearly a gravelly sandy loam or gravelly clay loam. The color of the subsoil is yellowish red, strong brown, or yellowish brown, and the texture is gravelly or slightly gravelly clay loam. The substratum is yellower than the subsoil. Both the surface soil and the subsoil range from slightly acid to neutral.

Newville gravelly loam, 10 to 30 percent slopes (NrD).—This soil is on rounded foothills in the western part of the county. These areas vary considerably in size and shape; some areas are more than 500 acres in size. The surface is generally smooth, but many areas have been cut by short drainageways and are undulating.

This soil is well drained. Permeability is slow, the available water holding capacity is low, and fertility is moderate to low. Runoff is medium, and the erosion hazard is moderate. In an area 3 to 4 miles north of Flournoy and in another area 9 miles north of Red Bluff, the substratum is partly cemented and is very slowly permeable to roots and water. The clay subsoil, which is at a depth of 10 to 20 inches, is slowly penetrated by roots and water.

Included with this soil in mapping are areas of Corning, Altamont, and Dibble soils and some areas that have slopes of less than 10 percent.

Newville gravelly loam, 10 to 30 percent slopes, is used for pasture and range and for dryfarmed grain. Yields of grain are fair. Most areas in the southern half of the county are grazed by sheep during the winter and early in spring. Here the forage is dominantly filaree and other annual forbs. The northern part of the county is grazed mainly by cattle, and here more than half the forage is wild oats, brome, and similar grasses. Dryfarmed barley or oats are rotated with pasture every 2 to 4 years in many areas. Capability unit VIe–3.

Newville gravelly loam, 3 to 10 percent slopes (NrB).—This soil is less steep but is otherwise similar to Newville gravelly loam, 10 to 30 percent slopes. Runoff is slow to medium and the erosion hazard is slight to moderate. Capability unit IVe–3.

Newville gravelly loam, 3 to 10 percent slopes, eroded (NrB2).—This soil is less steep but is otherwise similar to Newville gravelly loam, 10 to 30 percent slopes, eroded. It is also easier to manage, and gully erosion is easier to control. Runoff is slow to medium. Capability unit IVe–3.

Newville gravelly loam, 10 to 30 percent slopes, eroded (NrD2).—This soil is in drainageways in rounded

Figure 5.—**Sheep on a Newville gravelly loam west of Red Bluff; in the background are blue oaks and fairly deep gullies on steeper Newville gravelly loams.**

foothills in the western part of the county. The drainageways are cut by gullies that are 1 foot or more deep. Many of these gullies cannot be crossed with equipment used for cultivation. Animals grazing in this area must either walk around the gullies or walk through them.

Included with this soil in mapping are small areas of Dibble, Altamont, and Corning soils.

Most areas of this Newville soil are used for pasture and range, but the value of the soil for pasture and range and for dryfarmed grain has been reduced by erosion. A crop rotation of dryfarmed barley and oats every 2 to 4 years is common. Capability unit VIe–3.

Newville gravelly loam, 30 to 50 percent slopes (NrE).—This soil is steeper but is otherwise similar to Newville gravelly loam, 10 to 30 percent slopes. Runoff is rapid. The hazard of erosion is severe.

Because of the erosion hazard and the chance of injuring personnel or equipment, cultivating this steep soil is hazardous. Except for a small acreage that has slopes of 30 to 35 percent, the soil is therefore not cultivated. Most areas are used for grazing sheep and cattle, but excessive grazing causes sheet and gully erosion. Capability unit VIe–3.

Newville gravelly loam, 30 to 50 percent slopes, eroded (NrE2).—This soil is cut by gullies, some of which are 3 to 10 feet deep. The gullies are spaced 100 feet to about a quarter of a mile apart. Runoff is rapid, and the erosion hazard is severe.

All of this soil is used for pasture and range. The carrying capacity of the soil has been reduced because of the gullies. Capability unit VIe–3.

Newville gravelly loam, 50 to 65 percent slopes (NrF).—This soil is very steep but is otherwise similar to Newville gravelly loam, 10 to 30 percent slopes. Runoff is very rapid, and the erosion hazard is very severe. Many of the slopes face northward and are covered by a dense stand of blue oaks.

All of this soil is used for pasture and range. Because of the very steep slopes and the dense cover of trees, however, the areas are not grazed so much as surrounding areas. Capability unit VIIe–3.

Newville-Dibble complex, 10 to 30 percent slopes (NvD).—This complex consists of Newville gravelly loam, 10 to 30 percent slopes, and Dibble silty clay loam, 10 to 30 percent slopes. From 50 to 80 percent of each area is Newville soil, and the rest is Dibble soil. Newville part, capability unit VIe–3; Dibble part, capability unit IVe–5.

Newville-Dibble complex, 30 to 50 percent slopes (NvE).—This complex consists of Newville gravelly loam, 30 to 50 percent slopes, and Dibble silty clay loam, 30 to 50 percent slopes. From 50 to 80 percent of each area is

Newville soil, and the rest is Dibble soil. Newville part, capability unit VIe–3; Dibble part, capability unit VIe–5.

Newville-Dibble-gullied land complex, 10 to 30 percent slopes (NwD).—This complex consists of Newville gravelly loam, 10 to 30 percent slopes, and Dibble-gullied land complex, 10 to 30 percent slopes. From 50 to 80 percent of each area is Newville soil; the rest is Dibble soil and gullied land. Newville part, capability unit VIe–3; Dibble-gullied land part, capability unit IVe–5.

Newville-Dibble-gullied land complex, 30 to 50 percent slopes (NwE).—This complex consists of Newville gravelly loam, 30 to 50 percent slopes, eroded, and Dibble-gullied land complex, 30 to 50 percent slopes. From 50 to 80 percent of each area is Newville soil; the rest is Dibble soil. Newville part, capability unit VIe–3; Dibble-gullied land part, capability unit VIe–5.

Newville-Laniger complex, 10 to 30 percent slopes (NxD).—This complex consists of Newville gravelly loam, 10 to 30 percent slopes, and Laniger fine sandy loam, 8 to 30 percent slopes. From 50 to 80 percent of each area is Newville soil; the rest is Laniger soil. Newville part, capability unit VIe–3; Laniger part, capability unit VIe–8.

Orland Series

In the Orland series are nearly level, well-drained soils formed in recent alluvium derived chiefly from metamorphic rock. These soils are medium textured and are gray to light brownish gray throughout. The surface soil is near neutral, but the subsoil is moderately alkaline and slightly calcareous. Orland soils are on flood plains west of the Sacramento River along Thomes and Stony Creeks at elevations of 200 to 1,000 feet. Most of these soils are cultivated.

Profile of Orland silt loam along the Southern Pacific Railroad right-of-way, under a dense stand of annual grasses (east of U.S. Highway 99W and 0.5 mile south of Thomes Creek in the southeast corner of the SW¼SW¼ sec. 35, T. 25 N., R. 3 W.):

A1—0 to 18 inches, gray (2.5Y 5/1) silt loam, very dark gray (2.5Y 3/1) when moist; massive but is subangular blocky in places; slightly hard when dry, friable when moist, nonsticky when wet; many fine roots; very porous; neutral; clear, smooth boundary. 5 to 30 inches thick.

C1—18 to 34 inches, similar to the A1 horizon but is moderately alkaline and slightly calcareous; clear, smooth boundary. 10 to 20 inches thick.

C2—34 to 60 inches+, light brownish-gray (2.5Y 6/2) silt loam, dark grayish brown (2.5Y 4/2) when moist; massive; slightly hard when dry, friable when moist, nonsticky when wet; a few fine roots; many fine pores; moderately alkaline and moderately calcareous.

The color of the surface soil is gray, light brownish gray, or grayish brown, but the color of the subsoil is a little lighter. The texture of these soils is loam, silt loam or fine sandy loam. In places at a depth of 30 inches or more, the soils are underlain by gravel. The soil is generally neutral in the surface soil, but it becomes alkaline with increasing depth. In places the substratum is calcareous, but it is noncalcareous in areas where the soil is shallow to gravel.

Orland silt loam (Os).—This soil is in areas along Thomes and Stony Creeks; several of the areas are more than 100 acres in size. The surface is smooth.

This soil is well drained. Runoff is very slow, and permeability is moderate. The available water holding capacity and fertility are high. There is no erosion hazard. Because of platy silt particles in the soil, irrigation water infiltrates slowly. Water running over the surface orients the plates parallel to the surface, and as a result, the surface is sealed. If organic matter is added to the soil, sealing of the surface can be partly overcome.

Included with this soil in mapping are small areas of Cortina and Wyo soils.

If this Orland soil is irrigated, alfalfa, beans, pasture, milo, corn, melons, almonds, walnuts, prunes, and peaches grow well. Dryfarmed barley and pasture and range are grown in some areas. Capability unit I–1.

Orland loam (Om).—This soil is similar to Orland silt loam except for texture of the surface layer. Most areas are along Thomes Creek near Henleyville. The areas have a smooth surface and are small in size.

This soil is well drained. Runoff is very slow, and permeability is moderate. The available water holding capacity and fertility are high. Except for cutting of streambanks in places, there is no erosion hazard. The soil is flooded at times in winter.

Included with this soil in mapping are areas of Cortina and Wyo soils.

If this Orland soil is irrigated, alfalfa, sugarbeets, milo, beans, pasture, walnuts, almonds, prunes, and peaches can be grown. Most areas are used for dryfarmed grain and for pasture and range. Capability unit I–1.

Orland loam, moderately deep over clay loam (Op).—This soil has an unrelated substratum of clay loam but is otherwise similar to Orland loam. The alluvium from which this soil formed was deposited over a layer of clay loam similar to the subsoil of the Tehama soils. Permeability of this layer to roots and water is moderately slow. Depth to the clay loam is 30 to 40 inches, but in some places it is as much as 60 inches or as shallow as 15 inches.

This soil is used for grain and for pasture and range. If the soil is irrigated, a number of row crops and orchard crops grow well. Crops do not grow so well on areas where the soil is more than 60 inches deep to the underlying layer of clay loam, however. Capability unit IIs–3.

Orland loam, moderately deep over gravel (Or).—This soil has a very gravelly layer at a depth of 30 to 50 inches but is otherwise similar to Orland loam. The areas are mostly in long narrow bands fairly near the stream channel, and some areas are flooded during years of high rainfall. Included are areas of Cortina soils.

Most areas of this Orland soil are used for dryfarmed grain and for pasture and range. Some areas could be used more intensively for agriculture. If this soil is irrigated, orchard crops and row crops can be grown. Crops growing on this soil require more frequent irrigation than those on deeper soils. Capability unit IIs–0.

Orland fine sandy loam (Of).—This soil has a surface soil of fine sandy loam but is otherwise similar to Orland loam. It is on areas of alluvium deposited recently along Thomes and Stony Creeks.

If the areas are irrigated, alfalfa, beans, pasture, milo, melons, walnuts, almonds, prunes, and peaches grow well. Some areas are used for dryfarmed grain and for pasture and range. This soil requires more frequent irrigations than Orland loam. Capability unit I–1.

Parrish Series

Parrish soils are well drained and are moderately steep to very steep. These soils formed in material from such hard sedimentary and metamorphic rocks as sandstone, shale, conglomerate, or schist. The surface layer is brown, slightly acid, and medium textured, and the subsoil is reddish brown, medium acid, and fine textured. These soils are moderately deep to hard rock. They are on the slopes of mountains in the western part of the county at elevations of 1,500 to 3,500 feet. All the areas have a dense cover of shrubs.

Profile of Parrish gravelly loam on a slope of 34 percent that faces east, under a dense cover of shrubs (3 miles west and 1.5 miles south of Cold Fork in the SE¼SW¼ sec. 27, T. 27 N., R. 8 W.) :

A1—0 to 2 inches, brown (7.5YR 5/4) gravelly loam, dark brown (7.5YR 3/3) when moist; weak, coarse, granular structure; slightly hard when dry, friable when moist, nonsticky when wet; many fine roots; many fine pores; slightly acid; abrupt, wavy boundary. 3 to 8 inches thick.

A3—2 to 7 inches, brown (7.5YR 5/4) gravelly clay loam, reddish brown (5YR 4/4) when moist; moderate, fine, subangular blocky structure; slightly hard when dry, friable when moist, slightly sticky when wet; many fine roots; very porous; thin, patchy clay film; medium acid; abrupt, wavy boundary. 3 to 8 inches thick.

B2t—7 to 17 inches, reddish-brown (5YR 5/4) gravelly clay, reddish brown (5YR 4/4) when moist; subangular blocky structure; very hard when dry, firm when moist, sticky when wet; a few fine and medium roots; many fine pores; thick, continuous clay films; medium acid; diffuse boundary. 6 to 20 inches thick.

B3t—17 to 35 inches, light yellowish-brown (10YR 6/4) gravelly clay loam, dark yellowish brown (10YR 4/4) when moist; subangular blocky structure; hard when dry, firm when moist, slightly sticky when wet; a few fine pores; a few medium roots; medium acid; gradual, irregular boundary. 0 to 20 inches thick.

R—35 inches +, weathered conglomerate rock that has coatings of clay in seams of the rock.

The surface layer, or A1 horizon, is brown or pale-brown, slightly acid to neutral gravelly loam that is nearly a gravelly clay loam. The A3 horizon, or transitional layer, contains more clay than the surface layer, but in most places it is more similar to the surface layer than to the subsoil. The subsoil, or B2t horizon, is generally reddish-brown gravelly clay but in places is brown. It is slightly acid to medium acid. The color of the B3t horizon, or transitional layer to weathered rock, is light yellowish brown, strong brown, or reddish brown in places. In most areas this horizon is medium acid gravelly clay loam, but in a few places it is slightly acid gravelly clay. In some places this horizon so resembles the B2t horizon that only one horizon, the B2t, is recognized. Depth of these soils to conglomerate is normally 30 to 40 inches, but in some places it is 15 to 50 inches.

Parrish gravelly loam, 30 to 50 percent slopes (PaE).—This soil is on the upper slopes of deep canyons in mountainous areas in the western part of the county. Some areas are more than 1,000 acres in size. The slopes are cut by many short drainageways but are fairly smooth.

This soil is well drained. Permeability is slow, and the available water holding capacity and fertility are low. Runoff is rapid, and the erosion hazard is severe.

Included with this soil in mapping are small areas of Los Gatos, Josephine, and Maymen soils.

Chamise, buckbrush, mountain-mahogany, common manzanita, toyon, and California buckeye are predominant on this Parrish soil. These shrubs form a dense cover, protect the watershed, and provide browse areas and cover for wildlife. Capability unit VIIe–3.

Parrish gravelly loam, 10 to 30 percent slopes (PaD).—This soil is on ridgetops. It is less steep but is otherwise similar to Parrish gravelly loam, 30 to 50 percent slopes. Runoff is slow to medium, and the erosion hazard is moderate. Capability unit VIe–3.

Parrish gravelly loam, 50 to 65 percent slopes (PaF).—This soil is steeper but is otherwise similar to Parrish gravelly loam, 30 to 50 percent slopes. Runoff is very rapid, and the erosion hazard is very severe. Capability unit VIIe–3.

Parrish-Los Gatos gravelly loams, 30 to 50 percent slopes (PgE).—This complex consists of Parrish gravelly loam, 30 to 50 percent slopes, and Los Gatos gravelly loam, 30 to 50 percent slopes. Either soil may occupy from 30 to 70 percent of any one area. Included with these soils in mapping are areas of Maymen soils. Parrish part, capability unit VIIe–3; Los Gatos part, capability unit VIIe–8.

Perkins Series

In the Perkins series are nearly level, well-drained soils formed in gravelly alluvium derived from sandstone, shale, and schist. The surface soil is brown, slightly acid gravelly loam, and the subsoil is reddish-brown, slightly acid to medium acid gravelly clay loam. These soils are on terraces west of the Sacramento River at elevations of 200 to 1,000 feet. Most areas are cultivated.

Profile of Perkins gravelly loam along the railroad right-of-way, under annual grasses and forbs (1.1 miles north of the post office at Red Bluff in the southwest corner of the SE¼NE¼ sec. 18, T. 27 N., R. 3 W.) :

A1—0 to 4 inches, brown (10YR 4/3) gravelly loam, dark brown (10YR 3/3) when moist; moderately strong, medium, platy structure; slightly hard when dry, friable when moist, nonsticky when wet; many fine roots; a few fine pores; slightly acid; abrupt, wavy boundary. 2 to 8 inches thick.

A3—4 to 9 inches, brown (7.5YR 5/4) gravelly loam, dark brown (7.5YR 4/4) when moist; massive; hard when dry, friable when moist, nonsticky when wet; many fine roots; many fine pores; slightly acid; clear, wavy boundary. 4 to 10 inches thick.

B1t—9 to 20 inches, reddish-brown (5YR 5/4) gravelly loam, reddish brown (5YR 4/4) when moist; massive; hard when dry, friable when moist, nonsticky when wet; a few fine roots; many fine and medium pores; thin, discontinuous clay films; medium acid; clear, irregular boundary. 6 to 15 inches thick.

B2t—20 to 52 inches, reddish-brown (5YR 5/4) gravelly clay loam, reddish brown (5YR 4/4) when moist; massive; very hard when dry, firm when moist, sticky when wet; many fine and medium pores; a few fine roots; moderately thick, continuous clay films; medium acid; gradual, irregular boundary. 15 to 35 inches thick.

B3—52 to 60 inches +, yellowish-red (5YR 5/6) very gravelly sandy loam, yellowish red (5YR 4/6) when moist; massive; slightly hard when dry, very friable when moist, nonsticky when wet; very porous; thin, nearly continuous clay films; slightly acid.

The surface layer is brown to reddish-brown slightly gravelly to gravelly loam that is medium acid to slightly acid. In places the A1 horizon is massive. The upper part

of the subsoil, or B2 horizon, is reddish-brown or yellowish-red gravelly clay loam that is medium acid to slightly acid. The lower part of the subsoil, or B3 horizon, is reddish-brown or yellowish-red, very porous gravelly loam or very gravelly sandy loam that is sligthly acid to neutral.

Perkins gravelly loam, 0 to 3 percent slopes (PkA).—This soil is on low terraces west of the Sacramento River. Most areas are less than 500 acres in size and are in long, narrow stringers, the surface of which is smooth. The soil is 10 to 50 percent gravel.

This soil is well drained. Permeability is moderately slow, and the available water holding capacity and fertility are moderate. Runoff is slow, and there is no erosion hazard.

Included with this soil in mapping are small areas of Arbuckle, Kimball, and Moda soils.

Pasture, alfalfa, milo, and olives are grown on this Perkins soil in areas where irrigation water is available. Other areas are used for grain and for pasture and range. Capability unit IIs–4.

Perkins gravelly loam, 3 to 8 percent slopes (PkB).—This soil is on the edges of terraces. Runoff is slow to medium, and the erosion hazard is slight to moderate.

This soil is too steep to be irrigated unless overhead sprinklers are used, or the soil is leveled or terraced. Capability unit IIe–4.

Perkins-Kimball gravelly loams, 0 to 3 percent slopes (Pm).—This complex consists of Perkins gravelly loam, 0 to 3 percent slopes, and Kimball gravelly loam, 0 to 3 percent slopes. Either soil may occupy from 40 to 60 percent of any one area. Perkins part, capability unit IIs–4; Kimball part, capability unit IIIs–3.

Peters Series

In the Peters series are nearly level to steep, well-drained soils formed in material from consolidated tuff. This tuff is composed of basic volcanic ash that was deposited by wind or water or both. The Peters soils are dark gray, slightly acid, and fine textured. They are also shallow, and wide cracks form in them when they dry. Peters soils are on low, rounded hills in two areas in the county. One area is northeast of Corning, and the other is several miles north of Red Bluff. The vegetation is made up of annual grasses and forbs and oaks.

Profile of Peters clay on a slope of 5 percent that faces south; under pasture and range of grasses and forbs used for grazing cattle; elevation of 375 feet (7 miles north of Red Bluff in the SE¼NW¼SE¼ sec. 17, T. 28 N., R. 3 W.):

A1—0 to 12 inches, gray (10YR 5/1) clay, dark-gray (10YR 4/1) when moist; slightly lighter color in the lower part; strong, coarse, blocky structure; very hard when dry, very firm when moist, very sticky and plastic when wet; deep, wide cracks form in the soil when dry; numerous, fine cracks are in the uppermost part; slightly acid; abrupt, smooth boundary. 12 to 24 inches thick.

R—12 inches +, light-gray (10YR 7/1), weakly consolidated, stratified layers of andesitic tuffaceous silt, clay, and fine sand.

The color of these soils is generally gray, dark gray, or very dark gray; however, the substratum, or R horizon, is light gray to nearly white. The substratum is dense, hard, and brittle but can be chipped with a shovel. These soils range from slightly acid to neutral.

Peters clay, 8 to 30 percent slopes (PrD).—This soil is on rounded slopes of low hills north of Red Bluff. Most areas vary considerably in size and shape, and some areas are more than 100 acres in size.

This soil is well drained. Permeability is slow, and the available water holding capacity is low. Roots and water move through the clay slowly, except in areas along cracks. Runoff is medium or rapid, and the fertility and erosion hazard are moderate.

Included with this soil in mapping are small areas of Newville and Redding soils.

This Peters soil is used for pasture and range for cattle. Yields of forage are large, and the quality is good. Medusahead and deathcamas have invaded some areas, and as a result, the quality of the forage has been lowered. Capability unit IVe–5.

Peters clay, 1 to 8 percent slopes (PrB).—This soil is northeast of Corning. Runoff is slow, and the erosion hazard is slight.

Most of the acreage is used for pasture and range, but barley is grown on a small acreage. Capability unit IVe–5.

Peters clay, 8 to 30 percent slopes, eroded (PrD2).—This soil has been cut by gullies and has lost some of its surface soil through erosion. In places as much as 6 inches of soil has been removed through erosion as the result of excessive grazing and trampling when the soil is wet. In some areas gullies several feet across have cut into the soil, and here the dense substratum is exposed. Capability unit VIe–5.

Peters clay, 30 to 50 percent slopes (PrE).—On this soil runoff is rapid, and the erosion hazard is severe. All the soil is used for pasture and range. Capability unit VIe–5.

Peters-Newville complex, 30 to 50 percent slopes (PsE).—This complex consists of Peters clay, 30 to 50 percent slopes, and Newville gravelly loam, 30 to 50 percent slopes. From 50 to 80 percent of this complex is Peters soil, and the rest is Newville soil. Peters part, capability unit VIe–5; Newville part, capability unit VIe–3.

Pleasanton Series

The Pleasanton soils are nearly level to gently sloping, well drained, and dark grayish brown. These soils formed in alluvium derived from sandstone, shale, and conglomerate. They have a slightly acid, medium-textured surface soil and a slightly acid to neutral, moderately fine textured subsoil. These soils are on flood plains in narrow valleys in the western part of the county at elevations of 300 to 1,000 feet. The vegetation is annual grasses and forbs.

Profile of Pleasanton gravelly loam on a nearly level flood plain of a small stream, under annual grasses and forbs (4.5 miles northwest of Flournoy in the northeast corner of the NW¼SW¼NW¼ of sec. 1, T. 24 N., R. 6 W.):

Ap—0 to 11 inches, dark grayish-brown (10YR 4/2) gravelly loam, very dark grayish brown (10YR 3/2) when moist; massive; the uppermost part has platy structure; hard when dry, friable when moist, nonsticky when wet; very porous; many fine roots; slightly acid; clear, wavy boundary. 10 to 15 inches thick.

B1t—11 to 16 inches, dark grayish-brown (10YR 4/2) gravelly heavy loam, very dark grayish brown (10YR 3/2) when moist; massive; hard when dry, friable when moist, nonsticky when wet; slightly acid; a few fine roots; clear, wavy boundary. 3 to 10 inches thick.

B2t—16 to 34 inches, dark grayish-brown (10YR 4/2) gravelly clay loam, very dark grayish brown (10YR 3/2) when moist; massive; very hard when dry, firm when moist, sticky when wet; thick, continuous clay films; a few fine roots; slightly acid to neutral; clear, irregular boundary. 10 to 20 inches thick.

B3t—34 to 72 inches +, grayish-brown (10YR 5/2) gravelly clay loam, very dark grayish brown (10YR 3/2) when moist; massive; medium, distinct, strong-brown mottles; weakly stratified; very porous; clay films on sand grains and in pores; neutral.

The color of the surface layer is dark grayish brown or grayish brown, and the color of the subsoil is dark grayish brown, grayish brown, or brown. These soils are slightly acid to neutral.

Pleasanton gravelly loam, 1 to 10 percent slopes (PvB).—This is the only Pleasanton soil mapped in the county. All areas are in narrow valleys in the foothills in the western part of the county. The areas are small and form stringers along streams or short, gently sloping fans.

This soil is well drained. Permeability is moderately slow, and the fertility and available water holding capacity are moderate. Runoff is slow to medium and the erosion hazard is slight to moderate.

Included with this soil in mapping are areas of Arbuckle and Tehama soils.

All of this Pleasanton soil is used for dryfarmed grain and for pasture and range. Capability unit IIe–4.

Red Bluff Series

In the Red Bluff series are nearly level, well-drained soils that formed in old alluvium derived from sandstone shale, and schist of the Coast Range Mountains. The surface soil is reddish-brown, strongly granular gravelly loam, and the subsoil is red, massive, and brittle clay loam. In places in cultivated areas, the soils are strongly acid throughout. Red Bluff soils are on high terraces west of the Sacramento River at elevations of 300 to 1,500 feet. The vegetation is annual grasses and forbs. Most areas are used for pasture and range.

Profile of Red Bluff gravelly loam in an area used for grazing sheep (0.7 mile west and 0.4 mile south of the tower at the airport near Red Bluff, 0.05 mile east of the center of sec. 36, T. 27 N., R. 4 W.) :

Ap—0 to 6 inches, reddish-brown (5YR 4/4) gravelly loam, dark reddish brown (2.5YR 3/4) when moist; strong, medium, granular structure; hard when dry, friable when moist, slightly sticky and slightly plastic when wet; abundant very fine roots; many very fine pores; a few, small, hard concretions that are yellowish red when crushed; most of the gravel is less than 0.5 inch in diameter and consists of fragments of quartzite or chert; very strongly acid; abrupt, smooth boundary. 4 to 8 inches thick.

A3—6 to 20 inches, reddish-brown (5YR 4/4) gravelly loam, dark reddish brown (2.5YR 3/4) when moist; strong, medium, granular structure; nearly soft when dry, very friable when moist, slightly sticky and plastic when wet; a few fine roots; very porous; very strongly acid; abrupt, irregular boundary. 10 to 18 inches thick.

B2t—20 to 45 inches, red (2.5YR 4/6) slightly gravelly clay loam, weak red (10YR 4/4) when moist; massive; hard when dry, firm and brittle when moist, slightly sticky and plastic when wet; a few very fine roots; many very fine pores; many rodent holes filled with loose material from the A3 horizon; thin, continuous clay films in pores and on surfaces of mineral grains; nearly black stains in seams and on aggregates and mineral grains; this horizon seems weakly cemented when dry but cementation is not so apparent when the soil is wet; strongly acid; diffuse boundary. 15 to 30 inches thick.

B3t—45 to 72 inches, similar to the B2t horizon, but this horizon contains less clay in the lower part.

The A horizon ranges from brown, hue 7.5YR, to reddish brown, hue 5YR. It ranges from loam to light clay loam in texture. Reaction ranges from nearly neutral in places under native vegetation to strongly acid in many areas that are now cultivated or that formerly were cultivated. The granular structure of the A horizon and the high content of manganese in the A3 horizon are characteristic of these soils. The B horizon ranges from reddish brown to weak red or red, hues of 2.5YR or 10YR. It ranges from clay loam to light clay in texture and is medium acid to very strongly acid.

These soils are generally slightly gravelly to gravelly throughout; the gravel is mainly fragments of quartzite or chert. In places, however, the soils are sandy and are similar to the gravelly soils but contain reddish-brown concretions. In some places an indurated layer similar to the hardpan of the Redding soils is less than 5 feet from the surface. Springs and seeps indicate the presence of an impermeable layer in many places along the edges of terraces.

Red Bluff gravelly loam, 0 to 3 percent slopes (Rg).—This soil is on the smooth tops of high terraces west of the Sacramento River. The areas are oval in shape, and some of them are more than 100 acres in size. The soil is 15 to 50 percent gravel.

This soil is well drained. Permeability is moderately slow, fertility is low, and available water holding capacity is moderate. Runoff is slow, and there is no erosion hazard.

Included with this soil in mapping are small areas of Corning, Redding, or Perkins soils.

Most areas of this Red Bluff soil are used for pasture and range. The quality of the forage is poorer in areas that are cleared and cultivated than in areas that still have a moderately dense stand of blue oaks. Yields of forage are also smaller. Dryfarmed barley and oats are grown in a few areas, but yields are low. Irrigation water is generally not available; however, in a few places it pays to pump water to strawberries and other crops if fertilizer is applied. Capability unit IIIs–9.

Red Bluff gravelly loam, hardpan substratum, 0 to 3 percent slopes (Rh).—Because of the cemented layer at a depth of about 40 inches, a perched water table develops in this soil for short periods in winter. Water does not penetrate the substratum but drains laterally from the soil. If irrigation water is available, it must be carefully applied to avoid forming a perched water table. Capability unit IIIs–9.

Red Bluff loam, 0 to 3 percent slopes (Rb).—This soil is 5 to 15 percent gravel but is otherwise similar to Red Bluff gravelly loam, 0 to 3 percent slopes. It is easier to prepare a seedbed in this soil, and there is less wear on equipment used for cultivation. The available water holding capacity is high. Capability unit IIIs–9.

Redding Series

In the Redding series are nearly level to gently sloping soils that formed in old alluvium derived mainly from

sedimentary and metamorphic rocks. The surface soil is yellowish-red to reddish-brown, medium acid gravelly loam. The subsoil is yellowish-red, strongly acid gravelly clay and overlies a yellowish-red hardpan. In most areas these soils are shallow over the hardpan and have a hogwallow microrelief. All but a few areas of these soils are on high terraces west of the Sacramento River at elevations from 300 to 1,000 feet. The vegetation is mostly annual grasses and forbs but includes scattered blue oaks. Most areas are used for pasture and range.

Profile of Redding gravelly loam under annual grasses and forbs used for grazing; elevation of 311 feet (5 miles south of Red Bluff on Rawson Road, 0.5 mile south of the junction of Rawson Road and Rawson Avenue):

A11—0 to 7 inches, yellowish-red (5YR 5/6) gravelly light loam, dark reddish brown (2.5YR 3/4) when moist; weak, medium, granular structure; slightly hard when dry, very friable when moist, nonsticky and slightly plastic when wet; many very fine roots and pores; medium acid; gradual, smooth boundary. 5 to 10 inches thick.

A12—7 to 13 inches, yellowish-red (5YR 5/6) gravelly loam, red (2.5YR 4/6) when moist; weak, medium, subangular blocky structure; slightly hard when dry, friable when moist, nonsticky and slightly plastic when wet; a few very fine roots; many fine pores; strongly acid; abrupt, wavy boundary. 8 to 15 inches thick.

B2t—13 to 23 inches, yellowish-red (5YR 4/6), slightly gravelly clay, red (2.5YR 4/6) with dark-red coatings when moist; weak, medium, prismatic structure that breaks to moderate, medium, subangular blocky; extremely hard when dry, extremely firm when moist, sticky and very plastic when wet; a few very fine roots; many very fine pores; thick, continuous clay films; numerous, nearly black stains on ped faces; strongly acid; abrupt, wavy boundary. 2 to 8 inches thick.

C1m—23 to 35 inches, yellowish-red (5YR 4/6), indurated, iron-silica hardpan that is yellowish red (5YR 5/6) in the lower part and is red (2.5YR 4/6) when moist; dark-red (2.5YR 3/6), hardened clay films and black stains on fracture faces; no roots; abrupt, wavy boundary. 4 to 20 inches thick.

C2—35 inches +, stratified, softly consolidated siltstone and conglomerate that vary in density and hardness.

The surface layer, or A horizon, is generally yellowish-red or reddish-brown gravelly loam, but in places it is strong-brown slightly gravelly loam. It is slightly acid or medium acid and is 9 to 25 inches thick. The subsoil, or B2 horizon, is reddish-brown, yellowish-red, or red clay or heavy clay loam that contains varying amounts of gravel. It is medium acid or is strongly acid.

The hardpan, or Cm horizon, is indurated, particularly in the upper part. It is not always uniformly continuous and massive. Cracks and weakly cemented spots and small openings appear in places. The underlying material is gravelly and stratified, and it varies from consolidated to nearly loose. Depth to the indurated hardpan varies from place to place because of the hummocky microrelief.

Redding gravelly loam, 0 to 3 percent slopes (RnA).—Most of this soil is on the tops of high terraces west of the Sacramento River. A small acreage is east of the river within areas of Red Bluff, Los Molinos, and Vina soils. The size of the areas varies, but some areas are more than 500 acres in size. The surface is uneven because of the hogwallow microrelief. The soil is 15 to 50 percent gravel.

This soil is well drained. Permeability is very slow, and fertility and available water holding capacity are low. The cemented subsoil is nearly impervious to roots and water, and most of the water therefore drains laterally from the soil. The roots of plants flatten out above the clay subsoil and the hardpan. Runoff is slow, and the erosion hazard is slight.

Included with this soil in mapping are areas of Corning and Red Bluff soils.

This Redding soil is used for pasture and range and for dryfarmed grain. In most areas irrigation water is not available. Yields of forage are small, and the quality is poor. A crop rotation of several years of pasture and 1 year of grain is common. The relationship of moisture to plant growth is a problem. If rainfall is not properly distributed in spring, plants are damaged because of lack of moisture, or sometimes receive too much moisture and drown in depressions between the mounds. Capability unit IVs–8.

Redding gravelly loam, 3 to 8 percent slopes (RnB).—This soil is along the edges of terraces or in small drainageways that cut through the terraces. The erosion hazard is moderate. Capability unit IVe–8.

Redding gravelly loam, very shallow, 0 to 3 percent slopes (Ro).—Most areas of this soil are in the district of Jelly Ferry, north of Red Bluff. The average depth to hardpan is 8 to 12 inches. All areas are used for pasture and range. Capability unit VIIs–8.

Redding loam, 0 to 3 percent slopes (Rm).—This soil is 5 to 15 percent gravel. It holds more water than Redding gravelly loam, 0 to 3 percent slopes, but is otherwise similar. Also, it is easier to prepare a seedbed in this less gravelly loam. Capability unit IVs–8.

Redding-Newville complex, 3 to 30 percent slopes (RpD).—This complex consists of Redding gravelly loam, 3 to 8 percent slopes, and Newville gravelly loam, 10 to 30 percent slopes. The Redding soil makes up 40 to 80 percent of the area. Redding part, capability unit IVe–8; Newville part, capability unit VIe–3.

Riverwash

Riverwash (Rr) consists of channels of intermittent streams and of active streams where the water is high. The areas are made up of deposits of sand and gravel, some of which are mined.

Included with Riverwash in mapping are small areas of Cortina, Columbia, Maywood, Molinos, Orland, and Vina soils.

Areas of Riverwash have no agricultural value. Capability unit VIIIw–4.

Rock Land

Rock land (RtF) is made up of areas that consist of more than 50 percent exposed rock. The areas are on very steep slopes or are on gently sloping lava flows. The rocks range from 10 inches to many feet across, and are of metamorphic, or sedimentary, or volcanic origin. In many places the rocks are similar to the parent material of the associated soils. Little or no use is made of areas of this land type. Capability unit VIIIs–8.

Rubble Land

Rubble land (RuF) consists of areas of loose rock. Slopes are steep to very steep. The rocks range from 10 inches to nearly 3 feet in diameter. No vegetation grows on the

areas, and little or no use is made of areas of this land type. Capability unit VIIIs–8.

Sehorn Series

In the Sehorn series are gently sloping to steep, well-drained soils that formed in material from sandstone and shale. These soils are brown, slightly acid to neutral, and fine textured throughout. They are on rounded foothills in the western part of the county at elevations of 500 to 2,000 feet. The vegetation is mostly annual grasses and forbs but includes scattered oaks.

Profile of Sehorn clay on a slope of 33 percent that faces southwest, under a dense cover of annual grasses (NW¼ SW¼ sec. 3, T. 27 N., R. 7 W.) :

A11—0 to 18 inches, brown (10YR 5/3) clay, dark brown (10YR 4/3) when moist; massive, but when dry, the uppermost 1 to 3 inches cracks to strong, medium, angular structure in many places; hard to very hard when dry, very firm when moist, sticky when wet; a few slickensides in the lower part of this horizon; many fine roots to a depth of about 10 inches, but few below; many fine pores; slightly acid; very gradual boundary. 10 to 20 inches thick.

A12—18 to 33 inches, yellowish-brown (10YR 5/4) clay, dark yellowish brown (10YR 4/4) when moist; massive; hard to very hard when dry, very firm when moist, sticky when wet; a few fine roots; a few slickensides in the upper part of this horizon and fine, angular gravel in the lower part; many fine pores; slightly acid to neutral; abrupt, very irregular boundary. 15 to 25 inches thick.

R—33 inches +, very fractured, hard shale; soil material from the A12 horizon fills the cracks.

The surface soil is generally brown or pale-brown clay, silty clay, or clay loam near clay. In places it is yellowish brown. The subsoil is generally yellowish-brown or light yellowish-brown clay or silty clay, but in places it is brown or pale brown.

Sehorn clay and clay loam, 30 to 50 percent slopes (ScE).—These steeply sloping soils are on rounded foothills in the western part of the county. The surface is generally smooth. Some areas are more than 500 acres in size. Depth to hard shale is 20 to 40 inches.

These soils are well drained. Permeability is slow. The available water holding capacity and fertility are moderate. Runoff is rapid to medium, and the erosion hazard is severe. The first rains in fall soak through the many cracks in the surface and saturate the soils. When wet, the soils expand and the cracks close.

Included with these soils in mapping are Altamont, Millsholm, and Millsap soils.

All of these Sehorn soils are used for pasture and range. Yields of forage are large, and the quality is very good. The main forage plants are wild oats, soft chess, and burclover. In many places, however, medusahead, an undesirable grass, has invaded. Open stands of blue oaks grow in some areas, but most areas lack trees or shrubs. Capability unit VIe–5.

Sehorn clay and clay loam, 10 to 30 percent slopes (ScD).—These soils are not so steep as Sehorn clay and clay loam, 30 to 50 percent slopes. Runoff is slow to medium, and the erosion hazard is slight to moderate. Most of these soils are used for pasture and range, though dry-farmed grain is grown in a few areas. Capability unit IVe–5.

Sehorn-Altamont clays, 30 to 50 percent slopes (ShE).—This complex consists of Sehorn clay and clay loam, 30 to 50 percent slopes, and Altamont clay, 30 to 50 percent slopes. Sehorn soils make up from 50 to 70 percent of this complex, and the rest is Altamont soil. Both parts, capability unit VIe–5.

Sehorn-Millsholm complex, 10 to 30 percent slopes (SmD).—This complex consists of Sehorn clay and clay loam, 10 to 30 percent slopes, and Millsholm clay loam, 10 to 30 percent slopes. Either soil may occupy from 30 to 70 percent of any one area. Both parts, capability unit IVe–5.

Sehorn-Millsholm complex, 30 to 50 percent slopes (SmE).—This complex consists of Sehorn clay and clay loams, 30 to 50 percent slopes, and Millsholm clay loam, 30 to 50 percent slopes. Either soil may occupy from 30 to 70 percent of any one area. Both parts, capability unit VIe–5.

Sheetiron Series

In the Sheetiron series are strongly sloping to very steep, well-drained soils formed in material from metamorphic rock. These soils are light brownish-gray gravelly loam that is medium acid to strongly acid. Most areas are moderately shallow. Sheetiron soils are in mountainous areas in the western part of the county at elevations of 3,000 to 6,000 feet. Coniferous forests make up the vegetation.

Profile of Sheetiron gravelly loam on a slope of 24 percent that faces southwest; in an area once logged but now under an open stand mostly of ponderosa pine and black oak but that includes some shrubs; elevation of 5,000 feet (3.5 miles west of Patton Mill, 2,000 feet south and 1,000 feet west of the northeast corner of sec. 27, T. 24 N., R. 8 W.) :

O1 & O2—2 inches to 0, matted, fresh and decomposed needles and leaves; abrupt, smooth boundary. 1 to 2 inches thick.

A1—0 to 2 inches, light brownish-gray (2.5YR 6/2) gravelly loam, dark grayish brown (10YR 4/2) when moist; strong, fine, subangular blocky structure; slightly hard when dry, friable when moist, nonsticky when wet; a few fine roots; very porous; the gravel is flat, angular fragments of schist and irregular shaped fragments of quartzite; medium acid; abrupt, irregular boundary. 1 to 6 inches thick.

B2—2 to 19 inches, pale-brown (10YR 6/3) gravelly loam, brown (10YR 5/3) when moist; massive; slightly hard when dry, friable when moist, nonsticky when wet; many fine and medium roots; very porous; coatings of oriented mica on gravel and in pores; amount of angular gravel increases with increasing depth; strongly acid; abrupt, irregular boundary. 15 to 30 inches thick.

R—19 inches +, weathered, fractured, hard schist; material from the B2 horizon fills the cracks.

The surface layer is generally grayish brown, light grayish brown, or dark brown, but in the lower part it is pale brown, very pale brown, light yellowish brown, or light brownish gray. These soils are medium acid in the surface soil and are strongly acid or very strongly acid in the subsoil. Depth ranges from 16 to 32 inches.

Sheetiron gravelly loam, 30 to 50 percent slopes (SnE).—This soil is on the slopes of deep canyons in mountainous areas in the western part of the county. Some areas are more than 500 acres in size. The surface is uneven because of short drainageways that cut the areas.

Depth of the soil is about 20 inches on slopes that face south and west, but it is about 30 inches on slopes that face north and east

This soil is well drained. Permeability is moderately rapid, and fertility and available water holding capacity are low. Runoff is rapid, and the erosion hazard is severe. A few small areas along trails used for driving livestock and at timber-loading sites are eroded.

Included with this soil in mapping are areas of Josephine, Tyson, Los Gatos, and Maymen soils.

Timber is grown on this Sheetiron soil. Moderately dense stands, mainly of ponderosa pine but that include some incense-cedar and black oak, are on slopes that face south and west. Dense stands, mainly of Douglas-fir, white fir, and sugar pine but that include some canyon live oaks, are on slopes that face north and east. Capability unit VIe–4.

Sheetiron gravelly loam, 10 to 30 percent slopes (SnD).—This soil is in mountainous areas under timber. Most areas are along narrow ridgetops, and roads through the areas follow along these ridgetops. Using the ridges as driveways for sheep and cattle has caused erosion in a few places. Campsites and sites for cabins have been developed in some areas where water is available from springs. Capability unit IVe–4.

Sheetiron gravelly loam, 50 to 65 percent slopes (SnF).—This very steep soil is used for timber. The slopes make it difficult, however, to harvest timber from areas of this soil. Capability unit VIIe–4.

Sheetiron rocky loam, 30 to 50 percent slopes (SrE).—This soil has stones and boulders 3 to 6 feet in diameter scattered over 2 to 10 percent of the surface. These rocks interfere with harvesting of timber and also damage trees that are harvested. Capability unit VIs–7.

Sheetiron rocky loam, 50 to 65 percent slopes (SrF).—This soil has stones and boulders 3 to 6 feet in diameter scattered over 2 to 10 percent of the surface. It is difficult to harvest timber from this very steep soil because the stones and boulders interfere with harvesting and also damage trees that are harvested. Capability unit VIIs–1.

Stonyford Series

In the Stonyford series are steep to very steep, somewhat excessively drained soils. These soils formed in material from metamorphosed volcanic rock, generally known as greenstone and associated volcanic rocks in the Coast Range Mountains. The surface soil is brown, slightly acid stony loam, and the subsoil is slightly acid gravelly clay loam. Stonyford soils are in mountainous areas in the eastern part of the county at elevations of 1,000 to 4,000 feet. They have a dense cover of shrubs.

Profile of Stonyford stony loam on a slope of 25 percent that faces south, under a dense cover of shrubs (5 miles west of Paskenta, 1,000 feet north and 1,000 feet east of the west quarter corner of sec. 28, T. 24 N., R. 7 W.) :

A1—0 to 5 inches, strong-brown (7.5YR 4/4) stony loam near clay loam, yellowish red (5YR 3/4) when moist; weak, medium, subangular blocky structure; nonsticky when wet; very porous; many fine roots; stones 3 inches to 2 feet in diameter scattered over 1 to 10 percent of the surface; slightly acid; clear, irregular boundary. 3 to 8 inches thick.

B2t—5 to 11 inches, yellowish-red (5YR 5/6) gravelly clay loam, dark red (2.5YR 3/6) when moist; strong, medium, subangular blocky structure; slightly hard when dry, friable when moist, slightly sticky when wet; a few fine and medium roots; very porous; thin, continuous clay films; slightly acid; clear, irregular boundary. 4 to 8 inches thick.

B3t—11 to 21 inches, yellowish-red (5YR 5/6) gravelly clay loam, dark red (2.5YR 3/6) when moist; strong, medium, subangular blocky structure; hard when dry, firm when moist, slightly sticky when wet; a few medium roots; very porous; moderately thick, continuous clay skins; slightly acid; abrupt, irregular boundary. 5 to 15 inches thick.

R—21 inches +, fractured, partly weathered, metamorphosed, basic volcanic rock.

The surface soil is generally strong-brown, brown, or reddish-brown stony loam or gravelly clay loam. The uppermost inch of this layer is a little darker in places and has granular structure rather than subangular blocky. The subsoil is a little redder than the surface soil, and it contains a little more clay and is gravelly. These soils are slightly acid or neutral throughout. Depth varies within short distances, but it ranges from 12 to 30 inches.

Stonyford stony loam, 30 to 50 percent slopes (StE).—This steep soil is in mountainous, brush-covered areas in the western part of the county. Some areas are more than 500 acres in size. The surface is uneven because of rock outcrops and short drainageways. Partly rounded stones 3 inches to 3 feet in diameter are on 1 to 25 percent of the surface. Depth of the soil ranges from 12 to 30 inches.

This soil is somewhat excessively drained. Permeability is moderate, and fertility and available water holding capacity are low to moderate. Runoff is medium to rapid, and the erosion hazard is severe.

Included with this soil in mapping are areas of Cohasset, Henneke, Maymen, and Neuns soils.

Chamise, buckbrush, common and whiteleaf manzanita, California scrub oak, and mountain-mahogany are predominant on this Stonyford soil. Most areas have a dense cover of shrubs, which protect the watershed and provide browse areas and cover for wildlife. Capability unit VIIIs–8.

Stonyford stony loam, 50 to 65 percent slopes (StF).—Except for steeper slopes, this soil is similar to Stonyford stony loam, 30 to 50 percent slopes. These areas are on the very steep slopes of deep canyons. Capability unit VIIIs–8.

Supan Series

In the Supan series are undulating to steep, well-drained soils formed in material from volcanic breccia. The breccia is made up of partly rounded basalt and andesite that were cemented together with tuffaceous material. These soils are slightly acid and are brown, or nearly reddish brown, throughout. They have a surface soil of loam, a subsoil of light clay, and they are moderately deep to partly weathered rock. Supan soils are in the upper foothills in the eastern part of the county at elevations of 300 to 4,000 feet. The vegetation is shrubs and hardwoods.

Profile of Supan loam on a slope of 10 percent that faces south, under a dense cover of shrubs (7 miles east and 2 miles north of Paynes Creek, in the NW¼NW¼ sec. 24, T. 29 N., R. 1 E.) :

A1—0 to 1 inch, dark-brown (7.5YR 3/2) loam, dark reddish brown (5YR 3/2) when moist; moderate, medium to

thick, platy structure; hard when dry, friable when moist, slightly sticky and slightly plastic when wet; many very fine roots and pores; slightly acid; abrupt, smooth boundary. 0 to 3 inches thick.

A3—1 to 15 inches, brown (7.5YR 4/3) loam, dark reddish brown (5YR 3/3) when moist; weak, medium, subangular blocky structure; hard when dry, friable when moist, slightly sticky and slightly plastic when wet; many fine roots and pores; slightly acid; clear, wavy boundary. 6 to 15 inches thick.

B1t—15 to 20 inches, brown (7.5YR 4/3) clay loam, dark reddish brown (5YR 3/3) when moist; moderate, medium to coarse, subangular blocky structure; hard when dry, friable when moist, slightly sticky and slightly plastic when wet; a few very fine to medium roots; many very fine pores; a few subrounded cobblestones and pebbles; a few, thin, discontinuous clay films; slightly acid; clear, irregular boundary. 5 to 15 inches thick.

B2t—20 to 37 inches, brown (7.5YR 4/3) clay, dark reddish brown (5YR 3/3) when moist; moderate, medium, subangular blocky structure; hard to very hard when dry, very firm when moist, sticky and plastic when wet; a few fine to medium roots; a few very fine pores; thick, continuous clay films, mainly in pores; number of subrounded cobblestones increases with depth; neutral; gradual, irregular boundary. 10 to 20 inches thick.

B3t—37 to 46 inches, brown (7.5YR 4/4) clay loam, dark reddish brown (5YR 3/3) when moist; massive; hard when dry, friable when moist, slightly sticky and slightly plastic when wet; a few roots; a few very fine pores; thin, continuous clay films in some pores; many partly weathered fragments of rock; neutral; abrupt, irregular boundary. 6 to 20 inches thick.

R—46 inches +, partly weathered but hard volcanic breccia that has a few, widely spaced, narrow, nearly vertical cracks.

The A horizon is brown or dark-brown loam or gravelly loam. It is massive or has platy or weak granular structure. The A1 horizon grades to the B2 horizon through an A3 or B1 horizon or both. The B2 horizon is clay or clay loam and is generally the same color as the A horizon. The B3 horizon is the same color as the B2 horizon, but it contains less clay and is less porous. These soils test near slightly acid throughout, but in places the subsoil is neutral to medium acid. Depth is generally 36 to 48 inches.

Supan stony loam, 10 to 30 percent slopes (SuD).[12]—This soil is in long, narrow areas on fairly broad ridgetops in the upper foothills in the eastern part of the county. Some areas are more than 500 acres in size. The surface is gently undulating. Partly rounded rocks 1 to 3 feet in diameter are on 1 to 10 percent of the surface.

This soil is well drained. Permeability is slow; fertility and available water holding capacity are moderate. Runoff is medium, and the erosion hazard is moderate.

Included with this soil in mapping are areas of Cohasset and Toomes soils.

Most areas of this Supan soil have a dense cover of shrubs, but some areas are used for pasture and range. Yields of forage are about moderate, and the quality is fair. Buckbrush, birchleaf mountain-mahogany, flannelbush, redbud, poison oak, blue oak, black oak, and interior live oak are the dominant shrubs. These shrubs protect the watershed and provide browse and cover for wildlife. Capability unit VIs-8.

Supan stony loam, 30 to 50 percent slopes (SuE).[13]—Most of this soil is in long, narrow areas that are about on the contour of the slopes. Runoff is rapid, and the erosion hazard is severe. Capability unit VIs-8.

Tehama Series

In the Tehama series are nearly level, well-drained soils formed in mixed alluvium, chiefly from sedimentary rock. The surface soil is pale-brown, slightly acid loam or silt loam, and the subsoil is brown or yellowish-brown, neutral clay loam. These soils are on low terraces, mostly west of the Sacramento River, at elevations of 200 to 1,000 feet. Most areas have been cultivated.

Profile of Tehama silt loam in a nearly level area formerly under dryfarmed barley, elevation of 280 feet (1 mile north and 0.25 mile west of the depot of the Southern Pacific Railroad at Corning, 1,200 feet west of the northeast corner of sec. 15, T. 24 N., R. 3 W.):

A1—0 to 19 inches, pale-brown (10YR 6/3) silt loam, brown (10YR 5/3) when moist; massive; uppermost 4 to 8 inches has been cultivated; hard when dry, friable when moist, slightly sticky when wet; abundant very fine roots; many fine pores; slightly acid; gradual, smooth boundary. 12 to 24 inches thick.

B2t—19 to 42 inches, light yellowish-brown (2.5Y 6/3) clay loam, olive brown (2.5Y 4/3) when moist; massive; very hard when dry, firm when moist, sticky and plastic when wet; many very fine pores; a few fine roots; thin, continuous clay films in places; dark staining in seams and on sand grains; slightly acid to neutral; gradual, smooth boundary. 10 to 25 inches thick.

B3t—42 to 60 inches +, light yellowish-brown (2.5Y 6/3) heavy loam that in places has gravel in the lower part, olive brown (2.5Y 4/3) when moist; massive; many fine pores; thin continuous clay films; neutral.

The surface layer is pale-brown or light yellowish-brown loam or silt loam. It contains gravel in places. In areas that are not cultivated, the uppermost 1 or 2 inches of this layer is grayish brown. Texture of the subsoil is clay loam or silty clay loam. The color of the subsoil and substratum is pale brown, light yellowish brown, light brown, or brownish yellow. In places the substratum contains some lime. These soils are generally slightly acid in the surface soil. They are slightly acid to neutral or mildly alkaline in the subsoil.

Tehama silt loam, 0 to 3 percent slopes (Tc).—Most of this soil is on low terraces west of the Sacramento River, but a small acreage is east of the river in areas near Bend and Red Bluff. The areas vary considerably in size and shape, and some are more than 500 acres in size. The surface is smooth.

This soil is well drained. Permeability is slow. The available water holding capacity and fertility are moderate. Runoff is slow, and there is no erosion hazard.

Included with this soil in mapping are areas of Arbuckle, Maywood, and Hillgate soils.

If this Tehama soil is irrigated, pasture plants, alfalfa, milo, corn, and olives are grown. Other areas are used for dryfarmed grain and for pasture and range. Leveling is

[12] This soil includes some soils shown as Stover stony gravelly loam on advance sheets published by the University of California Agricultural Extension Service and the California Division of Forestry during the years 1953–59.

[13] This soil includes some soils shown as Stover stony gravelly loam on advance sheets published by the University of California Agricultural Extension Service and the California Division of Forestry during the years 1953–59.

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needed for proper use of all irrigation systems other than overhead sprinklers. Capability unit IIs–3.

Tehama loam, 0 to 3 percent slopes (TaA).—This soil has a surface soil of loam but is otherwise similar to Tehama silt loam, 0 to 3 percent slopes. Water infiltrates this soil slightly faster than it does the loam. Capability unit IIs–3.

Tehama loam, 3 to 8 percent slopes (TaB).—Most areas of this soil are along the edges of terraces. It is more difficult to prepare this soil for irrigation than the nearly level Tehama soils. Capability unit IIe–3.

Tehama gravelly loam, 0 to 3 percent slopes (Tb).—This soil is 10 to 20 percent of rounded gravel. The gravel interferes with cultivation and the preparation of a seedbed. Capability unit IIs–3.

Terrace Escarpments

Terrace escarpments (TeF) are along the edges of terraces, and they consist of very steep and narrow areas that are a mile or more across in places. On some escarpments the soil material varies considerably in its characteristics.

Included with these soils in mapping are areas of Tehama, Hillgate, Kimball, and Perkins soils.

Most areas of Terrace escarpments are used for limited grazing. None of the areas are cultivated. Capability unit VIIe–3.

Toomes Series

In the Toomes series are nearly level to very steep, well-drained soils that formed in material from volcanic rock. In places the rock is breccia made up of angular, basic rocks cemented together with tuffaceous material. In other places it is made up of andesitic and basaltic rock from volcanic flow. Toomes soils are brown, slightly acid, and medium textured throughout. These soils are shallow to very shallow and are rocky to extremely rocky. They are in areas east of the Sacramento River at elevations of 300 to 4,000 feet. The vegetation is mostly grasses and forbs but includes scattered oaks.

Profile of Toomes very rocky loam on a slope of 5 percent that faces west; used for grazing; elevation of 900 feet (west of Tuscan Buttes along California State Highway 36; 2,000 feet north and 1,000 feet east of the southwest corner of sec. 17, T. 28 N., R. 2 W.):

A11—0 to 1 inch, brown (7.5YR 5/4) gritty loam, dark reddish brown (5YR 3/4) when moist; weak, thin, platy structure; slightly hard when dry, friable when moist; abundant fine roots; many fine pores; dark-colored, subangular, basaltic stones 3 inches to 3 feet in diameter make up about 20 percent of the volume; slightly acid; abrupt, smooth boundary. ½ to 2 inches thick.

A12—1 to 12 inches, brown (7.5YR 4/4) gravelly heavy loam, dark reddish brown (5YR 3/4) when moist; moderate, medium, subangular blocky structure; slightly hard when dry, friable when moist; plentiful fine roots; common fine pores; slightly acid; abrupt, irregular boundary. 6 to 20 inches thick.

R—12 inches +, volcanic breccia made up of angular to subangular fragments of basaltic rock cemented together with light-gray, fine-textured, tuffaceous sediment; the matrix and the rocks are about equally hard; except in widely spaced cracks, the breccia is impervious to roots and water.

The soils on ridgetops and high plains are 8 to 12 inches deep and range in color from reddish brown or yellowish red to red. Soils on south-facing slopes are brown and are about 3 to 8 inches deep. On north-facing slopes the soils are also brown and are as much as 24 inches deep. The amount of rock is greater in the shallow soils than in the deep ones. At high elevations where rainfall is more plentiful, the soils are likely to be deeper than at lower elevations.

Toomes very rocky loam, 10 to 30 percent slopes (TgD).—This soil is above the areas that are intensely cultivated and below the areas in timber. It is the dominant soil east of the Sacramento River, and many areas are more than 500 acres in size. The surface is undulating because it is cut by short drainageways. Subangular volcanic rocks, some of which are more than 3 feet in diameter, cover 10 to 25 percent of the surface.

This soil is well drained. Permeability is moderate. The available water holding capacity and fertility are low. The hard volcanic breccia, which is at a depth of 8 to 15 inches, is impervious to roots and water. Water drains laterally from the soil down into cracks in the rock. Runoff is medium, and the erosion hazard is moderate.

Included with this soil in mapping are areas of Supan and Iron Mountain soils and areas of Rock land.

Cattle and sheep graze areas of this Toomes soil during the winter and spring. It is difficult, however, for animals to graze the areas because of the rocks. The quality of the forage is fair to poor. The soil is so shallow that it dries out if rainfall is not well distributed during winter and spring. Growth of forage is consequently limited. Capability unit VIIs–7.

Toomes very rocky loam, 30 to 50 percent slopes (TgE).—This soil is steeper than Toomes very rocky loam, 10 to 30 percent slopes. Grazing is more difficult on this soil than on the less steep Toomes soils. Capability unit VIIs–7.

Toomes very rocky silt loam, 1 to 10 percent slopes (TkB).[14]—This soil is underlain by hard, highly fractured andesitic and basaltic rocks in thin volcanic flows overlying breccia. Angular volcanic rocks cover 10 to 25 percent of the surface. Depth to partly weathered rock ranges from 10 to 20 inches, but in many cracks the soil is several feet deep.

Most areas of this soil are used for grazing sheep and cattle. Capability unit VIIs–7.

Toomes very rocky silt loam, 10 to 30 percent slopes (TkD).[15]—This soil has subangular, basic volcanic rocks, some of which are nearly 3 feet in diameter, scattered over 10 to 25 percent of the surface. In places they outcrop as much as 2 feet above the surface. Most of the rocks are loose, but some are still attached to the volcanic breccia. Depth to the hard andesite or basalt ranges from 8 to 15 inches, but it is generally less than 12 inches.

Included with this soil in mapping are small areas of Guenoc soils.

All of this Toomes soil is used for pasture and range. It is difficult for animals to graze this soil because of the

[14] This soil was shown as Jefcoat very rocky silt loam on advance sheets published by the University of California Agricultural Extension Service and the California Division of Forestry during the years 1953–59.

[15] This soil was shown as Hambright stony loam on advance sheets published by the University of California Agricultural Extension Service and the California Division of Forestry during the years 1953–59.

rocks. If rainfall is not properly distributed during winter and spring, this soil dries out and growth of forage is limited. Capability unit VIIs–7.

Toomes extremely rocky loam, 1 to 50 percent slopes (ThE).[16]—This soil has subangular rocks, some of which are nearly 6 feet in diameter, on 25 to 50 percent of the surface. More than half of the rocks in many areas are of breccia. Depth of the soil ranges from 3 to 8 inches.

Included with this soil in mapping are areas of Supan and Iron Mountain soils and areas of Rock land.

All of this Toomes soil is used for pasture and range. The many rocks on the surface make it difficult for cattle to graze the areas. In most areas more moss grows on this soil than grasses and forbs. Capability unit VIIs–7.

Toomes rocky loam, 10 to 30 percent slopes (TfD).—This soil has subangular stones, some of which are 2 to 3 feet in diameter, on 1 to 10 percent of the surface. In only a few places are the rocks still attached to the underlying breccia. Depth to the hard rock is 12 to 24 inches.

Included with this soil in mapping are areas of Supan soils.

All of this Toomes soil is used for pasture and range. The quality of the forage is fair to poor. Capability unit VIs–7.

Toomes rocky loam, 30 to 50 percent slopes (TfE).—This soil has subangular rocks, some of which are 2 to 3 feet in diameter, on 5 to 15 percent of the surface. Depth to hard rock is 12 to 24 inches. Capability unit VIIs–7.

Toomes-Supan rocky loams, 10 to 30 percent slopes (TmD).—This complex consists of Toomes rocky loam, 10 to 30 percent slopes, and Supan stony loam, 10 to 30 percent slopes. Small areas of Rock land are included. From 50 to 80 percent of each area is Toomes soil, and the rest is Supan soils. Toomes part, capability unit VIIs–7; Supan part, capability unit VIs–8.

Toomes-Supan rocky loams, 30 to 50 percent slopes (TmE).—This complex consists of Toomes rocky loam, 30 to 50 percent slopes, and Supan stony loam, 30 to 50 percent slopes. Small areas of Rock land are included. From 50 to 80 percent of each area is Toomes soil; the rest is Supan soil. Toomes part, capability unit VIIs–7; Supan part, capability unit VIs–8.

Toomes-Supan rocky complex, 10 to 30 percent slopes (TnD).—This complex consists of Toomes very rocky loam, 10 to 30 percent slopes, and Supan stony loam, 10 to 30 percent slopes. Small areas of Rock land are included. From 50 to 80 percent of each area is Toomes soil, and the rest is Supan soil. Toomes part, capability unit VIIs–7; Supan part, capability unit VIs–8.

Toomes-Supan rocky complex, 30 to 50 percent slopes (TnE).—This complex consists of Toomes very rocky loam, 30 to 50 percent slopes, and Supan stony loam, 30 to 50 percent slopes. Small areas of Rock land are included. From 50 to 80 percent of each area is Toomes soil, and the rest is Supan soil. Toomes part, capability unit VIIs–7; Supan part, capability unit VIs–8.

Toomes-Supan extremely rocky complex, 10 to 50 percent slopes (ToE).—This complex consists of Toomes extremely rocky loam, 1 to 50 percent slopes, and Supan stony loam, 10 to 30 percent slopes. Small areas of Rock land are included. From 50 to 80 percent of each area is Toomes soil, and the rest is Supan soil. Toomes part, capability unit VIIs–7; Supan part, capability unit VIs–8.

Tuscan Series

In the Tuscan series are nearly level to gently sloping, well-drained soils. These soils formed in old alluvium washed from areas of volcanic rock. The surface soil is dark-brown, slightly acid cobbly loam, and it grades to a subsoil of reddish-brown, slightly acid cobbly and gravelly clay loam. The subsoil is underlain by an indurated cobbly hardpan at a depth of less than 30 inches. Tuscan soils are on terraces at elevations of 200 to 1,000 feet. Most areas are east of the Sacramento River. The vegetation is annual grasses and forbs.

Profile of Tuscan cobbly loam on a slope of 2 percent that is used for grazing cattle in winter; elevation of 300 feet (3 miles east of Dairyville on Foothill Road, in the SW¼NW¼ sec. 29, T. 26 N., R. 2 W.):

A11—0 to 3 inches, dark-brown (7.5YR 4/3) cobbly loam, dark reddish brown (5YR 3/3) when moist; weak, fine, granular structure; slightly hard when dry, friable when moist, slightly sticky when wet; abundant very fine roots; many very fine pores; slightly acid; abrupt, wavy boundary. 1 to 3 inches thick.

A12—3 to 7 inches, reddish-brown (5YR 4/3) cobbly loam, dark reddish brown (5YR 3/3) when moist; strong, very fine, subangular blocky structure; slightly hard when dry, friable when moist, slightly sticky when wet; abundant very fine roots; many very fine pores; slightly acid; clear, irregular boundary. 3 to 6 inches thick.

B1t—7 to 12 inches, reddish-brown (5YR 4/4) light cobbly clay loam, dark reddish brown (5YR 3/4) when moist; moderate, fine, subangular blocky structure; hard when dry, firm when moist, sticky and slightly plastic when wet; thin, continuous clay films in pores; a few very fine roots; many very fine pores; slightly acid; abrupt, wavy boundary. 2 to 4 inches thick.

B2t—12 to 18 inches, reddish-brown (5YR 4/4) very cobbly clay loam; dark reddish brown (5YR 3/4) when moist; massive; hard when dry, firm when moist, sticky and plastic when wet; a few very fine roots; a few very fine pores; moderately thick, continuous clay films; slightly acid; abrupt, wavy boundary. 1 to 10 inches thick.

C1m—18 to 22 inches, reddish-brown (5YR 5/4) indurated cobbly hardpan, dark reddish brown (5YR 3/4) when moist; in places thin silica coatings are on pebbles and cobblestones and black manganese stains are in seams; abrupt, wavy boundary. 1 to 2 inches thick.

C2—22 inches +, consolidated and stratified cobblestones and gravel of volcanic origin.

The A horizon ranges from brown to reddish brown in color and from loam to clay loam in texture. It contains cobblestones and gravel in places. The brown color in the surface layer is associated with the clay loam texture of this layer in most places; these soils are redder with increasing depth. Rounded basaltic and andesitic rocks that range from 3 inches to as much as 15 inches in diameter are distributed over the surface. They form stringers in places, but in other places they are scattered on the surface, generally on less than 10 percent of the area. These soils range from slightly acid in the surface soil to medium acid in the B2t horizon. Consolidation of

[16] This soil includes some soils shown as Jefcoat extremely rocky silt loam, very shallow, on advance sheets published by the University of California Agricultural Extension Service and the California Division of Forestry during the years 1953–59.

the substratum extends to a depth of many feet, but the hardness of the stratified layers varies.

Tuscan cobbly loam, 1 to 5 percent slopes (TuB).—This soil is on the tops of old, gently sloping terraces east of the Sacramento River. The areas vary considerably in size and shape, and the surface has a slightly hummocky microrelief. Cobblestones that are nearly rounded and are 3 to 10 inches in diameter are scattered on 1 to 10 percent of the surface. In a few places these stones cover as much as 25 percent of the surface. Depth to the indurated hardpan is predominantly 10 to 20 inches.

This soil is well drained. Permeability is very slow. The available water holding capacity and fertility are low. The hardpan is impervious to plant roots and water. Water drains laterally from the soil, and roots flatten out above the hardpan. Runoff is slow, and there is no erosion hazard.

Included with this soil in mapping are areas of Anita, Inks, and Keefers soils.

Pasture and range are grown on this Tuscan soil in winter and spring. This soil is too shallow and has too many cobblestones on the surface to be used intensively for agriculture. Capability unit VIIs–8.

Tuscan cobbly loam, moderately deep, 1 to 5 percent slopes (TvB).—This soil has rounded cobblestones that range from 3 to 10 inches in diameter on 1 to 10 percent of the surface. Depth to the hardpan is 20 to 30 inches.

Included with this soil in mapping are small areas of Anita and Keefers soils.

All of this Tuscan soil is used for pasture and range. The quality of the forage is poor to fair. Capability unit IVs–8.

Tuscan clay loam, 1 to 8 percent slopes (TtB).—This soil has a surface layer that is nearly free of cobblestones, but it is otherwise similar to Tuscan cobbly loam, 1 to 5 percent slopes. It also holds more water and plants grow better on it. In many areas the slopes are rounded and are cut by short, shallow drainageways.

Included with this soil in mapping are areas of Anita and Keefers soils.

This Tuscan soil is used for pasture and range. The quality of the forage is poor to fair. Capability unit VIIs–8.

Tuscan stony loam, 1 to 5 percent slopes (TwB).—This soil has rounded basaltic or andesitic rocks 3 inches to nearly 2 feet in diameter on 1 to 10 percent of the surface. Shallow drainageways and low hummocks cut the areas and make the surface uneven. Depth to the cemented hardpan is 10 to 20 inches.

Included with this soil in mapping are small areas of Anita soils.

This Tuscan soil is used for pasture and range. The quality of the forage is poor. The stones on this soil interfere with management and also interfere with grazing. Capability unit VIIs–8.

Tuscan very stony loam, 3 to 15 percent slopes (TxC).—This soil is on the upper or eastern edges of the fans that the Tuscan soils occupy, and in many places it is adjacent to the Toomes soils. Rounded stones, some of which are nearly 30 inches in diameter, are on 10 to 25 percent of the surface.

Included with this soil in mapping are areas of Anita, Inks, and Toomes soils.

All of this Tuscan soil is used for pasture and range. The quality of the forage is poor. Because of stones on the surface, it is difficult for animals to graze on this soil. Capability unit VIIs–8.

Tuscan loam, 1 to 5 percent slopes (TsB).—This soil is nearly free of cobblestones but is otherwise similar to Tuscan cobbly loam, 1 to 5 percent slopes. It is easier for animals to graze this soil, and the soil is easier to manage for pasture and range. This soil is too shallow to be used intensively for agriculture. Capability unit VIIs–8.

Tyson Series

The Tyson series consists of undulating to very steep, well-drained soils formed in material from mica schist, a metamorphosed sedimentary rock. The surface layer is dark grayish-brown, neutral gravelly sandy loam, and the subsoil is brown, medium acid gravelly sandy clay loam. These soils are shallow to moderately deep to bedrock. They are in mountainous areas in the western part of the county at elevations that are generally more than 3,000 feet. A dense cover of shrubs is in most areas.

Profile of Tyson gravelly sandy loam on a slope of 50 percent that faces north; under a dense cover of tall shrubs; elevation of 3,500 feet (5 miles south and 8 miles west of Paskenta, 1,500 feet east and 500 feet south of the west quarter corner of sec. 30, T. 23 N., R. 7 W.):

O1 & O2—1 inch to 0, loose mat of fresh and partly decomposed leaves from oaks and shrubs; abrupt, smooth boundary. ½ to 2 inches thick.

A1—0 to 5 inches, dark grayish-brown (10YR 4/2) gravelly sandy loam, very dark brown (10YR 3/2) when moist; strong, fine, granular structure; soft when dry, friable when moist; many fine roots; very porous; neutral; abrupt, wavy boundary. 4 to 10 inches thick.

B2t—5 to 18 inches, brown (10YR 5/3) gravelly sandy clay loam, dark brown (10YR 3/3) when moist; moderate, medium, subangular blocky structure; slightly hard when dry, friable when moist; many fine roots; many fine pores; internal surfaces coated with a thin silvery sheen of oriented mica (sericite); medium acid; abrupt, irregular boundary. 10 to 30 inches thick.

R—18 inches +, hard, partly weathered, fractured sericite mica schist; the cracks are filled with soil material from the B2t horizon.

The A horizon is grayish brown, dark grayish brown, or very dark grayish brown and is gravelly or very gravelly loam or sandy loam. The B horizon is brown, pale brown, light brownish gray, or very pale brown and is gravelly or very gravelly loam or sandy clay loam. These soils are slightly acid throughout, or they are medium acid in the subsoil.

Tyson gravelly sandy loam, 30 to 50 percent slopes (TyE).—This soil is in fairly long, narrow areas on steep canyon walls in the mountains in the western part of the county. The surface is undulating because short drainageways cut the areas. Depth to hard rock is 12 to 40 inches.

This soil is well drained. Permeability is moderately rapid. The available water holding capacity and fertility are low to moderate. Runoff is medium, and the erosion hazard is moderate.

Included with this soil in mapping are areas of Los Gatos, Maymen, and Sheetiron soils.

Shrubs form a dense cover on all of this Tyson soil. The shrubs are mostly Brewer oak and mountain-mahogany but include some black oak and Douglas-fir. They

protect the watershed and provide browse and cover for wildlife. Capability unit VIIe–8.

Tyson gravelly sandy loam, 10 to 30 percent slopes (TyD).—Most areas of this soil are near the tops of ridges. Capability unit VIIe–8.

Tyson gravelly sandy loam, 50 to 65 percent slopes (TyF).—Most areas of this soil are on north-facing slopes of very deep canyons. Capability unit VIIIe–8.

Vina Series

The Vina series consists of nearly level to gently sloping, well-drained soils. These soils formed in recent alluvium washed from areas of volcanic rock. They are dark grayish brown to brown, neutral, and medium textured to moderately fine textured throughout. Vina soils are on flood plains of the Sacramento River at elevations of 200 to 1,000 feet. Nearly all areas are cultivated.

Profile of Vina loam in a nearly level area in a railroad right-of-way; under a cover of grasses and forbs; elevation of 200 feet (0.5 mile south of Vina, 1,200 feet west and 500 feet south of the northeast corner of sec. 23, T. 24 N., R. 2 W.):

A1—0 to 11 inches, dark grayish-brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) when moist; fine to very fine, granular structure; slightly hard when dry, friable when moist, slightly sticky and slightly plastic when wet; many fine roots; many fine pores; numerous wormholes; neutral; diffuse boundary. 5 to 15 inches thick.

C—11 to 66 inches, dark grayish-brown (10YR 4/2) loam stratified with sandy loam, particularly in the lower part, very dark grayish brown (10YR 3/2) when moist; massive; hard when dry, friable when moist, slightly sticky and slightly plastic when wet; many fine roots; many fine pores; some wormholes; grains of sand are mainly rounded fragments of andesite; neutral but is mildly alkaline in the lower part; many feet thick.

These soils range in color from dark grayish brown, grayish brown, or dark brown to brown, and the color changes little with depth. In places the soils are stickier when wet than in other places, and this may be a factor in the ease with which traffic pans develop. These soils are generally neutral throughout. In some areas, however, they are mildly alkaline in the lower part. Round, brittle nodules about 1 inch in diameter are in the lower part of some profiles in places that have a water table at a depth below 6 to 8 feet. In some places these soils are underlain by indurated sediments. Lime is in some areas at a depth of 7 or 8 feet.

Vina loam, 0 to 3 percent slopes (VnA).—This soil is east of the Sacramento River. One of the largest areas is near the town of Vina. Most areas have a smooth surface.

This soil is well drained. Permeability is moderate. The available water holding capacity and fertility are high. Runoff is very slow, and there is no erosion hazard.

Included with this soil in mapping are small areas of Molinos and Los Robles soils.

If this Vina soil is irrigated, alfalfa, beans, corn, melons, milo, prunes, peaches, and walnuts grow well (fig. 6). Other areas are used for dryfarmed grain and for pasture and range. Capability unit I–1.

Vina loam, 3 to 8 percent slopes (VnB).—This soil lies along the edges of old drainageways. It is too steep to be irrigated other than by overhead sprinklers. This soil is not farmed extensively, because of the small size of the areas. Also, it is surrounded by nearly level soils and requires different management practices than those soils. Capability unit IIe–1.

Figure 6.—**Young walnuts on Vina loam, 0 to 3 percent slopes, southeast of Red Bluff.**

Vina loam, deep, 0 to 3 percent slopes (Vd).—This soil has an unrelated indurated-layer of Tuscan soil at a depth of 30 to 50 inches. In some places water and roots cannot penetrate the indurated layer, but in other places they penetrate it very slowly. A perched water table develops in places in this soil for short periods after irrigation or after a heavy rain. In places deep-rooted crops are damaged because of this perched water table. Capability unit IIs–8.

Vina loam, water table, 0 to 3 percent slopes (Vw).—This soil has an unrelated indurated layer of Tuscan soil at a depth of 4 to 6 feet. Most areas are near areas of Tuscan soils and are less than 100 acres in size. Drainage is imperfect. In many places a perched water table forms at a depth of 20 to 40 inches when this soil and the surrounding soils are irrigated in summer. In places deep-rooted crops are damaged because of this high water table.

Pasture, corn, and beans are grown on this soil. Capability unit IIw–2.

Vina clay loam, deep, 0 to 3 percent slopes (Vy).—This soil has a surface layer of clay loam, which is sticky when wet, but is otherwise similar to Vina loam, 0 to 3 percent slopes. Consequently, it is more difficult to cultivate and prepare a seedbed in this soil. Also, this soil must be cultivated more carefully to keep a plowpan from forming. Capability unit I–1.

Windy Series

In the Windy series are undulating to very steep, well-drained soils. These soils formed in material from basic volcanic rock that in some places is made up of andesitic and basaltic rock from volcanic flows. In other places the andesitic and basaltic rock are cemented together with tuffaceous material. Windy soils are brown stony sandy

loam or gravelly sandy loam throughout. The surface soil is medium acid, but the subsoil is strongly acid. These soils are in mountainous areas in the eastern part of the county at elevations of more than 5,000 feet. Shrubs and conifers make up the vegetation.

Profile of Windy stony sandy loam on a slope of 10 percent that faces east; under a dense stand of shrubs; elevation of 5,600 feet (0.5 mile southeast of Colby Mountain Lookout, 0.25 mile east of the northwest corner of sec. 3, T. 26 N., R. 4 E.) :

O1 & O2—4 inches to 0, litter made up of accumulated fresh and decomposing shrubs; abrupt, smooth boundary. 3 to 8 inches thick.

A1—0 to 3 inches, dark-brown (10YR 3/3) stony sandy loam, very dark brown (10YR 2/2) when moist; strong, very fine, granular structure; soft when dry, very friable when moist, nonsticky when wet; many fine roots; very porous; about 2 percent angular stones scattered over the surface; medium acid; abrupt, smooth boundary. 3 to 6 inches thick.

B2—3 to 29 inches, brown (7.5YR 5/4) stony sandy loam, dark brown (7.5YR 3/3) when moist; the number of angular stones and cobblestones increases with increasing depth; medium acid in the upper part but is strongly acid in the lower part; this horizon is otherwise similar to the A1 horizon; abrupt, irregular boundary. 15 to 36 inches thick.

R—29 inches +, hard, partly weathered, fractured andesitic rock; cracks in the rock filled with material from the B2 horizon.

The A1 horizon is dark brown or very dark brown and is nearly neutral, slightly acid, or medium acid. The B2 horizon is brown to reddish brown and is medium acid to very strongly acid. The amount of angular cobblestones and stones increases in many places with increasing depth. In most places depth to hard rock is less than 30 inches, but depth ranges from 20 to 40 inches.

Windy stony sandy loam, 10 to 30 percent slopes (WsD).—This soil is on sloping plateaus on ridgetops, and some of the areas are fairly large. Most of the areas are along the eastern edge of the county at elevations of about 5,000 to 6,000 feet. Because it is cut by short drainageways, the surface is undulating. Angular rock fragments, some of which are more than 2 feet in diameter, cover 1 to 10 percent of the surface. Depth to fractured rock ranges from 20 to 40 inches.

This soil is well drained. Permeability is rapid, available water holding capacity is low, and fertility is low. Water and plant roots penetrate the fractured rock to a depth of many feet. Runoff is slow, and the erosion hazard is slight.

Included with this soil in mapping are areas of Cohasset, Jiggs, and Lyonsville soils.

Dense stands of shrubs cover many areas of this Windy soil, and timber is grown in some areas. White fir is the dominant conifer. Greenleaf manzanita, golden chinquapin, bearbrush, bitter cherry, and huckleberry oak are the dominant shrubs. These shrubs protect the watershed and provide cover and browse for wildlife. Capability unit VIs–7.

Windy stony sandy loam, 30 to 50 percent slopes (WsE).—Because this soil has steeper slopes, it is somewhat more difficult to harvest timber from its areas than from Windy stony sandy loam, 10 to 30 percent slopes. Capability unit VIs–7.

Windy stony sandy loam, 50 to 65 percent slopes (WsF).—This soil is along the upper edges of very steep slopes, and it is therefore difficult to harvest timber from the areas. Capability unit VIIs–1.

WINDY GRAVELLY SANDY LOAMS

Profile of Windy gravelly sandy loam on a slope of 10 percent that faces south; under a dense stand of red fir; elevation of 6,600 feet (at Humboldt Summit in the southeast corner of the county, at the northwest corner of NE¼SW¼ sec. 32, T. 27 N., R. 5 E.) :[17]

O1 & O2—¾ inch to 0 of fresh and partly decomposed litter from red fir; abrupt, wavy boundary. ½ to 3 inches thick.

A11—0 to 2 inches, very dark grayish-brown (10YR 3/2) gravelly sandy loam, very dark brown (10YR 2/2) when moist; strong, very fine, crumb structure; loose when dry, friable when moist, nonsticky when wet; a few roots; many pores that are irregular in shape; medium acid; clear, irregular boundary. 2 to 4 inches thick.

A12—2 to 12 inches, dark grayish-brown (10YR 4/2) gravelly sandy loam, very dark brown (10YR 2/2) when moist; strong, very fine, crumb structure; soft when dry, very friable when moist, nonsticky when wet; abundant very fine roots; many very fine pores that are irregular in shape; medium acid; clear, smooth boundary. 4 to 10 inches thick.

B1—12 to 25 inches, brown (10YR 4/3) gravelly sandy loam, very dark grayish brown (2.5YR 3/2) when moist; strong, very fine, crumb structure; soft when dry, very friable when moist, nonsticky when wet; about 10 percent stones by volume; plentiful very fine roots and a few large roots; many pores that are irregular in shape; clear, smooth boundary. 6 to 15 inches thick.

B2—25 to 45 inches, yellowish-brown (10YR 5/4) gravelly sandy loam, dark yellowish brown (10YR 3/4) when moist; strong, very fine, crumb structure; soft when dry, very friable when moist, nonsticky when wet; about 50 percent by volume is cobblestones and other stones that are irregular in shape; a few large roots; many pores that are irregular in shape; strongly acid; abrupt, irregular boundary. 12 to 24 inches thick.

R—45 inches +, partly weathered, hard volcanic breccia made up of angular andesitic stones cemented together with tuffaceous material.

The A11 horizon ranges from brown to very dark grayish brown in color. The lower part of the horizon is brown, yellowish brown, or light yellowish brown. These soils are medium acid in the A horizon and are strongly acid in the B horizon. Texture ranges from gravelly sandy loam to loam throughout. The lower part of the profile is gravelly, and in most places it contains many angular cobblestones and other stones. Depth of the soils ranges from about 3 to 5 feet.

Windy gravelly sandy loam, 10 to 30 percent slopes (WgD).—This soil is gravelly and is deeper than the soil described for the Windy stony sandy loams, and its subsoil contains more clay. The areas are not large and have uneven slopes. Angular stones cover less than 5 percent of the surface, but in places the subsoil is 50 percent stones. Depth ranges from 36 to 60 inches.

Most areas of this Windy soil are used for timber, but some areas have a dense stand of shrubs. Capability unit VIe–4.

Windy gravelly sandy loam, 30 to 50 percent slopes (WgE).—This soil has steeper slopes than Windy gravelly sandy loam, 10 to 30 percent slopes. The slopes make it

[17] This soil, the other phase of Windy gravelly sandy loam, and the four phases of Windy rocky sandy loam, were shown as members of the Lytton series on advance sheets published by the University of California Agricultural Extension Service and the California Division of Forestry during the years 1953–59.

difficult to harvest timber from areas of this soil. Capability unit VIe–4.

Windy rocky sandy loam, 10 to 30 percent slopes (WnD).—Most areas of this soil have uneven slopes, and some areas are fairly large. Angular stones, some of which are nearly 4 feet in size, are on 5 to 30 percent of the surface. Depth of the soil ranges from 30 to 48 inches.

Included with this soil in mapping are small areas of Rock land.

Timber is grown on most areas of this Windy soil; however, some areas have a dense stand of shrubs. Stones on the surface interfere with the moving of equipment used for harvesting timber and also damage trees that fall. Capability unit VIs–7.

Windy rocky sandy loam, 30 to 50 percent slopes (WnE).—This soil is steeper than Windy rocky sandy loam, 10 to 30 percent slopes. It is therefore difficult to harvest timber from areas of this soil. Capability unit VIs–7.

Windy rocky sandy loam, 50 to 65 percent slopes (WnF).—This soil is much steeper than Windy rocky sandy loam, 10 to 30 percent slopes. It is therefore difficult to harvest timber from areas of this soil. Capability unit VIIs–1.

Windy rocky sandy loam, moderately deep, 10 to 50 percent slopes, eroded (WrE2).—The profile of this soil is similar to the one described for the Windy series. Most areas are along ridgetops, and several inches of the original surface soil has been lost through erosion. Depth of the soil ranges from 20 to 30 inches.

Included with this soil in mapping are small areas of Rock land.

Dense stands of shrubs are on most areas of this Windy soil, but timber is grown in a few areas. The shrubs protect the watershed and provide browse and cover for wildlife. Capability unit VIIs–4.

Wyo Series

In the Wyo series are nearly level, well-drained soils. These soils formed in alluvium derived from metamorphic rock similar to that from which the Sheetiron soils formed. They are characteristically grayish brown in color. The surface soil is slightly acid and is medium in texture. The subsoil is mildly alkaline and is slightly finer textured than the surface soil. Wyo soils are along the Elder, Thomes, and Stonyford Creeks in the western part of the county. Most areas are cultivated, and many kinds of crops are grown. Yields are generally very good.

Profile of Wyo silt loam (about 4 miles south of the Tehama County line in Glenn County, approximately 1 mile west of Hamilton City, 1¼ miles east and ¼ mile north of the headquarters of Mills Orchard) :

A1—0 to 11 inches, grayish-brown (2.5Y 5/2) silt loam, very dark grayish brown (2.5Y 3/2) when moist; massive; hard when dry, friable when moist, slightly sticky and slightly plastic when wet; many very fine roots; many very fine pores and wormholes; slightly acid; clear, smooth boundary. 10 to 15 inches thick.

B2t—11 to 42 inches, grayish-brown (2.5Y 5/2) light silty clay loam, very dark grayish brown (2.5Y 3/2) when moist; weak, coarse, prismatic to subangular blocky structure; very hard when dry, firm when moist, sticky and plastic when wet; many fine roots; many very fine pores; thin, continuous clay films in many pores and adjacent areas; neutral but is mildly alkaline in lower part; clear, smooth boundary. 8 to 20 inches thick.

C—42 to 50 inches +, light olive-brown (2.5Y 5/3) silt loam, olive brown (2.5Y 4/3) when moist; massive; hard when dry, friable when moist, slightly sticky and slightly plastic when wet; a few roots; many very fine pores; in places thin clay films are in pores; moderately alkaline in the lower part of the horizon; but the upper part has mycelial lime and is moderately calcareous.

The surface layer is grayish brown or light brownish gray, and it is slightly acid or neutral. The B2 horizon is the same color as the surface layer. Its texture is silty clay loam or heavy silty clay loam, however, and it is neutral or mildly alkaline. The C horizon is light olive brown or light yellowish brown. In places it is silt loam, is mildly alkaline to moderately alkaline, and contains lime in the upper part.

Wyo silt loam, 0 to 3 percent slopes (Wz).—Most areas of this soil have a smooth surface. The increase in clay in the subsoil does not interfere with penetration of roots or water. Because of the silt loam texture, the surface layer seals over during irrigation, and the rate that water infiltrates the soil therefore decreases. Depth of the soil is more than 6 feet.

This soil is well drained. Permeability is moderately slow. The available water holding capacity and fertility are high. Runoff is very slow, and there is no erosion hazard.

Included with this soil in mapping are areas of Orland and Cortina soils.

If this Wyo soil is irrigated, alfalfa, pasture, corn, walnuts, prunes, and similar crops grow well. Dryfarmed grain is grown in some areas. Capability unit I–1.

Wyo loam, 0 to 3 percent slopes (Wy).—This soil is easier to manage than Wyo silt loam, 0 to 3 percent slopes, because of its loamy texture. In places some areas are cut by shallow drainageways, but in most areas the surface is smooth. Depth of the soil is more than 6 feet.

Included with this soil in mapping are areas of Orland and Cortina soils.

Alfalfa, beans, corn, prunes, walnuts, and similar crops grow well on this Wyo soil. Dryfarmed grain is also grown. Capability unit I–1.

Yollabolly Series

The Yollabolly series consists of moderately sloping to very steep, excessively drained soils formed in material from metamorphic rock, predominantly of chlorite-sericite mica schist. These soils are light brownish gray, are medium acid to strongly acid, and are medium textured and very rocky and shallow. Yollabolly soils are at elevations of more than 6,000 feet in mountainous areas in the western part of the county. Open stands of pines and shrubs grow on these soils.

Profile of Yollabolly very rocky loam (1 mile east of South Yolla Bolly Mountains, the southeastern part of the NE¼ sec. 11, T. 25 N., R. 9 W.) :

O1—½ inch to 0, loose litter of pine needles and twigs. ½ to 1 inch thick.

A11—0 to 4 inches, light brownish-gray (10YR 6/2) gravelly loam, dark grayish brown (10YR 4/2) when moist; weak, thin, platy structure that breaks to medium, granular; slightly hard when dry, friable when moist; common very fine roots and pores; the uppermost half inch is a continuous layer of gravel and cobblestones; medium acid; gradual, irregular boundary. 1 to 5 inches thick.

A12—4 to 10 inches, light brownish-gray (10YR 6/2) gravelly loam, dark grayish brown (10YR 4/2) when moist; massive; slightly hard when dry, friable when moist; a few very fine roots; very porous; oriented mica lines the pores and coats the gravel; strongly acid; abrupt, very irregular boundary. 8 to 12 inches thick.

R—10 inches +, weathered and fractured chlorite-sericite schist.

These soils range from light brownish gray through grayish brown and brown. They generally are less than 12 inches thick, and they range from medium acid to strongly acid.

Yollabolly very rocky loam, 30 to 65 percent slopes (YbE).—This soil is along the tops of the Coast Range Mountains in the western part of the county. The areas vary considerably in size and are undulating because they are cut by short drainageways. Angular rock fragments, some of which are 3 feet or more in diameter, cover 5 to 25 percent of the surface.

This soil is excessively drained. Permeability is moderate, but the available water holding capacity and fertility are low. Runoff is rapid to very rapid, and the erosion hazard is severe to very severe.

Included with this soil in mapping are areas of Masterson and Sheetiron soils.

Some areas of this Yollabolly soil are used for timber; the dominant conifers are Jeffrey pine and white fir. The stands are open, and the quality of the timber is low. Capability unit VIIs–1.

Yollabolly very rocky loam, 10 to 30 percent slopes (YbD).—Areas of this soil are along the tops of the Coast Range Mountains. Capability unit VIIs–4.

Yolo Series

The Yolo series consists of nearly level, well-drained soils. These soils formed in recently deposited alluvium. The alluvium was derived mostly from areas of sedimentary rock but partly from metamorphic and basic igneous rocks. These soils are brown to pale brown and are medium textured throughout. The surface soil is neutral, and the subsoil is mildly alkaline. Yolo soils are along streams in the western part of the county. Most areas are cultivated.

Profile of Yolo loam in a nearly level area under grass, just outside of a cultivated field (along Elder Creek 2.5 miles west and 0.5 mile south of Gerber, near the center of sec. 3, T. 25 N., R. 3 W.):

A1—0 to 34 inches, brown (10YR 5/3) loam, very dark grayish brown (10YR 3/2) when moist; massive; hard when dry, friable when moist, slightly sticky when wet; many fine roots; very porous; neutral; gradual, wavy boundary. 2 to 3 feet thick.

C1—34 to 68 inches, pale-brown (10YR 6/3) loam, brown (10YR 5/3) when moist; mildly alkaline but is otherwise similar to the A1 horizon; abrupt boundary. 3 or more feet thick.

IIC2—68 inches +, sandy gravel that has many large voids; a thin coat of lime is on some of the pebbles.

The A horizon is brown and dark grayish brown in color and is neutral or slightly acid. The C horizon is pale brown, yellowish brown, or brown and is neutral or is mildly alkaline. In some areas the lower part of this horizon is very slightly calcareous. The IIC2 horizon is lacking in places.

Yolo loam (Yo).—Most of this soil is on recent deposits of alluvium along Elder and Cottonwood Creeks. It is in fairly small areas that are long and narrow.

This soil is well drained. Permeability is moderate, but available water holding capacity and fertility are high. Runoff is very slow. Except in areas along streambanks, there is no erosion hazard.

Included with this soil in mapping are areas of Cortina, Maywood, and Zamora soils.

If this Yolo soil is irrigated, alfalfa, beans, corn, sugarbeets, prunes, peaches, and walnuts grow well. Other areas are used for pasture and range and for dryfarmed grain. Capability unit I–1.

Yolo loam, clay loam substratum (Ys).—This soil is west of U.S. Highway 99W and south of Elder Creek. The soil material was deposited over an older soil similar to the soils of the Tehama series. In most places the substratum is at a depth of 30 to 40 inches, but in some places it is at a depth of 15 to 50 inches. The substratum is slowly permeable to roots and water, and in places water remains above the substratum for short periods after irrigation or after a heavy rain. Capability unit IIs–3.

Yolo clay loam (Yt).—This soil has a subsoil that is moderately slowly permeable. It is more difficult to cultivate and to prepare a seedbed in this clay loam than in Yolo loam. Capability unit I–1.

Zamora Series

In the Zamora series are nearly level, well-drained soils formed from fairly recent alluvium derived from sedimentary, metamorphic, and igneous rocks. These soils are on flood plains along the Sacramento River above the flood stage of the river. Their surface soil is grayish brown and is medium textured to moderately fine textured. The subsoil is dark grayish brown and is moderately fine textured. Zamora soils are deep and typically are neutral throughout. Most areas are cultivated.

Profile of Zamora silt loam (1 mile southwest of the Tehama Post Office, in the northwest corner of the NE¼ NW¼ sec. 19, T. 25 N., R. 2 W.):

A1—0 to 10 inches, grayish-brown (10YR 5/2) silt loam, dark grayish brown (10YR 4/2) when moist; moderate, medium, granular structure; hard when dry, friable when moist, slightly sticky when wet; very porous; many fine roots; neutral; abrupt, wavy boundary. 10 to 20 inches thick.

B1t—10 to 18 inches, dark grayish-brown (10YR 4/2) silty clay loam, very dark grayish brown (10YR 3/2) when moist; strong, angular, blocky structure; hard when dry, friable when moist, slightly sticky when wet; thin, discontinuous clay films; pores are less numerous and finer than in the A1 horizon; a few fine roots; neutral; abrupt, irregular boundary. 0 to 10 inches thick.

B2t—18 to 47 inches, dark grayish-brown (10YR 4/2) silty clay loam, very dark grayish brown (10YR 3/2) when moist; moderate, medium, subangular blocky structure; hard when dry, friable when moist, slightly sticky when wet; many fine pores; thin, continuous clay films; a few fine roots; neutral; gradual, irregular boundary. 10 to 30 inches thick.

C—47 to 78 inches +, grayish-brown (10YR 5/2) silt loam, dark brown (10YR 4/2) when moist; massive; hard when dry, friable when moist, slightly sticky when wet; a few fine roots; neutral.

The surface soil in cultivated areas is grayish brown, brown, dark brown, or dark grayish brown. In many areas

that are not cultivated, the A1 horizon is dark grayish brown. The B1t horizon, if present, is the same color or is slightly darker colored than the A1 horizon. The B2t horizon is grayish-brown, dark grayish-brown, or brown silty clay loam, clay loam, or heavy clay loam. The C horizon is lighter colored than the B2t horizon and contains less clay. Zamora soils are generally neutral throughout, but in places they are slightly acid in the surface layer and mildly alkaline in the subsoil and substratum. In some places the subsoil is slightly calcareous.

Zamora silt loam, 0 to 3 percent slopes (Zm).[18]—This soil is west of the Sacramento River along major streams. The areas are parallel to the streams, are fairly small, and have a smooth surface. The soil is well drained. Runoff is very slow, and permeability is moderately slow. The available water holding capacity and fertility are high. There is no erosion hazard.

Included with this soil in mapping are areas of Columbia and Orland soils.

If this Zamora soil is irrigated, the running of irrigation water over the surface of the soil tends to seal it and reduce penetration of the water. Adding organic matter helps control sealing of the surface. Capability unit I–1.

Zamora clay loam, 0 to 3 percent slopes (Zc).—This soil is in narrow stringers in small valleys in the western foothills; the areas are fairly smooth. Except for the texture of the surface soil, this soil is similar to Zamora silt loam, 0 to 3 percent slopes.

Included with this soil in mapping are areas of Myers and Yolo soils. Also included are areas on short fans that have slopes that range from 3 to 8 percent.

This Zamora soil is used for dryfarmed grain and for pasture and range. Irrigation water is not available in most areas. Capability unit I–1.

Zamora loam, 0 to 3 percent slopes (Za).[19]—This soil has a surface soil of loam but is otherwise similar to Zamora silt loam, 0 to 3 percent slopes. Irrigation water penetrates this soil faster than it does the silt loam. Capability unit I–1.

Zamora silty clay loam, 0 to 3 percent slopes (Zo).[20]—This soil has a surface soil of silty clay loam, but it is otherwise similar to Zamora silt loam, 0 to 3 percent slopes. Because of the texture, it is more difficult to cultivate and to prepare a seedbed in this soil. Capability unit I–1.

Use and Management of the Soils

In this section the capability grouping used by the Soil Conservation Service is explained and suggestions for managing soils in each capability group are given. Then management of the more important crops in the county is discussed. Following this the estimated yields of the soils for the more important crops in the county and the Storie index rating for each of the soils are given. After that management of pasture and range and of brushland and woodland are described.

Capability Groups of Soils

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

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

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

Class I. Soils in class I have few limitations that restrict their use.

Class II. Soils have some limitations that reduce the choice of plants or require moderate conservation practices.

Class III. Soils have severe limitations that reduce the choice of plants or require special conservation practices, or both.

Class IV. Soils have very severe limitations that restrict the choice of plants, require very careful management, or both.

Class V. Soils subject to little or no erosion but have other limitations, impractical to remove, that limit their use largely to pasture, range, woodland, or wildlife food and cover.

Class VI. Soils have severe limitations that make them generally unsuited to cultivation and limit their use largely to pasture or range, woodland, or wildlife food and cover.

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

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

[18] This soil was shown as Proberta silt loam on advance sheets published by the University of California Agricultural Extension Service and the California Division of Forestry during the years 1953–59.

[19] This soil includes some soils shown as Proberta loam on advance sheets published by the University of California Agricultural Extension Service and the California Division of Forestry during the years 1953–59.

[20] This soil was shown as Proberta silty clay loam on advance sheets published by the University of California Agricultural Extension Service and the California Division of Forestry during the years 1953–59.

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In class I there are no subclasses, because the soils of this class have few limitations. Class V can contain, at the most, only subclasses indicated by *w*, *s*, and *c*, because the soils in it are subject to little or no erosion, though they have other limitations that restrict their use largely to pasture, range, woodland, wildlife, 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 in California are given numbers that indicate the chief kind of limitation responsible for placement of the soils in the capability class and subclass. For this reason some of the units within the subclasses are not numbered consecutively and their symbols are a partial key to some of the soil features. In Tehama County the numerals used to designate units within the classes and subclasses are these:

0. A problem or limitation caused by very gravelly material in the substratum.
1. An erosion hazard, actual or potential.
2. A problem or limitation of wetness because of a high water table, seepage, or flooding.
3. A problem or limitation of slow permeability of the subsoil.
4. A problem or limitation caused by coarse soil texture or excessive gravel.
5. A problem or limitation caused by fine soil texture.
6. A problem or limitation caused by salt or alkali.
7. A problem or limitation caused by stones or rock outcrops.
8. A problem or limitation caused by shallow depth of soil over bedrock.
9. A problem or limitation caused by low fertility.

Management by Capability Units

The productivity and responses of a soil depend on many factors, especially on the nature of the soil, the climate in which it is located, and the management it receives. Soil characteristics and climate cannot be changed readily, but management can be controlled. Changes in the management of some soils can drastically change the quality and yield the crop produces. Depending on the kind, recurring practices in management establish a trend toward improvement, maintenance, or depletion of the soil.

A good system of soil management is likely to consist of a combination of several practices. Among these practices are the use of a good cropping system, application of fertilizer, and the control of runoff. The effectiveness of any one practice is dependent upon other practices. For example, a system for disposal of storm water may be ineffective unless the outlet can be connected with an adequate community drainage system.

Because of the wide variety of soils, it is desirable to group most of them into units for general discussion of their use and management requirements. Such a grouping has been made in this section. This section contains a description of each capability unit, a list of the soils in it, and suggestions for the use and management of the soils. Additional information about each kind of soil is given in the section "Descriptions of the Soils."

Capability unit I–1

In this unit are very deep, well-drained, nearly level soils on alluvial fans and flood plains. These soils consist of fairly uniform, stratified deposits of alluvial materials. Variations in texture caused by stratification do not hinder use of the soils. On the flood plain of the Sacramento River, the soils formed in alluvium from various sources. The soils on the east side of the Sacramento Valley formed in alluvium mostly from volcanic rock, and those on the west side formed in material washed from the Tehama formation or from sedimentary rock.

All of the soils in this unit are moderate to high in fertility, are easy to work, and have moderate to high available water holding capacity. Permeability is moderately slow to moderately rapid. Runoff is slow to very slow.

The following soils are in this unit:

CmA	Columbia fine sandy loam, 0 to 3 percent slopes.
Co	Columbia loam, 0 to 3 percent slopes.
CsA	Columbia silt loam, 0 to 3 percent slopes.
Lk	Los Robles clay loam, 0 to 3 percent slopes.
Lo	Los Robles loam, 0 to 3 percent slopes.
Mc	Maywood fine sandy loam, 0 to 3 percent slopes.
Me	Maywood loam, 0 to 3 percent slopes.
Mh	Maywood silt loam, 0 to 3 percent slopes.
Mf	Maywood loam, high terrace, 0 to 3 percent slopes.
Mg	Maywood loam, moderately well drained, 0 to 3 percent slopes.
My	Molinos fine sandy loam.
Of	Orland fine sandy loam.
Om	Orland loam.
Os	Orland silt loam.
VnA	Vina loam, 0 to 3 percent slopes.
Vy	Vina clay loam, deep, 0 to 3 percent slopes.
Wy	Wyo loam, 0 to 3 percent slopes.
Wz	Wyo silt loam, 0 to 3 percent slopes.
Yo	Yolo loam.
Yt	Yolo clay loam.
Za	Zamora loam, 0 to 3 percent slopes.
Zc	Zamora clay loam, 0 to 3 percent slopes.
Zm	Zamora silt loam, 0 to 3 percent slopes.
Zo	Zamora silty clay loam, 0 to 3 percent slopes.

The soils in this unit are the most productive in the county. They are well suited to all crops that are suitable for the climate and that require good drainage. Crops on these soils include the row crops and field crops commonly grown, grapes, orchard crops, berries, and pasture crops Most areas are used for orchard crops.

These soils generally are fairly low in organic matter and nitrogen. Crops on them, however, respond readily if fertilizer is applied. For maximum yields most crops on these soils require fertilizer that contains nitrogen, and the quality of legumes is improved if phosphate and sulfur are applied.

The use of green-manure crops, crop rotations, and crop residues helps maintain organic matter. In orchards the green-manure crops need to be planted in fall. All crop residues should be returned to the soil. For maximum yields of forage from irrigated pastures, fertilizer is needed. In addition each pasture should be divided into several units and each unit grazed in rotation.

All methods of irrigation are suitable for these soils. The frequency of irrigation and the quantity of water used depend upon the crop grown and upon the available water holding capacity of the soil. These soils all hold water well, and additional water is available in some soils because

of subirrigation. Also in some soils, and particularly in the Columbia, Vina, and Molinos, moisture occurs in the substratum at a depth of about 10 or 12 feet. Deep-rooted tree crops on these soils require less irrigation than on other soils.

Leveling or grading causes little damage on these soils. Soils that have a texture of clay loam, however, are particularly susceptible to the formation of tillage pans. Formation of a tillage pan can be reduced if overcultivation is avoided and if machinery and livestock are kept out of fields when the soils are wet. Eliminating tillage, chopping the cover crop, and irrigating with sprinklers all help in reducing formation of a tillage pan in orchards. If a pan develops, it can be corrected in orchards by chiseling and in open fields by subsoiling or chiseling.

In small scattered areas where the Farwell soils are included in areas of the Vina or Columbia soils, a weakly cemented hardpan is at a depth of 2 or more feet. Such areas are generally along a transition zone between the Columbia and Vina soils. If the pan in such an area is relatively near the surface, it can be broken by deep subsoiling. Included areas of these Farwell soils, where the pan is deeper, are poorly suited to deep-rooted crops.

Capability unit IIe–1

In this unit are very deep, well-drained, gently sloping soils on fans and terraces or on flood plains. These soils consist of fairly uniform, recent alluvial materials. The soils of this unit that are on the flood plain of the Sacramento River have formed in mixed sediments. The soils on the east side of the Sacramento Valley, in contrast, formed in alluvium derived from volcanic rock.

All of the soils of this unit have a slight to moderate erosion hazard, slow to medium runoff, and moderate to moderately rapid permeability; they are otherwise similar to the soils of capability unit I–1.

The following soils are in this unit:

CmB Columbia fine sandy loam, 3 to 8 percent slopes.
CsB Columbia silt loam, 3 to 8 percent slopes.
VnB Vina loam, 3 to 8 percent slopes.

These highly productive soils are used mostly for irrigated orchards, but a few fields are used mainly for dryland grain rotated with pasture. If these soils are irrigated, they are suited to all crops that are adapted to the climate and that require good drainage.

The use of crop residues, green-manure crops, crop rotations, and fertilizer helps maintain organic matter and yields. Sheet erosion in grainfields can be controlled by cultivating across the slope, stubble mulching, growing cover crops, and the use of similar practices that are fairly easy to apply. Leveling or grading can be done without lasting damage to the soils.

On irrigated soils the hazard of erosion is slight to moderate. Erosion can be controlled by applying the irrigation water carefully, generally by contour furrows on the gentler slopes and by sprinklers on the steeper slopes. By these methods, the water can be applied evenly and at a rate that permits the soil to absorb it. A system for removing excess water safely also is needed.

All of the soils in this unit are easy to work, but a tillage pan tends to form in the Vina soil. Minimum tillage slows formation of such a pan, but if a pan forms it can be broken by chiseling or subsoiling.

Capability unit IIe–3

The only soil in this unit is Tehama loam, 3 to 8 percent slopes (TaB). It is a deep, well-drained, nearly level to gently sloping soil on smooth, low terraces. This soil is on sediments derived from the Tehama formation or from sandstone and shale. The surface soil is loam, and the subsoil is clay loam. Aeration of the soil under most conditions is favorable for growth of crops. Permeability of the subsoil is moderately slow to slow, and the effective rooting depth is about 3 to 4 feet. The water-holding capacity is moderate. Productivity is also moderate, and the soil is fairly easy to work. The hazards of runoff and erosion are slight to moderate.

This soil is better suited to irrigated, shallow-rooted orchard and field crops and pasture plants than to other uses. It is, however, also suited to dryland hay, grain, and pasture. Most irrigated crops on this soil respond if fertilizer that contains nitrogen and phosphate is added. The content of organic matter is naturally low, and under dryland farming it is difficult to increase the supply. If this soil is irrigated, the use of crop residues, green-manure crops, and crop rotations help to maintain the content of organic matter.

Erosion caused by irrigation can be controlled on the sloping areas by using sprinklers, but on the gentler slopes contour irrigation can be used. If surface irrigation methods are used, a system for safely disposing of excess irrigation water may be needed. Erosion caused by irrigation can be minimized if the water is applied at a slow rate. In this way, nearly all the water enters the soil and runoff is slight. Sheet erosion in fields of grain and hay can be controlled if tillage is done across the slope, stubble mulching is practiced, cover crops are grown, and similar practices that are easy to apply are used.

Capability unit IIe–4

In this unit are very deep, well-drained, gently sloping, gravelly soils. These soils are on material from old gravelly terraces of the Tehama formation. They are typically in narrow valleys along streams or are on low terraces. These soils are mostly on the west side of the Sacramento Valley. Irrigation water is available for only part of the area.

These soils have a gravelly clay loam subsoil, and in places the lower part of the substratum is very gravelly. Depth of the soils is more than 5 feet. Permeability is moderate to moderately rapid, the water-holding capacity is moderate, and the erosion hazard is slight. Natural fertility is moderate. The soils are easy to work, but in places gravel interferes with seeding.

The following soils are in this unit:

AvB Arbuckle gravelly loam, 3 to 8 percent slopes.
PkB Perkins gravelly loam, 3 to 8 percent slopes.
PvB Pleasanton gravelly loam, 1 to 10 percent slopes.

If irrigated, these soils are suited to orchards, vineyards, row crops, field crops, and specialty crops. Dryfarmed areas are suited only to grain, hay, and pasture. The soils are well suited to deep-rooted crops if irrigated. They are also suited to shallow-rooted crops, but these require more careful irrigation practices. Irrigation water should be applied in smaller amounts on shallow-rooted crops than on deep-rooted crops, and more frequently.

These soils are difficult to irrigate because of the slopes and slight erosion hazard. Erosion can be controlled if irrigation is done on the contour or if sprinklers are used. These practices also control loss of water and leaching of plant nutrients. The use of green-manure crops, crop residues, and crop rotations helps maintain the content of organic matter. Most crops on these soils respond if fertilizer that contains nitrogen and phosphate is applied. On dryfarmed areas erosion can be controlled by seeding across the slope, using stubble mulch, and growing cover crops.

Capability unit IIw–2

Vina loam, water table, 0 to 3 percent slopes (Vw), is the only soil in this unit. It is nearly level and is imperfectly drained. The areas are in smooth, narrow valleys along streams, where the water table is high until summer. The soil is on recent alluvium derived from volcanic rock or from sedimentary rock.

Permeability of this soil is moderate to moderately rapid, except in the lower part. The soil is generally underlain by clay or by a hardpan, and permeability through these layers is very slow. In places the effective rooting depth is limited by the clay or by the hardpan, but the water table, which in most places is below a depth of about 2 feet, generally restricts the rooting depth. The available water holding capacity is moderate, and natural fertility is moderate to high. The soil is easy to work, though it is hard when dry.

Imperfect drainage makes this soil better suited to shallow-rooted crops than to deep-rooted ones. Improvement of drainage is not generally feasible, because of the size and shape of the areas and because of the lack of suitable outlets. Wetness can be minimized, however, by avoiding overirrigation. Grading the fields to eliminate low spots also improves drainage, and cuts can be deep without exposing infertile subsoil. Because of subirrigation, some crops can be grown successfully without irrigation or with only supplemental irrigation late in summer.

Tillage pans are common in these soils, but formation of a tillage pan can be reduced if cultivating is done late in spring after the surface soil dries. If a tillage pan forms, it can be broken by chiseling in summer or in fall when the soil is dry. Crops in most areas of this soil respond if fertilizer that contains nitrogen is added. The use of green-manure crops, crop residues, and crop rotations also helps to maintain productivity.

Capability unit IIs–0

The soils in this unit are moderately deep or deep, nearly level to gently sloping, and droughty. They are along the Sacramento River and its tributaries on alluvium from various sources. These soils are well drained and are mostly moderately deep to sand or gravel. The water-holding capacity is moderate. Permeability of the surface soil and subsoil is moderate to moderately rapid. The soils are easy to work. Natural fertility is medium, and crops on the soils respond quickly if fertilizer is added. Runoff is very slow to slow, and the erosion hazard is slight.

The following soils are in this unit:

- Cn Columbia fine sandy loam, moderately deep, 0 to 3 percent slopes.
- CpB Columbia loamy fine sand, 1 to 8 percent slopes.
- Ct Columbia silt loam, moderately deep, 0 to 3 percent slopes.
- Md Maywood fine sandy loam, moderately deep, 0 to 3 percent slopes.
- Mzd Molinos fine sandy loam, deep over gravel.
- Mzm Molinos fine sandy loam, moderately deep over gravel.
- Or Orland loam, moderately deep over gravel.

These soils are too droughty to produce satisfactory yields without irrigation and are therefore best suited to irrigated orchard, row, and field crops. Sprinkling is generally the best method for irrigation, but the loams and silt loams can be satisfactorily irrigated by surface methods. Irrigating frequently with small quantities of water avoids wasting water and leaching of plant nutrients. If leveling and grading is done, the cuts should be shallow to avoid uncovering the underlying sand or gravel.

The use of green-manure crops, crop residues, and crop rotations helps maintain productivity. Most crops on these soils respond if nitrogen fertilizer is added. For best results fertilizer should be applied in small amounts several times during the growing season.

Capability unit IIs–3

In this unit are deep, well-drained, nearly level soils that have a slowly permeable subsoil. These soils are on very gently undulating low terraces on alluvium derived mostly from old high terraces of the Tehama formation. Runoff is very slow. The subsoil is clay loam, and the effective rooting depth generally is about 24 to 30 inches. Natural fertility is moderate. In places the soils are associated with nearly level soils that have a claypan.

The following soils are in this unit:

- Az Arbuckle-Tehama complex, 0 to 3 percent slopes (Tehama part only).
- Op Orland loam, moderately deep over clay loam.
- TaA Tehama loam, 0 to 3 percent slopes.
- Tb Tehama gravelly loam, 0 to 3 percent slopes.
- Tc Tehama silt loam, 0 to 3 percent slopes.
- Ys Yolo loam, clay loam substratum.

These soils are better suited to irrigated pasture, field, and shallow-rooted orchard crops than to other uses. They are also suited to dryland grain and hay. Most crops on these soils respond if fertilizer that contains nitrogen and phosphate is applied. If the soils are used intensively, however, potash is also needed for high yields. Returning crop residues to the soils, growing green-manure crops in orchards, and using crop rotations help to maintain yields. Maximum yields of forage can be obtained from irrigated pastures if the fields are grazed in rotation and fertilizer is applied.

All methods of irrigation are suitable for these soils. If the quantity of water applied is small and the runs are long, the water will have ample time to enter the soil. Excess irrigation water may need to be disposed of through a community drainage system. If leveling or grading is done, cuts should be shallow to avoid uncovering the less fertile, clayey subsoil. In irrigated pastures trampling of wet soil by livestock, which tends to slow intake of water into these soils, can be avoided by rotating grazing.

Capability unit IIs–4

The soils in this unit are mostly well drained and are nearly level and gravelly. They are in narrow valleys along streams or are on low terraces. Most of the soils have a subsoil of gravelly clay loam. In some places the lower part of the subsoil is gravelly. In other areas the soils are underlain by shale bedrock.

Permeability of these soils is moderately slow to rapid. The water-holding capacity and natural fertility are moderate. Runoff is very slow, but irrigation water enters the soils rapidly. Some areas of these soils include small patches of silty Tehama soils, in which permeability is moderately slow.

The following soils are in this unit:

Au Arbuckle gravelly fine sandy loam, 0 to 3 percent slopes.
AvA Arbuckle gravelly loam, 0 to 3 percent slopes.
Az Arbuckle-Tehama complex, 0 to 3 percent slopes (Arbuckle part only).
Mzs Molinos gravelly fine sandy loam.
PkA Perkins gravelly loam, 0 to 3 percent slopes.
Pm Perkins-Kimball gravelly loams, 0 to 3 percent slopes (Perkins part only).

If these soils are irrigated, they are suited to a wide range of orchard, row, and field crops. Deep-rooted crops grow well, and shallow-rooted crops also grow well if careful irrigation practices are used. On shallow-rooted crops the irrigation water should be applied in smaller amounts than on deep-rooted crops and more often. Short irrigation runs are best because the soils take water rapidly. In areas where these gravelly soils are intermingled with less permeable soils, such as in the Arbuckle-Tehama complex, irrigation may be difficult.

Organic matter is naturally low in these soils, but it can be increased if green-manure crops, crop residues, and crop rotations are used. Most crops on these soils respond if fertilizer that contains nitrogen and phosphate is applied, but a few may need potash, especially under intensive management.

Capability unit IIs–5

In this unit are deep, well-drained, fine-textured soils that have slow permeability. These soils are nearly level and are on flood plains and low terraces on alluvium from volcanic rock. The subsoil is clayey and restricts the growth of deep-rooted crops. Also, a tillage pan readily forms in these soils. The available water holding capacity is moderate to high, and natural fertility is moderate. Water penetrates the soils slowly. The soils are hard when dry, and if they are cultivated when wet, they compact and are hard and cloddy.

The following soils are in this unit:

Bg Berrendos clay loam, 0 to 3 percent slopes.
Fa Farwell clay loam, 0 to 3 percent slopes.

Slow penetration of irrigation water is the principal problem in managing these soils. If irrigated, these soils are well suited to pasture plants and to all orchard, row, and field crops except for deep-rooted plants. Walnuts and alfalfa grow better on soils that are more permeable than these soils. Almonds are difficult to grow because it generally is necessary to heat the orchard for protection from frost. Traffic on the soils when they are wet causes a tillage pan to form. Then when the soils are irrigated, the pan slows penetration of water. If a pan forms, however, it can be broken by chiseling. Fairly deep cuts can be made when leveling or grading is done without uncovering the clayey subsoil.

All methods of irrigation are suitable for these soils, but penetration of water is generally best if sprinklers or furrows are used. In orchards a system of furrows placed at right angles to the borders helps to slow movement of water across the field and thus increases penetration. Fairly long irrigation runs allow ample time for water to soak into the soil. Using green-manure crops, adding fertilizer, returning crop residues to the soils, and growing crops in rotation all help to maintain productivity. Most crops on these soils respond if fertilizer that contains nitrogen is applied, but prune trees that are heavy with fruit may also need potash.

Capability unit IIs–8

This unit consists of deep, well-drained, nearly level soils on alluvium from volcanic or sedimentary rocks. The areas are smooth and are along streams and on low terraces.

These soils are moderately permeable, but they are underlain at a depth of about 3 or 4 feet by a cobbly hardpan that is very slowly permeable. Available water capacity is moderate, and natural fertility is high. These soils are generally easy to work, but they become compact if worked when wet.

The following soils are in this unit:

Mzr Molinos fine sandy loam, deep over rock.
Vd Vina loam, deep, 0 to 3 percent slopes.

If these soils are irrigated, they are well suited to pasture plants and to many orchard, row, and field crops. Walnuts, alfalfa, and other deep-rooted plants are not suited. All irrigation methods are suitable for use on these soils. Runs should be short, and the water should be applied frequently and in small quantities. In this way accumulation of water above the hardpan can be avoided and high yields obtained.

Care is needed in leveling or grading areas of these soils to keep from making the soils too shallow and lowering yields. A tillage pan is likely to form in these soils, and livestock and machinery need to be kept off the areas when they are wet. If a tillage pan forms, it can be broken by chiseling.

The use of green-manure crops, crop residues, fertilizer, and crop rotations helps to maintain productivity. Most crops on these soils respond if fertilizer that contains nitrogen is added, but prunes may also need potash for satisfactory yields.

Capability unit IIIe–3

In this unit are moderately deep, gently sloping, well-drained soils that have a very slowly permeable subsoil. These soils are on smooth terraces on old alluvium derived from sedimentary rock. The dense clay subsoil limits the effective rooting depth, which is about 2 or 3 feet.

Permeability of these soils is slow to very slow. The available water holding capacity and natural fertility are moderate to low. Runoff is slow to medium, and the erosion hazard is generally moderate. The soils are easy to work, but they compact easily if they are cultivated or trampled when wet.

The following soils are in this unit:

HgB Hillgate loam, 3 to 8 percent slopes.
HhB Hillgate loam, shaly substratum, 0 to 8 percent slopes.
HmE Hillgate-Lodo complex, 3 to 50 percent slopes (Hillgate part only).
HtD Hillgate-Millsholm complex, 3 to 30 percent slope (Hillgate part only).
KoB Kimball gravelly loam, 3 to 8 percent slopes.
KpB Kimball loam, 3 to 8 percent slopes.

If these soils are irrigated, they are well suited to pasture plants, olives, and other shallow-rooted crops. They are

also suited to dryland grain, hay, and pasture. These soils are susceptible to erosion if irrigated or if used for dryland crops. Erosion caused by irrigation can be controlled by irrigating on the contour or by using sprinklers on the steeper slopes. Best results are obtained if small quantities of water are applied frequently. Cultivating and seeding across the slope, growing cover crops, and returning crop residues to the soil all help to control erosion on areas in dryland crops.

Most crops on these soils respond if fertilizer that contains nitrogen and phosphate is added. Growing crops in rotations helps to maintain yields. Satisfactory yields of forage can be obtained from irrigated pastures if the fields are grazed in rotation and if fertilizer is applied.

Capability unit IIIe–5

The soils in this unit are deep, gently sloping to undulating, and clayey. They are on high terraces or are on foothills in the uplands. These soils overlie soft, calcareous shale or sedimentary deposits. The surface soil shrinks and cracks when dry. Permeability is slow. The available moisture holding capacity and natural fertility are moderate. The soils are fairly easy to work unless they are dry. Runoff from higher lying soils is likely to cut gullies in areas of this soil, but the erosion hazard is otherwise slight.

The following soils are in this unit:

AcB Altamont clay, terrace, 3 to 10 percent slopes.
NcB Nacimiento-Altamont complex, 3 to 10 percent slopes (both parts).
NhB Nacimiento-Newville complex, 3 to 10 percent slopes (Nacimiento part only).

This soil is well suited to dryland grain and hay and range and pasture. If water is available, the gentler slopes are suitable for irrigated crops and for pasture. Irrigation is hazardous on the steeper slopes except by sprinklers. When the soil is dry, it takes water rapidly but after it becomes moist, permeability is slow and runoff increases. Wide cracks occur when the soil is dry, and preparing a seedbed is difficult.

In grainfields erosion can be controlled by seeding on the contour and by mixing stubble from the grain into the surface soil. Special practices are needed in some fields for the control of gully erosion. Growing soil-improving crops in a rotation, using green-manure crops, and adding fertilizer all help to maintain yields. Most crops on this soil respond if nitrogen fertilizer is applied.

Capability unit IIIw–5

Soils in this unit are nearly level and have slow or very slow permeability. These soils are deep or moderately deep and are in shallow basins on terraces and along minor narrow drainageways. They formed in fine-textured alluvium derived from sedimentary and volcanic rocks.

The available water holding capacity is low to moderate, and fertility is moderate. Penetration of these clayey soils by roots and moisture is difficult, and the soils are difficult to work. These soils are very plastic and sticky when wet and are very hard when dry. As they dry, they shrink and wide cracks form in them. Runoff is slow in some places.

The following soils are in this unit:

Af Anita clay, moderately deep.
Ag Anita clay, deep.
Ao Anita cobbly clay, moderately deep.
Ap Anita gravelly clay, moderately deep.
At Anita-Keefers complex, 0 to 3 percent slopes (Anita part only).
Bc Berrendos clay, 0 to 3 percent slopes.
Bd Berrendos clay, hardpan substratum, 0 to 3 percent slopes.
Cc Clear Lake clay.

These soils are better suited to irrigated row crops and pasture plants than to other uses. Nevertheless they are also used for dryland grain, hay, and pasture. All methods of irrigating are suitable, but sprinklers or furrows combined with borders apply the water at a rate that permits the soils to absorb it most rapidly. The irrigation water penetrates rapidly when the soils are dry and have cracks in them, but it moves into the soils slowly to very slowly when they are wet. Long irrigation runs allow the water ample time to soak into the soils. In places a system for disposing of excess water is needed for improved yields.

The use of crop rotations, green-manure crops, and crop residues helps to maintain yields and to improve tilth. Most crops on these soils respond if nitrogen fertilizer is added. Fertilizer containing other elements may be required, however, to maintain yields if the soils are used intensively.

Capability unit IIIs–3

In this unit are moderately deep, mostly well-drained, nearly level to very gently undulating soils, which have a subsoil that has slow to very slow permeability. Depth to the subsoil or substratum is about 2 or 3 feet. These soils are on high terraces on old alluvium derived mostly from sedimentary rock. Because of the relief, disposal of surface water is generally a problem. These soils are wet during the rainy season but are dry and hard during the summer. Wetness during the growing season is not generally enough to interfere with the growth of crops. Available moisture holding capacity is moderate to low, and natural fertility is generally also moderate to low.

The following soils are in this unit:

At Anita-Keefers complex, 0 to 3 percent slopes (Keefers part only).
Aw Arbuckle gravelly loam, clayey substratum, 0 to 3 percent slopes.
Ay Arbuckle gravelly loam, clayey substratum, channeled.
HgA Hillgate loam, 0 to 3 percent slopes.
Hk Hillgate gravelly loam, 0 to 3 percent slopes.
Hl Hillgate silt loam, 0 to 3 percent slopes.
Kf Keefers loam, 0 to 3 percent slopes.
Km Keefers loam, moderately deep, 0 to 3 percent slopes.
KoA Kimball gravelly loam, 0 to 3 percent slopes.
KpA Kimball loam, 0 to 3 percent slopes.
Mw Moda gravelly loam.
Mx Moda loam, 0 to 3 percent slopes.
Mz Molinos fine sandy loam, moderately deep over clay.
Pm Perkins-Kimball gravelly loams, 0 to 3 percent slopes (Kimball part only).

These soils are better suited to shallow-rooted, irrigated pasture plants, olives, and similar crops than to other uses. They are also suited to such dryland crops as grain, hay, and pasture. These soils are likely to become waterlogged when they are irrigated. Applying small quantities of water at frequent intervals helps to avoid waterlogging. Leveling and grading must be done with care to avoid uncovering the clayey subsoil. The soils can generally be graded so that the excess surface water drains

off, but in places a community drain involving several farms is needed for adequate removal of such water.

The use of crop rotations, green-manure crops, crop residues, and fertilizer helps maintain productivity. Most crops on these soils respond if fertilizer that contains nitrogen and phosphate is applied, but the Molinos soil may require nitrogen only. Productivity can be maintained in irrigated pastures if grazing is rotated and fertilizer is applied.

Capability unit IIIs–5

In this unit are nearly level clay soils that have slow permeability. These soils are deep or moderately deep and are in shallow basins and along minor drainageways. They developed in fine-textured alluvium derived from sedimentary rock. Runoff is slow in some areas, and permeability is slow. Penetration of roots and moisture is difficult. The soils are very plastic and sticky when wet and very hard when dry. As these soils dry, they shrink and wide cracks form, and they are then difficult to work. The available water holding capacity and natural fertility are moderate.

The following soils are in this unit:

AcA Altamont clay, terrace, 0 to 3 percent slopes.
Mzy Myers clay, 0 to 3 percent slopes.

These soils are better suited to irrigated row crops, pasture plants, and to such orchard crops as prunes and possibly pears than to other uses. They are, however, also used for dryland grain, hay, and pasture. All methods of irrigation are suitable, but sprinklers or furrows combined with borders apply the water at a rate that permits the soil to absorb it most rapidly. The irrigation water penetrates rapidly when the soils are dry and have cracks in them, but it moves into the soils slowly to very slowly when they are wet. Long irrigation runs allow the water ample time to soak into the soil. In places a system for disposing of excess water is needed for improved yields.

The use of crop rotations, green-manure crops, and crop residues helps to maintain productivity and to improve tilth. Most crops on these soils respond if fertilizer that contains nitrogen is added, but fertilizer that contains other elements may be needed to maintain yields under more intensive use.

Capability unit IIIs–8

Soils in this unit are moderately deep, nearly level, moderately well drained and well drained and are underlain by a hardpan. These soils are along streams and on low terraces on alluvial material derived from volcanic rock. Permeability of the subsoil is moderately slow to slow. Depth to the hardpan, which is very slowly permeable, is about 3 to 5 feet. The surface soil is generally clay loam, but the subsoil has slightly more clay. The available water holding capacity is moderate. The soils are sticky when wet and are hard when dry. They are fairly difficult to work.

The following soils are in this unit:

Bh Berrendos clay loam, hardpan substratum, 0 to 3 percent slopes.
Lm Los Robles clay loam, moderately deep, 0 to 3 percent slopes.

These soils are better suited to irrigated pasture plants, shallow-rooted row and field crops, and to such orchard crops as prunes and pears than to other uses. Because of their hardpan, careful irrigation is needed to avoid waterlogging. A pan forms readily in these soils when tillage is done or if irrigated pastures are grazed when wet. Leveling and grading must be carefully planned to avoid deep cuts that expose the clayey subsoil.

The use of green-manure crops, crop residues, crop rotations, and fertilizer helps maintain productivity. Most crops on these soils respond if fertilizer that contains nitrogen is applied. For high yields of forage from irrigated pastures, fertilizer is needed. In addition the fields should be divided into several units and each unit grazed in rotation.

Capability unit IIIs–9

In this unit are deep, well-drained, strongly acid soils that have low fertility. These soils are nearly level and are on high terraces underlain by the Red Bluff formation. They are reddish-brown soils that have a subsoil of clay loam or clay. In some places the soils are underlain by a cemented hardpan that is nearly impermeable. Permeability of the subsoil is generally moderate, and the available water holding capacity is also moderate. Runoff is slow, and there is no erosion hazard.

The following soils are in this unit:

Rb Red Bluff loam, 0 to 3 percent slopes.
Rg Red Bluff gravelly loam, 0 to 3 percent slopes.
Rh Red Bluff gravelly loam, hardpan substratum, 0 to 3 percent slopes.

Most areas of these soils are used for range or pasture, but a few are also used for irrigated pasture. Trees or brush need to be cleared from some areas before they can be cultivated. Because of their low fertility, these soils are suited only to strawberries or other specialty crops that produce enough returns to pay for the large amounts of fertilizer needed. If the nutrient deficiency is corrected and the soils are irrigated, a wide variety of crops can be grown and yields are satisfactory. Irrigation water, however, is not available to many areas of these soils, and dryland farming is not generally economical.

The water-holding capacity of these soils is lower than for most deep, medium-textured soils, and irrigation runs therefore need to be fairly short. Also the amount of water used needs to be smaller and should be applied at shorter intervals. The soils can be worked fairly soon after irrigation water is applied or after a rain without a tillage pan forming. Spring or winter harvesting of strawberries can consequently be done as needed. Leveling and grading must be done carefully to avoid uncovering the less fertile subsoil.

Use of green-manure crops, crop residues, and crop rotations helps to maintain productivity. Most crops on these soils need fertilizer that contains nitrogen and phosphate, and some require potash, lime and sulfur.

Capability unit IVe–1

In this unit are deep, well-drained, moderately steep soils. These soils are in mountainous areas on formations of volcanic or sedimentary rock. The subsoil of these soils is generally loam and clay loam. Rainfall is high in areas of these soils, and the growing season is short. Vegetation is mainly coniferous forest and associated shrubs.

The available water supplying capacity of these soils is high, and natural fertility is moderate. Permeability is moderate to moderately slow. The soils generally absorb water rapidly until saturated. Runoff is slow, and the erosion hazard is slight unless the soils are cleared and cultivated.

The following soils are in this unit:

AaD Aiken loam, 10 to 30 percent slopes.
CdD Cohasset loam, 10 to 30 percent slopes.
CeD Cohasset loam, very deep, 10 to 30 percent slopes.
LsD Lyonsville and Cohasset soils, 10 to 30 percent slopes (Cohasset part only).

This unit includes most of the highly productive timber soils in the county. Trees grow rapidly or very rapidly. Although these soils are very well suited to the production of timber, yields in many areas can be improved by pruning and thinning the trees and controlling fire, insects, and diseases.

If irrigation water is available, the less sloping areas of these soils could be cleared and used for orchards or irrigated pastures. Intensive practices are needed, however, for control of brush and trees, which reproduce rapidly unless seed sources are eliminated. Also stones need to be removed from a few areas. Orchards generally need a permanent cover for control of erosion. For satisfactory yields of forage, fertilizer that contains nitrogen and phosphate is needed. The pastures also require protection from deer.

Capability unit IVe-3

In this unit are well-drained, mostly gently sloping soils that are slowly to very slowly permeable. These soils are on high terraces. They have a claypan or other dense layer at a depth of about 2 or 3 feet, which restricts the effective rooting depth. Permeability of the subsoil is slow or very slow. The available water holding capacity and natural fertility are low to moderate. Runoff is slow to medium, and if these soils are cultivated, the hazard of erosion is severe. Many areas have hummocky microrelief, but the soils are fairly easy to work. A cultivation pan does not form readily unless the soils are worked when wet.

The following soils are in this unit:

CwB Corning gravelly loam, 3 to 8 percent slopes.
CxB2 Corning-Newville gravelly loams, 3 to 10 percent slopes, eroded (both parts).
CyB Corning-Redding gravelly loams, 0 to 5 percent slopes (Corning part only).
MsD Millsap loam, 10 to 30 percent slopes.
MvD Millsholm-Millsap complex, 10 to 30 percent slopes (Millsap part only).
NhB Nacimiento-Newville complex, 3 to 10 percent slopes (Newville part only).
NrB Newville gravelly loam, 3 to 10 percent slopes.
NrB2 Newville gravelly loam, 3 to 10 percent slopes, eroded.

These soils are better suited to a long rotation of pasture crops and an occasional grain crop than to other uses. Most areas are difficult to reach with irrigation water, but if water is available, these soils are fairly well suited to irrigated pasture. Because of the erosion hazard and relief, sprinklers are the best method to use in applying irrigation water. Erosion can be controlled if tillage is done across the slope. Yields of grain and forage are low, even if grown in a long rotation; they can be increased if fertilizer that contains nitrogen and phosphate is applied. Some areas are hummocky, and they need to be graded and smoothed before they can be farmed satisfactorily.

Capability unit IVe-4

Soils in this unit are well drained to excessively drained and are mostly moderately steep. These soils are at high elevations where the climate is cool and rainfall is fairly high. The surface layer and subsoil are typically gravelly loam or sandy loam. Most of the soils are underlain by volcanic bedrock at a depth of 3 or 4 feet. The vegetation is mainly coniferous forest and associated shrubs.

The available water supplying capacity of these soils is moderate to low. Permeability of the subsoil is moderate to rapid. Except for the Forward soil, which is highly susceptible to erosion, the hazard of erosion is slight unless the cover of vegetation is destroyed.

The following soils are in this unit:

CfD Cohasset gravelly loam, 10 to 30 percent slopes.
CvD Cone extremely gravelly sandy loam, 10 to 30 percent slopes.
EgB Elam very gravelly loamy sand, 0 to 8 percent slopes.
FoD Forward sandy loam, 10 to 30 percent slopes.
JoD Josephine gravelly loam, 10 to 30 percent slopes.
JsD Josephine-Sheetiron gravelly loams, 10 to 30 percent slopes (both parts).
LsD Lyonsville and Cohasset soils, 10 to 30 percent slopes (Lyonsville part only).
LvD Lyonsville and Jiggs gravelly sandy loams, 10 to 30 percent slopes (both parts).
MaD Manton sandy loam, 10 to 30 percent slopes.
MbD Masterson gravelly loam, 10 to 30 percent slopes.
MkD McCarthy sandy loam, 10 to 30 percent slopes.
SnD Sheetiron gravelly loam, 10 to 30 percent slopes.

Because of present economic conditions, these soils are better suited to trees than to other uses. Trees grow at medium or high rates, and the soils have gentle enough slopes that intensive woodland management practices are easy to use. Yields can be improved and timber of better quality can be obtained if pruning, thinning, and restocking are done with care. The stands also must be protected from fire and insects and diseases controlled.

In general the growing season is too short for most crops, but at lower elevations some of the soils could be cleared and planted to irrigated orchard or pasture. Irrigation water is not readily available in places.

Capability unit IVe-5

Soils in this unit are well drained, gently sloping to moderately steep, and clayey. These soils are in the western part of Tehama County. The texture in most areas is clay, and the soils are underlain by shale or sandstone bedrock, generally at a depth of 3 or 4 feet. The vegetation is mainly annual and perennial grasses, oak trees, and shrubs. Most areas are now cultivated or have been cultivated, though the more sloping areas are difficult to work.

Permeability of the subsoil is moderate to slow. Natural fertility is moderate. Runoff is slow to medium if the soils are under a cover of grass or other vegetation, but it is medium to rapid if the soils are cultivated. Gullies are likely to form in these soils if the cover is disturbed. The soils that have clay texture drain slowly in spring and are slow to warm up. They shrink when dry, and wide cracks form in them and make preparing a seedbed difficult.

The following soils are in this unit:

AbD Altamont clay, 10 to 30 percent slopes.
AcD Altamont clay, terrace, 10 to 30 percent slopes.
DbD Dibble silty clay loam, 10 to 30 percent slopes.
DgD Dibble-gullied land complex, 10 to 30 percent slopes.
DnD Dibble-Newville complex, 10 to 30 percent slopes (Dibble part only).
DxD Dibble-Newville-gullied land complex, 10 to 30 percent slopes (Dibble part only).
HtD Hillgate-Millsholm complex, 3 to 30 percent slopes (Millsholm part only).
LfD Lodo-Millsholm complex, 10 to 30 percent slopes (Millsholm part only).
MtD Millsholm clay loam, 10 to 30 percent slopes.
MvD Millsholm-Millsap complex, 10 to 30 percent slopes (Millsholm part only).
NaD Nacimiento silty clay loam, 10 to 30 percent slopes.
NaD2 Nacimiento silty clay loam, 10 to 30 percent slopes, eroded.
NcD Nacimiento-Altamont complex, 10 to 30 percent slopes (both parts).
NcD2 Nacimiento-Altamont complex, 10 to 30 percent slopes, eroded (both parts).
NhD Nacimiento-Newville complex, 10 to 30 percent slopes (Nacimiento part only).
NhD2 Nacimiento-Newville complex, 10 to 30 percent slopes, eroded (Nacimiento part only).
NvD Newville-Dibble complex, 10 to 30 percent slopes (Dibble part only).
NwD Newville-Dibble-gullied land complex, 10 to 30 percent slopes (Dibble-gullied land part only).
PrB Peters clay, 1 to 8 percent slopes.
PrD Peters clay, 8 to 30 percent slopes.
ScD Sehorn clay and clay loam, 10 to 30 percent slopes.
SmD Sehorn-Millsholm complex, 10 to 30 percent slopes (both parts).

These soils are better suited to dryland grain rotated with range or pasture than to other uses. Some of the areas need to be cleared of stones or trees before they can be cultivated. If irrigation water is available, the soils are suitable for irrigated pasture. When the soils are dry, they take in water rapidly, but after they are moist, penetration of water is moderate to slow. The steep, irregular slopes make sprinkling the best method of irrigating. Yields of forage are generally high if these soils are used for pasture or range.

Using a long rotation and farming across the slope generally control erosion, but areas that are gullied require special practices. Yields of crops grown in a long rotation can be maintained if fertilizer is applied. Grain crops on these soils generally require nitrogen, and irrigated pastures generally also require phosphate.

Capability unit IVe-8

Soils in this unit are moderately deep, well drained, gently sloping to sloping, and slowly permeable. These soils are on terraces or foot slopes that have smooth to hummocky relief. The surface soil is loam or fine sandy loam and is gravelly in places. These soils have a hardpan or bedrock at a depth of 18 to 48 inches. A few of the soils have stones scattered on the surface.

The available water holding capacity and fertility of these soils are low. Effective rooting depth is 18 to 48 inches. Runoff is slow to medium, and the erosion hazard is moderate.

The following soils are in this unit:

GnD Guenoc loam, 10 to 30 percent slopes.
LaB Laniger fine sandy loam, 0 to 8 percent slopes.
LbB Laniger fine sandy loam, deep, 0 to 8 percent slopes.
RnB Redding gravelly loam, 3 to 8 percent slopes.
RpD Redding-Newville complex, 3 to 30 percent slopes (Redding part only).

These soils are better suited to irrigated pasture than to other uses. Some of the more gently sloping areas are fairly well suited to dryland grain. Irrigation water is not available to many areas, and these areas ought to remain in dryland grain or pasture. Cobblestones and larger stones need to be removed from some of the soils before they can be cultivated. In places hummocks need to be smoothed to improve surface drainage. Sprinkler irrigation is best for these soils, because they require small amounts of water applied frequently. Irrigated forage also needs fertilizer that contains nitrogen and phosphate.

Capability unit IVw-5

Soils in this unit are shallow, imperfectly drained, nearly level, and very slowly permeable. These soils are along small, narrow drainageways and are on alluvium from volcanic rock.

The available water holding capacity and fertility of these soils are low. Penetration of the soils by roots and moisture is difficult. These soils are difficult to work. They are very plastic and sticky when wet and are very hard when dry. As they dry, they shrink and wide cracks form in them. Runoff is slow, and the erosion hazard is slight.

The following soils are in this unit:

Ad Anita clay.
An Anita cobbly clay.
AsB Anita stony clay, 0 to 8 percent slopes.

These soils are better suited to irrigated pasture than to other uses. They also are suitable for dryland pasture. All methods of irrigating are suitable, but sprinklers are best because water can be applied at a slower rate. The irrigation water penetrates the soils rapidly when they are dry and have cracks in them, but it moves into the soils slowly when they are wet. Long irrigation runs allow the water ample time to soak into the soils. In most places cobblestones and larger stones must be removed before the soils can be cultivated successfully.

Capability unit IVs-3

Soils in this unit are shallow, gently sloping, and very slowly permeable. These soils are on terraces that generally have hummocky relief. Their surface soil is mostly gravelly or cobbly loam, and their subsoil is gravelly clay. Some of the soils have a hardpan or claypan, generally at a depth of 1 or 2 feet.

The available water holding capacity and natural fertility of these soils are low. Effective depth for root development, which is about 18 to 24 inches, is restricted by very slow permeability in the pan. Runoff is slow, and the erosion hazard is slight. Although the Los Robles soil is moderately deep, it is included in this unit because it closely resembles the soils in this unit.

The following soils are in this unit:

CwA Corning gravelly loam, 0 to 3 percent slopes.
Ln Los Robles cobbly loam, moderately deep, 0 to 3 percent slopes.

These soils are better suited to irrigated pasture or to dryland grain rotated with pasture than to other uses. Irrigating is not feasible, however, unless the irrigation water available is inexpensive. Cobblestones need to be removed from nearly all of the soils before they are seeded to irrigated pasture. In places hummocks need to be smoothed to prevent water accumulating between the

mounds and standing in the areas all winter. Borders or sprinklers are suitable irrigation methods to use, depending on the smoothness of the field. If leveling is done, cuts must be shallow to avoid exposing the underlying pan. For high yields in irrigated areas, apply small amounts of water frequently. Irrigated forage generally also requires fertilizer that contains nitrogen and phosphate.

Capability unit IVs–4

In this unit are nearly level soils that are mostly gravelly and are very droughty. These soils are along streams, where they are subject to overflow; they are on recent alluvium washed from rocks of the Tehama formation and from sedimentary rocks. In some areas the soils are underlain by loose, stream-washed gravel. The available water holding capacity and natural fertility are low. Permeability is rapid. Runoff is slow, and erosion is not a hazard except along streambanks.

The following soils are in this unit:

Cz	Cortina gravelly fine sandy loam.
Czm	Cortina gravelly fine sandy loam, moderately deep.
Czs	Cortina very gravelly fine sandy loam.
Mo	Millrace cobbly fine sandy loam, 0 to 3 percent slopes.
Mp	Millrace gravelly fine sandy loam, 0 to 3 percent slopes.

These soils are best suited to irrigated orchards, pasture, and other crops. The water-holding capacity of the soils is so low that yields are seldom satisfactory if the soils are dryfarmed. Because of the coarse texture of the soils, the irrigation runs need to be short or overhead sprinklers should be used for irrigating. The irrigation water must be applied frequently. Crops on these soils respond if fertilizer that contains nitrogen is applied, and in places phosphate is also needed.

If leveling and grading is done, care is needed to avoid deep cuts that would uncover the very gravelly subsoil. Areas that are subject to overflow require a protective cover of close-growing crops in winter.

Capability unit IVs–8

Soils in this unit are well drained, shallow, gently sloping, and very slowly permeable. These soils are on terraces that have hummocky relief. The surface layer is gravelly or cobbly loam. The subsoil is gravelly clay underlain by a hardpan.

The available water holding capacity and natural fertility of these soils are low. Effective depth for root development, which is 18 to 24 inches, is restricted by the hardpan. Runoff is slow, and the erosion hazard is slight.

The following soils are in this unit:

CyB	Corning-Redding gravelly loams, 0 to 5 percent slopes (Redding part only).
Rm	Redding loam, 0 to 3 percent slopes.
RnA	Redding gravelly loam, 0 to 3 percent slopes.
TvB	Tuscan cobbly loam, moderately deep, 1 to 5 percent slopes.

These soils are better suited to irrigated pasture or to dryland pasture than to other uses, because irrigation water is available to only a few areas. Cobblestones need to be removed from some areas before they can be cultivated. Most areas are hummocky, and they need to be smoothed to improve surface drainage and yields. Sprinkler irrigation is generally best for these soils, but a few of the smoother areas can be irrigated by flooding. The irrigation water must be applied frequently and in small amounts. Crops on these soils respond if fertilizer that contains nitrogen and phosphate is applied.

Capability unit Vw–2

This unit consists only of Chummy soils, 0 to 3 percent slopes (Cb). These soils are deep and are poorly drained. They are in mountain meadows on alluvium derived mainly from volcanic rocks. In some areas the soils are gravelly. Permeability of the subsoil is generally moderately slow. Fertility is moderate. Runoff is very slow, and the soils are saturated with water during most of the year.

These soils are generally better suited to grazing than to other uses, but hay can be harvested from the drier areas. The amount and the quality of forage can be improved in some areas if water control is improved and fertilizer that contains nitrogen and phosphate is applied. Improving water control will in most places reduce the size of marshy areas.

Vegetation in the meadows best suited for grazing consists mainly of tufted hairgrass and smaller amounts of Kentucky bluegrass, meadow bluegrass, redtop, native clovers, sedges, yarrow, fivefinger, and dock. Vegetation in the wetter areas is mainly sedges and wiregrass, and in drier areas the vegetation is tarweed and other dryland forbs.

Capability unit VIe–1

In this unit are deep, well-drained, steep soils. These soils are in mountainous areas on volcanic rock. The surface layer is loamy and the subsoil is clay loam. In areas of these soils, annual rainfall is high and the growing season is short.

The available water supplying capacity of these soils is high. Natural fertility is moderate. These soils absorb water rapidly until they are saturated. Water moves moderately slowly through the subsoil. Runoff is medium to rapid, and the erosion hazard is very severe.

The following soils are in this unit:

CdE	Cohasset loam, 30 to 50 percent slopes.
CdF	Cohasset loam, 50 to 65 percent slopes.

These soils are too steep for cultivated crops and are best suited to timber. Trees grow rapidly, but the steep slopes make it difficult to harvest trees in some areas. In most areas yields can be improved by pruning and thinning the trees and by controlling fire, insects, and diseases.

Capability unit VIe–3

In this unit are well-drained, gently sloping to moderately steep, gravelly soils. These soils are in the uplands. They formed in material from various kinds of rock. The soils on the east side of the county formed in material from volcanic rock, and those on the west side of the Sacramento River formed over shale or in gravelly sediments from the Tehama formation. Grasses and oaks make up the vegetation.

The texture of the subsoil is generally fine sandy loam or clay loam. In most places the subsoil is moderately to slowly permeable. Some areas, however, are underlain by bedrock that is very slowly permeable. The available water supplying capacity ranges from low to moderately low. The effective rooting depth is shallow to deep, and natural fertility is low to moderate. Relief generally is hilly, and runoff is rapid. The erosion hazard is severe in

most areas, but in a few areas it is only slight. The soils in overgrazed areas are susceptible to gullying.

The following soils are in this unit:

DnD Dibble-Newville complex, 10 to 30 percent slopes (Newville part only).
DnE Dibble-Newville complex, 30 to 50 percent slopes (Newville part only).
DxD Dibble-Newville-gullied land complex, 10 to 30 percent slopes (Newville part only).
DxE Dibble-Newville-gullied land complex, 30 to 50 percent slopes (Newville part only).
MsE Millsap loam, 30 to 50 percent slopes.
MvE Millsholm-Millsap complex, 30 to 50 percent slopes (Millsap part only).
NhD Nacimiento-Newville complex, 10 to 30 percent slopes (Newville part only).
NhD2 Nacimiento-Newville complex, 10 to 30 percent slopes, eroded (Newville part only).
NhE Nacimiento-Newville complex, 30 to 50 percent slopes (Newville part only).
NhE2 Nacimiento-Newville complex, 30 to 50 percent slopes, eroded (Newville part only).
NrD Newville gravelly loam, 10 to 30 percent slopes.
NrD2 Newville gravelly loam, 10 to 30 percent slopes, eroded.
NrE Newville gravelly loam, 30 to 50 percent slopes.
NrE2 Newville gravelly loam, 30 to 50 percent slopes, eroded.
NvD Newville-Dibble complex, 10 to 30 percent slopes (Newville part only).
NvE Newville-Dibble complex, 30 to 50 percent slopes (Newville part only).
NwD Newville-Dibble-gullied land complex, 10 to 30 percent slopes (Newville part only).
NwE Newville-Dibble-gullied land complex, 30 to 50 percent slopes (Newville part only).
NxD Newville-Laniger complex, 10 to 30 percent slopes (Newville part only).
PaD Parrish gravelly loam, 10 to 30 percent slopes.
PsE Peters-Newville complex, 30 to 50 percent slopes (Newville part only).
RpD Redding-Newville complex, 3 to 30 percent slopes (Newville part only).

These soils are better suited to grazing than to other uses. Yields of forage are low to fair, but they can be improved in places if trees and brush are cleared from the areas. In places on some of the gentler slopes it is feasible to seed the areas and apply fertilizer. Areas best suited to grazing support vegetation consisting of soft chess, wild oats, needlegrass, pine bluegrass, melic, hill lotus, and annual clover. Less desirable plants are filaree, annual fescue, red brome, ripgut brome, three-awn, and lupine. In places there are medusahead, fiddleneck, prickly phlox, ceanothus, manzanita, and other undesirable plants. In overgrazed areas the less desirable and the undesirable plants are dominant.

Capability unit VIe-4

This unit consists of moderately deep to deep, well-drained to excessively drained, mostly gravelly soils. These soils are in the uplands under a forest of coniferous trees and shrubs. In the eastern part of the county, the soils formed in material from volcanic rock. The soils west of the Sacramento River formed in material derived from metamorphosed rock or are underlain by sandstone or shale.

Permeability is moderate to rapid. The available water supplying capacity is low to moderate. Slopes are steep, but erosion is slight unless the vegetation is destroyed. In most places the subsoil is similar to the surface soil in texture or is slightly more clayey.

The following soils are in this unit:

CfE Cohasset gravelly loam, 30 to 50 percent slopes.
CvE Cone extreme y gravelly sandy loam, 30 to 50 percent slopes.
HuE Hugo gravelly sandy loam, 30 to 50 percent slopes.
JoE Josephine gravelly loam, 30 to 50 percent slopes.
JoE2 Josephine gravelly loam, 30 to 50 percent slopes, eroded.
JsE Josephine-Sheetiron gravelly loams, 30 to 50 percent slopes (both parts).
LvE Lyonsville and Jiggs gravelly sandy loams, 30 to 50 percent slopes (both parts).
MkE McCarthy sandy loam, 30 to 50 percent slopes.
SnE Sheetiron gravelly loam, 30 to 50 percent slopes.
WgD Windy gravelly sandy loam, 10 to 30 percent slopes.
WgE Windy gravelly sandy loam, 30 to 50 percent slopes.

These soils are better suited to trees than to other uses. Trees grow at medium to rapid rates on most of the soils. These soils are too steep and droughty for cultivated crops. Also they occur at high elevations where the growing season is short. Timber production can be improved by pruning and thinning the trees and by controlling fire, insects, and diseases.

Capability unit VIe-5

In this unit are well-drained, mostly steep, clayey soils that are in the uplands. These soils are underlain by sandstone, shale, or basalt. The surface soil and subsoil are similar in texture and generally contain lime. A few areas are stony. Most of the soils are strongly calcareous, especially in the subsoil. The imperfectly drained Burris soil is included in this unit because of similar texture, slope, and erosion hazard.

All of the soils in this unit are slowly permeable. The available moisture supplying capacity is moderate, and the soils absorb water rapidly when dry. Effective soil depth is generally moderately deep. Runoff is medium to rapid, and erosion is likely to be severe on overgrazed areas. Some of the overgrazed areas have been invaded by medusahead wildrye, an undesirable grass.

The following soils are in this unit:

AbE Altamont clay, 30 to 50 percent slopes.
AcE Altamont clay, terrace, 30 to 50 percent slopes.
BuD Burris stony clay, 10 to 30 percent slopes.
DbE Dibble silty clay loam, 30 to 50 percent slopes.
DgE Dibble-gullied land complex, 30 to 50 percent slopes.
DnE Dibble-Newville complex, 30 to 50 percent slopes (Dibble part only).
DxE Dibble-Newville-gullied land complex, 30 to 50 percent slopes (Dibble part only).
LfE Lodo-Millsholm complex, 30 to 50 percent slopes (Millsholm part only).
MtE Millsholm clay loam, 30 to 50 percent slopes.
MvE Millsholm-Millsap complex, 30 to 50 percent slopes (Millsholm part only).
NaE Nacimiento silty clay loam, 30 to 50 percent slopes.
NaE2 Nacimiento silty clay loam, 30 to 50 percent slopes, eroded.
NcE2 Nacimiento-Altamont complex, 30 to 50 percent slopes, eroded (both parts).
NhE Nacimiento-Newville complex, 30 to 50 percent slopes (Nacimiento part only).
NhE2 Nacimiento-Newville complex, 30 to 50 percent slopes, eroded (Nacimiento part only).
NvE Newville-Dibble complex, 30 to 50 percent slopes (Dibble part only).
NwE Newville-Dibble-gullied land complex, 30 to 50 percent slopes (Dibble-gullied land part only).
PrD2 Peters clay, 8 to 30 percent slopes, eroded.
PrE Peters clay, 30 to 50 percent slopes.
PsE Peters-Newville complex, 30 to 50 percent slopes (Peters part only).
ScE Sehorn clay and clay loam, 30 to 50 percent slopes (both parts).

ShE Sehorn-Altamont clays, 30 to 50 percent slopes (both parts).
SmE Sehorn-Millsholm complex, 30 to 50 percent slopes (both parts).

These soils are better suited to grazing than to other uses. Yields of forage are fair to good if good management is used. Brush and trees need to be cleared from some of the soils. Selected areas are suitable for seeding, and plants on some areas respond if fertilizer is applied.

Areas of these soils that are best suited to grazing have vegetation made up of burclover, wild oats, soft chess, and other desirable annuals and a few perennial grasses, such as needlegrass and oniongrass. There are also smaller numbers of annual fescue, wild barley, filaree, lupine, and other less desirable plants. In addition there are medusahead, tarweed, star-thistle, and a few other undesirable plants. On some overgrazed areas there are nearly solid stands of medusahead, the control of which is a serious problem.

Capability unit VIe–8

In this unit are well-drained, sloping to steep, loamy or gravelly soils. These soils are in the uplands under oaks, shrubs, and grasses. They have a subsoil of fine sandy loam or gravelly loam.

Permeability of these soils is moderate. The available water supplying capacity and fertility are low to moderate. Runoff is medium to rapid, and the erosion hazard is moderate to severe.

The following soils are in this unit:

HvD Hulls gravelly loam, 10 to 30 percent slopes.
HvE Hulls gravelly loam, 30 to 50 percent slopes.
LaD Laniger fine sandy loam, 8 to 30 percent slopes.
LaE Laniger fine sandy loam, 30 to 50 percent slopes.
NxD Newville-Laniger complex, 10 to 30 percent slopes (Laniger part only).

These soils are better suited to grazing than to other uses. Yields of forage are low to fair, but they can be improved in places if trees and brush are cleared from the areas.

Areas of these soils that are best suited to grazing have vegetation of soft chess, wild oats, needlegrass, pine bluegrass, melic, hill lotus, and annual clover. Less desirable plants are filaree, annual fescue, red brome, ripgut brome, three-awn, and lupine. In places there are fiddleneck, ceanothus, manzanita, and other undesirable plants. In overgrazed areas the less desirable plants and the undesirable plants are dominant.

Capability unit VIw–1

In this unit are soils that are flooded annually and have a severe hazard of erosion. The areas are along the Sacramento River and its tributaries. Most of the soils are well drained and all are subirrigated. All of the soils are subject to scouring because of flooding, and erosion is likely to be severe if the soils are left bare of vegetation during winter. Most of the soils are stratified. The texture of the surface soil varies greatly within short distances but is generally sandy. Many areas are traversed by a network of flood channels. The soils along the smaller streams are more uniform than those along the larger streams. In some areas the subsoil is clay or clay loam.

Because of the variability in texture of these soils, permeability ranges from rapid to very slow. The available water supplying capacity varies, according to the texture and the depth to a water table.

The following soils are in this unit:

Cu Columbia complex, channeled.
Czx Cortina complex.
Kn Keefers complex, channeled.
Mr Millrace complex, channeled.
Mzt Molinos complex, channeled.

These soils are better suited to pasture and range than to other uses. Yields of forage are generally fair to good, and the higher yields are from soils along the principal streams. Yields generally are lower on the Keefers and Cortina soils than on the other soils in this unit, because their water supplying capacity is lower.

On the soils best suited to pasture and range, the plant cover is made up of blue wildrye, needlegrass, oniongrass, wild oats, soft chess, clover, and similar desirable plants. Less desirable plants are red brome, squirreltail, filaree, wild buckwheat, star-thistle, and tarweed. Soils that produce lower yields have a larger proportion of the less desirable plants. Yields along major streams could be improved in places by removing blackberries, wild grapes, and brush. It is feasible to add fertilizer to some of the soils. Other soils are suitable for clearing and seeding to forage plants of better quality. If protected by levees, some areas of these soils could be used more intensively.

Capability unit VIs–1

Soils in this unit are moderately deep to deep, mostly rolling to steep, well drained, and stony. They are in the uplands. The soils are underlain by volcanic rocks. Coniferous forest and shrubs make up the vegetation.

Permeability of these soils is moderate. The available water supplying capacity is also moderate. The soils are porous, and runoff is slow to medium. Erosion is slight unless the vegetation is destroyed. The subsoil is more clayey than the surface soil.

The following soils are in this unit:

CgD Cohasset stony loam, 10 to 30 percent slopes.
CgE Cohasset stony loam, 30 to 50 percent slopes.

These soils are better suited to trees than to other uses; trees grow on them at medium to rapid rates. Erosion generally is not a severe hazard. Careful logging is needed, however, on the steeper slopes of the Cohasset soils for the control of erosion. On most of these soils, the quantity and quality of the timber can be improved by thinning and pruning the trees and by controlling fire, insects, and diseases.

Capability unit VIs–7

This unit consists of well-drained, mostly gently sloping to steep soils that are generally rocky or stony. These soils are in the uplands under forest. They are generally underlain by volcanic bedrock. Some of the soils, however, formed in material from shaly sedimentary rock. The surface soil and subsoil are similar in texture.

Permeability of these soils is rapid. The available water supplying capacity is low to moderate. Runoff and erosion are slight unless the cover of vegetation has been destroyed.

The following soils are in this unit:

ChD2 Cohasset stony loam, moderately deep, 10 to 30 percent slopes, eroded.
DyD Dubakella stony loam, 10 to 30 percent slopes.
DyE Dubakella stony loam, 30 to 50 percent slopes.
IkD Inskip very rocky silt loam, 10 to 30 percent slopes.
IkE Inskip very rocky silt loam, 30 to 50 percent slopes.

ImD Inskip very rocky silt loam, moderately deep, 10 to 30 percent slopes.
JgD Jiggs stony sandy loam, 10 to 30 percent slopes.
JgE Jiggs stony sandy loam, 30 to 50 percent slopes.
LtD Lyonsville and Cohasset stony soils, 10 to 30 percent slopes (both parts).
LyD Lyonsville and Jiggs stony sandy loams, 10 to 30 percent slopes (both parts).
LyE Lyonsville and Jiggs stony sandy loams, 30 to 50 percent slopes (both parts).
MmE McCarthy stony sandy loam, 30 to 50 percent slopes.
MnE McCarthy-Iron Mountain complex, 30 to 50 percent slopes (McCarthy part only).
NkB Nanny stony loam, 0 to 8 percent slopes.
NmB Nanny stony loam, moderately deep, 0 to 8 percent slopes.
NnD Neuns stony loam, 10 to 30 percent slopes.
NnE Neuns stony loam, 30 to 50 percent slopes.
NpE Neuns-Dubakella complex, 30 to 50 percent slopes (both parts).
SrE Sheetiron rocky loam, 30 to 50 percent slopes.
TfD Toomes rocky loam,10 to 30 percent slopes.
WnD Windy rocky sandy loam, 10 to 30 percent slopes.
WnE Windy rocky sandy loam, 30 to 50 percent slopes.
WsD Windy stony sandy loam, 10 to 30 percent slopes.
WsE Windy stony sandy loam, 30 to 50 percent slopes.

These soils are better suited to trees than to other uses. They are too steep and rocky for satisfactory production of cultivated crops. Trees grow at a medium rate. Nevertheless the quantity and quality of timber can be improved by pruning and thinning the trees and by controlling fire, insects, and diseases.

Capability unit VIs–8

Soils of this unit are moderately deep, well drained, moderately steep to steep, and mostly rocky, stony, or cobbly. These soils are in the uplands under annual grasses, scattered perennial grasses, shrubs, and a few oaks and Digger pines. The soils are underlain by volcanic rock. The surface soil and subsoil are generally similar in texture or the subsoil is slightly more clayey.

Permeability of the subsoil is moderate, and water moves very slowly through the bedrock. The available water supplying capacity is low, and effective rooting depth is generally about 2 to 4 feet. Runoff is generally slow to rapid, and the hazard of erosion is slight to moderate.

The following soils are in this unit:

GnE Guenoc loam, 30 to 50 percent slopes.
GsD Guenoc stony loam, 10 to 30 percent slopes.
GsE Guenoc stony loam, 30 to 50 percent slopes.
IcD Inks cobbly loam, 3 to 30 percent slopes.
IcE Inks cobbly loam, 30 to 50 percent slopes.
IxE Iron Mountain-Supan complex, 30 to 50 percent slopes (Supan part only).
Kc Keefers cobbly loam, moderately deep, 0 to 3 percent slopes.
SuD Supan stony loam, 10 to 30 percent slopes.
SuE Supan stony loam, 30 to 50 percent slopes.
TmD Toomes-Supan rocky loams, 10 to 30 percent slopes (Supan part only).
TmE Toomes-Supan rocky loams, 30 to 50 percent slopes (Supan part only).
TnD Toomes-Supan rocky complex, 10 to 30 percent slopes (Supan part only).
TnE Toomes-Supan rocky complex, 30 to 50 percent slopes (Supan part only).
ToE Toomes-Supan extremely rocky complex, 10 to 50 percent slopes (Supan part only).

These soils are better suited to pasture and range than to other uses, and yields of forage are generally low to fair. On most areas the cover is a fairly dense stand of brush and scattered Digger pines and oaks. Desirable forage plants are soft chess, wild oats, clover, needlegrass, melic, and a few other perennial grasses. Brush crowds out the desirable grasses if the soils are overgrazed or burned. Clearing trees and brush would improve the forage on most of the areas. Selected areas of the Guenoc soils are suitable for clearing and seeding to improved legumes and grasses.

Capability unit VIIe–3

In this unit are shallow to moderately deep, well-drained, steep to very steep soils. These soils are on hills in the western part of Tehama County. The subsoil is more clayey than the surface soil, which generally is gravelly. Scattered annual grasses and dense stands of oaks and shrubs make up the vegetation on most of these soils.

The available water supplying capacity of these soils is low to moderate. Water moves through the subsoil slowly and through the bedrock very slowly. Runoff is rapid to very rapid, and the erosion hazard is severe to very severe.

The following soils are in this unit:

MsF Millsap loam, 50 to 65 percent slopes.
MvF Millsholm-Millsap complex, 50 to 65 percent slopes (Millsap part only)
NrF Newville gravelly loam, 50 to 65 percent slopes.
PaE Parrish gravelly loam, 30 to 50 percent slopes.
PaF Parrish gravelly loam, 50 to 65 percent slopes.
PgE Parrish-Los Gatos gravelly loams, 30 to 50 percent slopes (Parrish part only).
TeF Terrace escarpments.

These soils are better suited to grazing and browse than to other uses. Yields of forage are generally low to very low. Soft chess, wild oats, filaree, annual fescue, ripgut brome, and lupine are on the soils best suited to range.

Capability unit VIIe–4

In this unit are shallow to moderately deep, well-drained, steep to very steep, gravelly soils. These soils are in mountainous areas. They are generally underlain by volcanic rock, but the soils in the western part of the county are underlain by sedimentary rock or greenstone. The vegetation is coniferous forest and shrubs.

The available water supplying capacity of these soils is moderate to low, and intake of water is generally rapid. Runoff is slow unless the vegetative cover has been destroyed. Erosion is generally slight, but is severe after a fire or if logging is carelessly done. The Josephine soil is particularly susceptible to erosion.

The following soils are in this unit:

HuF Hugo gravelly sandy loam, 50 to 65 percent slopes.
JoF2 Josephine gravelly loam, 50 to 65 percent slopes, eroded.
LvF Lyonsville and Jiggs gravelly sandy loams, 50 to 65 percent slopes (both parts).
MkF McCarthy sandy loam, 50 to 65 percent slopes.
SnF Sheetiron gravelly loam, 50 to 65 percent slopes.

These soils are better suited to trees than to other uses; trees grow on them at medium to slow rates. Unless logging is done very carefully, the hazard of erosion is severe.

Capability unit VIIe–5

In this unit are well-drained, shallow to moderately deep, very steep soils on sedimentary rocks. These soils are on hills in the western part of Tehama County. The surface soil and subsoil are clay loam. Scattered to dense stands of oak and brush make up the vegetation.

The available water supplying capacity of these soils is low. Water moves slowly through the subsoil and very slowly through the bedrock. Fertility is low, runoff is rapid, and the erosion hazard is severe.

The following soils are in this unit:

LfF Lodo-Millsholm complex, 50 to 65 percent slopes (Millsholm part only).
MtF Millsholm clay loam, 50 to 65 percent slopes.
MvF Millsholm-Millsap complex, 50 to 65 percent slopes (Millsholm part only).

These soils are better suited to grazing than to other uses. Yields of forage are low to very low. Soft chess, wild oats, burclover, and scattered perennial grasses grow on the soils best suited to grazing. Less desirable plants are filaree, annual fescue, ripgut brome, and lupine. In places are nitgrass, medusahead, tarweed, fiddleneck, and other undesirable plants.

Capability unit VIIe–8

Soils in this unit are shallow, well drained, moderately steep to very steep, and gravelly. These soils are in the uplands on ridgetops and on upper and lower slopes of canyons. The available water holding capacity is low. Fertility is moderate to low, and most areas are covered by thick stands of chamise brush. The underlying bedrock is slowly permeable, and runoff is rapid to very rapid. The erosion hazard is moderate to severe.

The following soils are in this unit:

HvF Hulls gravelly loam, 50 to 65 percent slopes.
LgE Los Gatos gravelly loam, 30 to 50 percent slopes.
LgF Los Gatos gravelly loam, 50 to 65 percent slopes.
LhE Los Gatos-Maymen gravelly loams, 30 to 65 percent slopes (Los Gatos part only).
PgE Parrish-Los Gatos gravelly loams, 30 to 50 percent slopes (Los Gatos part only).
TyD Tyson gravelly sandy loam, 10 to 30 percent slopes.
TyE Tyson gravelly sandy loam, 30 to 50 percent slopes.

These soils are used for limited grazing and browse. They are best suited for wildlife, recreation, and watershed. Removal of brush and reseeding with forage plants that can compete with the brush helps to improve the use of these soils. Only a few small test areas of the gently sloping, deeper soils have been improved.

Capability unit VIIs–1

In this unit are shallow or moderately deep, well-drained, very steep, stony and rocky soils. These soils are in mountainous areas. They generally are underlain by volcanic rock, but in the western part of the county they are underlain by sedimentary rock or greenstone. Coniferous forest and shrubs make up the vegetation.

The available water supplying capacity of these soils is moderate to low, and intake of water is generally rapid. Runoff is slow unless the cover of vegetation has been destroyed. Erosion is generally slight, but it is likely to be severe after a fire or if logging is done carelessly. The Jiggs soils are particularly susceptible to erosion.

The following soils are in this unit:

JgF Jiggs stony sandy loam, 50 to 65 percent slopes.
JgF2 Jiggs stony sandy loam, 50 to 65 percent slopes, eroded.
LyF Lyonsville and Jiggs stony sandy loams, 50 to 65 percent slopes (both parts).
MmF McCarthy stony sandy loam, 50 to 65 percent slopes.
NnF Neuns stony loam, 50 to 65 percent slopes.
NoF Neuns stony loam, deep, 50 to 65 percent slopes.
SrF Sheetiron rocky loam, 50 to 65 percent slopes.
WnF Windy rocky sandy loam, 50 to 65 percent slopes.
WsF Windy stony sandy loam, 50 to 65 percent slopes.
YbE Yollabolly very rocky loam, 30 to 65 percent slopes.

These soils are better suited to trees than to other uses; trees grow at medium to slow rates. Erosion is severe unless logging is done very carefully.

Capability unit VIIs–4

Soils in this unit are shallow or moderately deep and well drained to excessively drained. These soils are rocky, stony, or gravelly and are in the uplands under forest. The forest is coniferous and has brushfields in the openings. These soils have fairly gentle slopes. Except for the Childs and Elam soils, which formed in coarse-textured, gravelly alluvium, the soils are underlain by volcanic rock or serpentine.

All of these soils have low available water supplying capacity. The intake of water into the soils is rapid, and there is generally little runoff. Erosion is correspondingly low except on some of the steeper slopes.

The following soils are in this unit:

CaC Childs gravelly loam, 5 to 15 percent slopes.
EmB Elam very gravelly loamy sand, moderately deep, 0 to 8 percent slopes.
Ew Elam very gravelly loamy sand, imperfectly drained variant, 0 to 3 percent slopes.
ImE Inskip very rocky silt loam, moderately deep, 30 to 50 percent slopes.
JgD2 Jiggs stony sandy loam, 10 to 30 percent slopes, eroded.
JgE2 Jiggs stony sandy loam, 30 to 50 percent slopes, eroded.
WrE2 Windy rocky sandy loam, moderately deep, 10 to 50 percent slopes, eroded.
YbD Yollabolly very rocky loam, 10 to 30 percent slopes.

These soils are better suited to trees than to other uses. Trees, however, grow at a slow rate. Some of the more accessible soils are suitable for production of Christmas trees.

Capability unit VIIs–7

Soils in this unit are very shallow to shallow and are well drained to excessively drained. These soils are stony or rocky to extremely rocky and are in the uplands. Nearly all of the soils are underlain by volcanic bedrock, but some are underlain by bedrock of shale or serpentine. In most areas the relief is characteristic of old dissected terraces. Slopes range from gentle on the ridgetops to steep or very steep on the side slopes.

The available water supplying capacity of these soils is low. During the more intense storms in the area, the soils fill fairly quickly with water, and runoff then is rapid. The soils are relatively stable, however, and erosion is generally slight. Runoff from these soils brings most of the floods caused by overflow of Antelope, Mill, and Deer Creeks.

The following soils are in this unit:

CkF Colluvial land, volcanic rocks.
GgE Goulding stony loam, 30 to 50 percent slopes.
HmE Hillgate-Lodo complex, 3 to 50 percent slopes (Lodo part only).
IrD Iron Mountain rocky sandy loam, 10 to 30 percent slopes.
IrE Iron Mountain rocky sandy loam, 30 to 50 percent slopes.
IrF Iron Mountain rocky sandy loam, 50 to 65 percent slopes.
IsE Iron Mountain stony loam, 30 to 50 percent slopes.

IxE Iron Mountain-Supan complex, 30 to 50 percent slopes (Iron Mountain part only).
LdD2 Lodo and Maymen shaly loams, 10 to 30 percent slopes, eroded (both parts).
LfD Lodo-Millsholm complex, 10 to 30 percent slopes (Lodo part only).
LfE Lodo-Millsholm complex, 30 to 50 percent slopes (Lodo part only).
MnE McCarthy-Iron Mountain complex, 30 to 50 percent slopes (Iron Mountain part only).
MuE Millsholm rocky sandy loam, 30 to 50 percent slopes.
MuF Millsholm rocky sandy loam, 50 to 65 percent slopes.
TfE Toomes rocky loam, 30 to 50 percent slopes.
TgD Toomes very rocky loam, 10 to 30 percent slopes.
TgE Toomes very rocky loam, 30 to 50 percent slopes.
ThE Toomes extremely rocky loam, 1 to 50 percent slopes.
TkB Toomes very rocky silt loam, 1 to 10 percent slopes.
TkD Toomes very rocky silt loam, 10 to 30 percent slopes.
TmD Toomes-Supan rocky loams, 10 to 30 percent slopes (Toomes part only).
TmE Toomes-Supan rocky loams, 30 to 50 percent slopes (Toomes part only).
TnD Toomes-Supan rocky complex, 10 to 30 percent slopes (Toomes part only).
TnE Toomes-Supan rocky complex, 30 to 50 percent slopes (Toomes part only).
ToE Toomes-Supan extremely rocky complex, 10 to 50 percent slopes (Toomes part only).

These soils are better suited to grazing than to other uses. On the soils best suited to grazing, the vegetation is mainly wild oats, soft chess, clover, filaree, a few perennial grasses, and other desirable forage plants. There are also red brome, annual fescue, ripgut brome, annual barley, and similar less desirable plants. Undesirable plants are wild mustard, wild buckwheat, tarweed, goldfields, and similar plants. Brush grows in dense patches, and there are generally a few scattered oak trees. Yields of forage are generally low to very low. The grazing season is long because the soils that face south warm up early in the season and thus produce forage early in the season. Forage is produced somewhat later on the ridgetops, and even later on soils that face north.

Capability unit VIIs–8

In this unit are very shallow to moderately deep, well-drained, nearly level to gently sloping soils underlain by a hardpan. These soils are on terraces that characteristically have hummocky relief. The texture of the surface soil is mostly cobbly, stony, very stony, or gravelly loam and clay loam. The soils have a subsoil of slowly permeable clay that rests abruptly on a nearly impermeable, indurated hardpan.

The available water supplying capacity of these soils is low. Water stands in areas between the hummocks during most of the winter. Fertility is low to medium. Runoff is slow, and erosion is slight.

The following soils are in this unit:

Ro Redding gravelly loam, very shallow, 0 to 3 percent slopes.
TsB Tuscan loam, 1 to 5 percent slopes.
TtB Tuscan clay loam, 1 to 8 percent slopes.
TuB Tuscan cobbly loam, 1 to 5 percent slopes.
TwB Tuscan stony loam, 1 to 5 percent slopes.
TxC Tuscan very stony loam, 3 to 15 percent slopes.

These soils are better suited to grazing than to other uses. In areas best suited to grazing, where the soils are moderately deep, the vegetation is soft chess, wild oats, clover, and other desirable plants. Less desirable plants, such as filaree, red brome, and annual fescue, also grow in small amounts; and a few undesirable plants, such as turkeymullein, nitgrass, fiddleneck, and tarweed, are on the areas. Most areas of these soils have been used for grazing in winter and are severely overgrazed. Here the vegetation is mostly forbs, and production is generally very low.

Capability unit VIIs–9

Henneke stony loam, 10 to 30 percent slopes (HeD) is the only soil in this unit. It is well drained and is in the uplands on serpentine. The vegetation is mostly shrubs.

Permeability of this soil is moderately slow. The available water supplying capacity is low, and fertility is very low. This soil tends to slip when it is saturated.

This soil is better suited to grazing and browse than to other uses. Because of the very low fertility, annual grasses are sparse among the shrubs on this soil. Roads across areas of this soil may need excessive maintenance because of landslides.

Capability unit VIIIe–8

Tyson gravelly sandy loam, 50 to 65 percent slopes (TyF) is the only soil in this unit. It is well drained, very shallow to shallow and very steep. This soil is in the uplands, and most areas are covered with chamise brush. The underlying bedrock is slowly permeable shale. Runoff is medium to very rapid, and erosion is moderate to severe. During heavy storms much water and sediment from this soil washes into streams on the west side of the county. Natural fertility of this soil is moderate to low.

This soil is better suited to wildlife, watershed, and recreation than to other uses.

Capability unit VIIIw–4

One miscellaneous land type, Riverwash (Rr), is in this unit. It consists of gravel bars and of sandy land deposited by streams along rivers and smaller streams. Constructing levees in places on this land type would help to protect adjacent areas from scouring during floods.

Capability unit VIIIs–8

Soils in this unit are shallow, well drained, moderately steep to very steep, and mostly rocky or stony. These soils are in the uplands and are underlain by various kinds of bedrock. Runoff is medium to very rapid, and erosion is severe in some places.

The following soils are in this unit:

ClF Colluvial land, sedimentary rocks.
GgF Goulding stony loam, 50 to 65 percent slopes.
LdE2 Lodo and Maymen shaly loams, 30 to 65 percent slopes, eroded (both parts).
LfF Lodo-Millsholm complex, 50 to 65 percent slopes (Lodo part only).
LhE Los Gatos-Maymen gravelly loams, 30 to 65 percent slopes (Maymen part only).
MbgE Maymen and Lodo gravelly loams, 30 to 65 percent slopes (both parts).
RtF Rock land.
RuF Rubble land.
StE Stonyford stony loam, 30 to 50 percent slopes.
StF Stonyford stony loam, 50 to 65 percent slopes.

These soils are suitable only for wildlife, watershed, and recreation. Some areas require protection from fire.

Capability unit VIIIs–9

Soils in this unit are very shallow and stony. They are in the uplands and are underlain by serpentine bedrock.

Runoff is medium to very rapid, and the hazard of landslides is severe in places.

The following soils are in this unit:

HeE Henneke stony loam, 30 to 65 percent slopes.
HfD Henneke stony loam, landslips, 10 to 30 percent slopes.
HfE Henneke stony loam, landslips, 30 to 65 percent slopes.

These soils are suitable only for wildlife, watershed, and recreation. Some areas need protection from fire. Locating roads across areas of these soils is costly and hazardous because of landslides.

Crop Management [21]

The climate in the Sacramento Valley part of Tehama County is suitable for growing a wide variety of crops. Rainfall is adequate for growing small grains without irrigation. In some areas the soils store enough moisture from winter rainfall to produce alfalfa, grain sorghum, sudangrass, and similar summer crops without irrigation. Yields of these crops increase, however, if the soils are irrigated. Also, if irrigation water is available, a wider variety of orchard, row, and field crops can be grown.

Management of some of the more important crops in Tehama County is discussed in the following paragraphs. As new and better methods of management become known, some of the practices described here will be changed.

Alfalfa.—Most of the alfalfa in the county is grown on the deep, well-drained, alluvial soils along the Sacramento River. It is mostly grown on irrigated soils, but some is grown as a dryland crop. Much of the alfalfa is grown on specialized farms as the chief crop or in rotation with such cash crops as sugarbeets, corn, and grain sorghum. Those farms where dairy and beef cattle and sheep are raised are the chief market for alfalfa hay. Most of the alfalfa is baled, but some is made into pellets.

Some alfalfa hay is grown on dairy farms to provide winter roughage for the cattle. A small amount is chopped in the field and used as feed. Some alfalfa is pastured.

Most alfalfa in this county is irrigated, and the soil therefore must be nearly level so that water can be distributed evenly. Surface drainage also must be provided so that water does not accumulate in low places. Irrigated alfalfa requires 3 to 5 acre-feet of water annually.

There are several varieties of alfalfa to choose from, depending on the circumstances under which the crop is grown. California Common, an old variety that developed under the natural process of survival of the fittest under California conditions, produced high-quality hay for many years. It is susceptible, however, to some diseases and has largely been replaced by Caliverde. Caliverde is a variety developed by the University of California through introduction of disease resistant varieties into California Common. It is resistant to wilt and leaf spot but is subject to attacks by the spotted alfalfa aphid. Growers who have the equipment for control of this aphid continue to plant Caliverde. Both California Common and Caliverde grow well if dryfarmed.

The variety Lahontan is resistant to the spotted alfalfa aphid but is more susceptible to alfalfa rust and leaf spot. The seedlings also have less vigor than Caliverde seedlings, and good stands are therefore harder to establish. The Lahontan variety is nevertheless a favorite of growers that do not have equipment for the control of aphids.

The variety Moapa is short lived but produces high yields. It is resistant to the spotted alfalfa aphid and is suitable for planting in areas where it is not necessary for the stand to last for a long time.

Stands of California Common generally last about 4 years, and Caliverde last 4 to 5 years. Lahontan and Moapa are relatively new varieties, and it is not known how long they will last, but Moapa is expected to last 2 years.

In irrigated areas seeding in spring can be done from February 15 to April 15, and in fall from October 15 to November 15. In dryfarmed fields, seeding is done in spring from April 1 to May 1. Seeding in irrigated areas is at the rate of 15 to 16 pounds per acre, but in dryfarmed areas 2 to 4 pounds of seed per acre are planted.

Sulfur or phosphate fertilizer, and in a few places both, are required for good yields of alfalfa on soils in Tehama County.

Spotted alfalfa aphids, armyworms, and other insects are a problem, but predatory insects help keep them in check. The chief diseases are root rot of seedlings and alfalfa wilt. In places gophers and deer are a hazard. Weeds that are sometimes difficult to control are pigeongrass, johnsongrass, watergrass, and yellow star-thistle.

Irrigated alfalfa generally produces five cuttings a year. In years when weather remains good until late in fall, a sixth crop is sometimes harvested. Dryland alfalfa produces from one to four cuttings. The number depends on the amount of moisture the soil is able to store during the winter to supply the plants during the spring and summer.

Rains frequently wet part of the first cutting of alfalfa in spring, and in fall rains occasionally wet part of the last cutting. In many irrigated fields yields are lowered because adequate irrigation water was not supplied.

Barley.—Barley is the principal dryland grain crop, and most of it is grown in the foothills in the western part of the county. Much of the barley is grown in rotation with forage plants on sheep and cattle ranches and is fed to the animals. Some, however, is sold for malting purposes.

Only an occasional field of barley is irrigated in Tehama County, and then only in dry years. Yields fluctuate somewhat with the amount of rainfall, but the frequency and timing of rainfall is more important than the amount. Occasionally the crop in a particular field is lost because of drought, but generally all of the crop is harvested.

Barley that follows summer fallow is planted from September 15 to November 15. Winter sown barley is seeded from December 1 to February 1, and spring barley from February 1 to March 15.

Suitable varieties to plant in winter and in fields that are summer fallowed are Arivat, Atlas 46, and Tennessee Winter; Tennessee Winter is preferred on cold, wet soils. California Mariout is a suitable variety for planting in spring. All varieties are seeded at the rate of 100 pounds per acre.

Nitrogen and phosphorus, and in places sulfur, are deficient in many of the soils. The amount and kind of fertilizer required depends on the soil, the crop rotation used, and if the fertilizer required increases yields enough

[21] By Leland S. Frey and Wallace Schreader, Agriculture Extension Service, University of California.

to justify the cost. Depending on these factors, fertilizer can be applied in the following amounts:

	Lbs. per acre
Nitrogen	0–40
Phosphorous	0–20
Sulfur	0–40

For some soils nitrogen alone is needed. Others require phosphate, sulfur, or both, in addition to nitrogen. Overfertilizing with nitrogen causes lodging in wet years and pinched grain in dry years. Little economic benefit results from fertilizing fields that are farmed infrequently.

Insects that damage barley are chiefly aphids, which carry the yellow dwarf virus. Some diseases that affect barley, in addition to the dwarf virus, are smut, mildew, and stripe. Morning glory, yellow star-thistle, and wild radish are the weeds that are likely to cause damage.

Barley is harvested for grain with a combine. Occasionally, however, barley in a poor field does not make a grain crop and is baled for hay. In a few areas barley is pastured. If stock is to be pastured on the plants of young grain, the stock must be removed before the plants start to joint.

In most places barley is grown in rotation with pasture or range plants. In such a rotation barley is planted 1 year out of every 5 to 20 years, depending upon the soil and the demand for barley. In some places grain is grown every other year under a summer fallow system, and in a few areas where the barley is winter sown, it is grown every year.

Grain sorghum.—Grain sorghum is grown chiefly on soils on recent alluvium and on low terraces. In places it is the chief crop, but in many areas it is grown as an intercrop in young orchards. Much of the crop is sold to local feed mills. Grain sorghum grows in soils that range from sandy loam to clay in texture. Yields are best, however, on deep, well-drained soils that range from very fine sandy loam to silt in texture.

In most places grain sorghum is irrigated, but in a few areas it is grown as a dryland crop. If irrigated, the crop requires from 2.5 to 4.5 acre-feet of water. Yields are most affected by excess moisture or lack of moisture when the plants are about 6 inches high and again when the head is in the boot. On deep soils that range from very fine sandy loam to silt in texture, if the moisture level of the soil is at field capacity when the head emerges from the boot, irrigation can be discontinued. On the shallow soils and on sands and loamy sands, however, further irrigation may be necessary.

Sorghum may be seeded any time after danger of frost is past, generally April 15 to July 1. It takes 100 to 150 days for the crop to mature, depending on the variety and planting date.

A wide variety of sorghums produce well in this county. Pollinated varieties are being replaced by hybrids, which promise still more varieties. A suitable variety for late planting is Double Dwarf 38, and for medium planting a suitable variety is R.S. 610. Suitable early varieties are Double Dwarf Sooner, either white or yellow, and White Durra. Suitable for very early planting is Ryer 15. If the soils are irrigated, Ryer 15 can be seeded at the rate of 15 to 30 pounds per acre, but all other varieties should be seeded at the rate of 10 to 25 pounds per acre. Seeding in dryland fields should be at the rate of 5 to 10 pounds per acre for Ryer 15, and all other varieties should be seeded at the rate of 1 to 3 pounds per acre.

Depending on soil and crop history, nitrogen and phosphate fertilizers are needed. Nitrogen can be applied at the rate of 80 to 125 pounds per acre, and phosphates at the rate of 40 to 60 pounds per acre.

Pests that are a hazard to grain sorghum are armyworms, corn earworms, aphids, and weeds that are common to the area.

Grain sorghum can be harvested at maturity when the moisture content of the seed is not above 14 percent. Harvesting is done with a combine. The crop from late plantings or from varieties that are slow maturing frequently must be dried for safe storage.

Irrigated pastures.—Irrigated pastures occupy a larger part of the irrigated land in Tehama County than any other irrigated crop. They are used to provide summer roughage for dairy cattle wherever an adequate supply of irrigation water is available. They are also used, however, for grazing by sheep and by beef cattle.

Irrigated pastures are probably the least selective crop in regard to soil of all crops grown in the county. Fairly high yields of high-quality forage are produced on soils that are too limited in depth for most other crops.

Most irrigated pastures are on soils that have restricted underground drainage, and extra care is required to provide surface drainage. The root system of the pasture plants is shallow, and uniform distribution of irrigation water is essential.

Irrigated pastures require a total of 4 to 6 acre-feet of water a year. The water should be divided into 20 to 24 irrigations and applied throughout the growing season. During the hot, dry summer months, water should be applied on irrigated pastures once a week.

Irrigated pastures are made up of combinations of several grasses and legumes, depending on the use to be made of the pasture. Grasses and legumes adapted to conditions in Tehama County are given in the list that follows:

Grasses	*Legumes*
Annual ryegrass	Ladino clover
Perennial ryegrass	Narrowleaf trefoil
Dallisgrass	Broadleaf trefoil
Orchardgrass	Alfalfa
Alta fescue	Alsike clover

Each of these plants have advantages and disadvantages. A mixture of seeds widely used in Tehama County, and excellent for dairy cattle, is 20 percent each of Ladino clover, narrowleaf trefoil, and perennial ryegrass, 25 percent of annual ryegrass, and 15 percent of dallisgrass. Other combinations can be made to meet special needs. For all mixtures, a total of about 10 to 15 pounds of seed per acre should be used.

Preferred dates for seeding in fall are from October 15 to November 15, and in spring from February 15 to April 15. If the seed is planted in fall, the rains in fall and winter are sufficient for growth. Spring plantings must be irrigated frequently if not enough rain falls to maintain adequate moisture in the soil for growth of the seedlings.

Phosphate and sulfur are required for best yields of pasture on many soils. An annual application of 300 to 400 pounds of single superphosphate generally supplies adequate amounts of both elements. Some soils require only sulfur. For these, an annual application of 100 pounds of agricultural sulfur or 300 pounds of gypsum will supply the amount needed. Nitrogen is required occasion-

ally along with phosphate or sulfur to obtain full benefit from fertilizer. Nitrogen also extends the growing season and increases yields of grasses. The cost of using nitrogen on irrigated pasture should be carefully compared to the benefits expected.

Grasshoppers are the chief insect pests on irrigated pastures. Most of the plants are fairly free from disease. Dallisgrass is subject to ergot, which apparently does not harm the pasture but occasionally poisons livestock. The chief weed pest is pigeongrass.

Yields of irrigated pasture greatly increase if the pastures are grazed in regular order and if definite periods for recovery of the plants are allowed between grazing periods. Irrigated pasture produces more feed late in spring than at any other time during the grazing season; the surplus can be harvested for hay or silage.

Yields on many pastures are seriously limited because irrigation water soaks into many of the soils slowly. The rate of penetration is further slowed if leveling is done when the soils are excessively dry, if soil structure is destroyed, and if the pastures are grazed when wet. Some practices that help increase penetration of water follow:

(1) Growing sudangrass or small grain crops after leveling is done and adding sufficient fertilizer.
(2) Applying barnyard manure.
(3) Applying fertilizer according to the needs of the particular soil.
(4) Rotating pastures to avoid grazing in summer when the soils are wet and to permit regrowth of plants. If rotational grazing is not feasible, select one field for grazing and use the time to improve all the rest.
(5) Rotating irrigated pasture with other crops, such as red clover for hay or sudangrass for hay, pasture, or silage.

Almonds.—Almonds are grown on soils on alluvial flood plains and fans along the Sacramento River and other streams in the county. In the past most almonds were grown in the uplands and on terraces under dryland conditions. Yields were low, and this acreage has been mostly replaced by irrigated orchards where higher yields are obtained. Almonds require deep, well-drained soils that range from fine sandy loam to loam in texture. Most of the crop is sold through a marketing cooperative, though several independent buyers also operate in the county.

In Tehama County growers use 1½ to 2 acre-feet of irrigation water annually on almonds. The water is applied in two or three irrigations in the period between the first part of May through the last part of July. Experiments indicate, however, that additional water applied over a longer period of time would increase yields.

Almonds are grown from peach, almond, and plum rootstocks. Peach rootstock is generally used and produces a bearing tree at 4 to 6 years of age. Trees from peach rootstock reach their peak at about 35 years of age and then start to decline. Almond rootstock produces a bearing tree in 6 to 8 years; the trees are large and live a long time. Almond rootstock is used on calcareous soils to overcome chlorosis induced by lime. Plum rootstock (Marianna 2624) is used in places on soils that are severely infested with oak root fungus. Its use is limited because of incompatibility with some desirable almond varieties.

At least 3 varieties of almonds are used for cross pollination purposes. The soft shell variety, Nonpareil, is generally used because the yields and the value of the crops produced are high. Other varieties used for pollination are Ne Plus Ultra, Davey, Texas, and Peerless.

The usual practice is to select as the main variety one that is heavy bearing and has a soft shell and two pollinators. These are then planted alternately, using 3 rows of the main variety and 1 row of the pollinators. Varieties are seldom mixed in a row because this would interfere with mechanical harvesting. The trees are generally planted 28 to 32 feet apart and number 42 to 55 trees per acre.

Pruning of young trees should be done and the trees trained so that the lowest limb is not less than 30 inches from the ground. In this way ample room is provided for mechanical harvesting. From 10 to 15 percent of old fruiting wood should be removed from mature trees each year. In this way growth of new fruiting wood is encouraged and vigor of the trees maintained. Suckers and water sprouts need to be removed each spring. All other pruning and training is done when the trees are dormant.

The only fertilizer needed is nitrogen. Zinc and potassium, which are needed in other counties in the Sacramento Valley, have not proven of value in Tehama County. Nitrogen is not generally needed until the trees start to bear. It can be used on mature orchards at rates of 100 to 150 pounds per acre, or 2 to 3 pounds per tree.

Cover of grasses and forbs are allowed to grow in the orchards during the winter. They are disked under late in March or early in April. New growth is generally disked under after each irrigation. In many places the tops of the grasses and forbs are chopped down and left in the orchard. The chopped material reduces soil compaction and improves infiltration of irrigation water.

Common insect pests are brown almond mites, red spider mites, peach twig borers, boxelder bugs, and navel orangeworms. Diseases that are likely to affect the trees are brown rot, shot hole, leaf blight, almond scab, rhizopus hull rot, mallet wound of Texas, bacterial gummosis, crown gall, phomis, and oak root fungus. Fungus disease is particularly a problem if rains occur late in spring. The weeds johnsongrass, morning-glory, and puncturevine are a hazard to harvesting machines.

The hazard of frost in spring is severe in most years, especially in low areas where air drainage is poor. Cool weather in spring also often interferes with bee activity and thus reduces pollination. Two or three strong colonies of bees per acre are needed for adequate pollination.

Harvesting is done from the middle of August to early in October. The nuts are harvested whenever the hulls are open and easy to remove from the tree by knocking or shaking. The date of maturity varies, according to the variety grown.

Yields of almonds vary greatly. The wide variation in yields is partly because of alternate bearing, that is, a light crop of almonds follows a heavy crop. Weather conditions and effectiveness of control of diseases and insects also affect yields. Yields can be increased if irrigation water is applied carefully.

Olives.—Most olives are grown near the town of Corning. These are mostly canning olives of the Sevillano variety, but a few olives of the Mission variety are grown for oil. Independent and cooperative canneries are in Corning, and much of the crop is marketed through these

outlets. The rest of the crop is bought by canning companies located farther south in the Sacramento and San Joaquin Valleys.

Suitable soils for Sevillano olives are those on low terraces that have a subsoil that has moderately rapid drainage. Olives grown on deep soils, required by most deciduous trees, are likely to produce heavy crops of small fruit. Market demand, however, is for fruit of large size. Most growers therefore avoid planting olive trees on deep soils. Also, canning olives are hand picked from ladders and large trees that bear small fruit are costly to harvest. Trees on extremely shallow or imperfectly drained soils generally produce low yields.

Most growers in Tehama County apply 1 to 2 acre-feet of irrigation water on olive orchards annually. The water is applied in 10 or 12 irrigations in the period from May through October. It is likely that an increase in the amount of water applied would increase yields. The rate at which water infiltrates into the soil in most groves is slow.

Since World War II, use of the Sevillano olive for canning has increased, and now more than 90 percent of the olives grown are of this variety. In most orchards the trees are planted on squares that are 20 to 25 feet apart. Trial plots planted by the University of California, however, show that yields are best if the trees are planted 30 to 35 feet apart at the rate of 35 to 48 trees per acre.

Pruning encourages renewal of bearing wood and maintains the vigor of the trees. Olives are normally pruned in winter, and 10 to 50 percent of the wood is removed. Olives can be pruned at any time of the year, but studies show that pruning in summer reduces the spread of olive knot disease. Trees are occasionally cut back to permit harvesting from ladders 14 to 16 feet in height.

Nitrogen is the only fertilizer needed. It can be applied at the rate of 1 to 1½ pounds of nitrogen per tree.

Cover crops are allowed to grow in many orchards during the winter. They are disked under late in March or early in April. New growth is generally disked under after each irrigation. In some orchards the tops of the vegetation are chopped down and left in the orchard. The chopped material helps to reduce soil compaction and to improve infiltration of irrigation water.

Common insect pests are black scale, parlatoria scale, grasshoppers, and European plum borers. Throughout the county the trees are subject to the diseases olive knot and peacock spot.

Harvesting of canning olives is done by hand from ladders. Olives for oil are knocked from trees onto canvas sheets spread on the ground.

The Sevillano olive, for reasons not known, has an irregular bearing habit in the Corning area. Yields there fluctuate greatly.

Prunes.—Prunes are grown on both sides of the Sacramento River on deep, alluvial soils. Suitable soils range from fine sandy loam to clay. Clay loams are best, providing they are deep and are well drained. The fruit is sold to cooperative and independent buyers.

The irrigation water used on orchards in the county amounts to 1½ to 2 acre-feet of water annually. The water is applied in two or three irrigations in the period from May through August.

Prunes are grown from peach and plum rootstocks. Peach rootstock produces bearing trees in 4 to 6 years. Use of peach rootstock is limited, however, because although the yield is heavy, the fruit is small. Peach rootstock is therefore used for interplanting in newly planted walnut orchards. Plum rootstocks Marianna 2624 and Myrobalan 29C are used because of resistance to oak root fungus.

The chief variety of prunes grown is the French, but Imperial and Robe de Sargeant are also grown. Imperial and Robe de Sargeant produce mature fruit early and are used to extend the total harvest season. The fruit, however, is of inferior quality and the demand for it is small.

Prune trees are generally planted on squares that are 22 to 24 feet apart and at the rate of 75 to 90 trees per acre. The young trees are pruned and trained so that the lower branches are not less than 30 inches above the ground for easy mechanical harvesting. Each year 10 to 15 percent of the wood is removed from bearing trees to renew fruiting wood and to maintain the vigor of the trees. Pruning is done when the trees are dormant.

Nitrogen is needed on all soils in prune orchards. It can be applied at the rate of 1 to 1½ pounds per mature tree. On some soils yields increase if potash is applied at rates of 25 to 50 pounds per tree. The nitrogen and phosphate must be applied every few years. Zinc sprays benefit prunes on some of the soils.

Cover crops of grasses and forbs are allowed to grow in the orchards during the winter. They are disked under late in March or early in April. New growth is generally disked under after each irrigation. In some orchards the tops of the grasses and forbs are chopped down and left in the orchard. The chopped material reduces soil compaction and improves infiltration of irrigation water.

Common insect pests are the soft brown scale, parlatoria scale, San Jose scale, peach twig borer, red-humped caterpillar, brown almond mite, red spider, mealy plum aphid, and leaf curl plum aphid. Brown rot, peach rust, bacterial gummosis, crown gall, crown rot, and oak root fungus are the chief diseases. In some orchards puncturevine, johnsongrass, and morning-glory are a problem.

Plums are harvested from the latter part of August to the early part of October, depending on the variety and the season. The fruit is generally harvested shortly after the green color leaves the flesh of the fruit. It is removed from the trees by mechanical shakers, which cause the fruit to drop to the ground or onto catching frames.

Occasionally an unseasonally late frost in spring seriously reduces yields. Even though an entire crop is lost at times, most growers believe the cost of heating the orchards exceeds the benefits.

The fruit generally requires thinning to increase the size of the fruit and to reduce the amount of fruit on the tree. Overproduction is likely to cause the trees to die back.

Walnuts.—Walnuts are grown on alluvial soils on both sides of the Sacramento River. Deep, well-drained soils that range from fine sandy loam to clay loam in texture are needed for best yields. The crop is sold through cooperative and independent packers.

The orchards now receive 1½ to 2 acre-feet of irrigation water annually. The water is applied in two or three irrigations in the period between the early part of May and the early part of August. Studies at the University of California Experiment Station, however, show that the use of 2½ to 3 acre-feet of water annually, applied in four to five irrigations, benefits walnuts.

Rootstock from Northern California black walnuts is most commonly used for walnut plantings, because of resistance to oak root fungus. Paradox, a hybrid rootstock, is used if plantings are made on fine-textured soils or soils that have slow subsoil drainage. It is also used when replacing trees. Rootstock of the Chinese wingnut is useful in areas where nematodes are common. This rootstock is not readily compatible with many walnut varieties and sometimes requires a sandwich graft of the Eureka walnut variety for propagation.

Most of the walnuts planted before 1945 were Franquettes, but since then the Hartley walnut has become popular. Franquettes require 12 to 15 years to come into bearing. The nuts mature late, in mid-October, and consequently, in some years rain makes harvest of the nuts difficult. On the other hand, the Hartley walnut comes into bearing in 8 to 10 years and the nuts mature about the first of October. In 1960 several new varieties were introduced that come into bearing in 6 to 8 years and mature nuts somewhat earlier than the Hartley. Of these, those that are planted most frequently are U.C. 50–55, U.C. 49–47, and Nugget.

Walnuts are planted on the square, 25 to 30 feet apart, at the rate of 48 to 70 trees per acre. When the tops start to meet, they are thinned to 12 to 17 trees per acre that are 50 to 60 feet apart. The young trees are pruned to 5 or 6 main branches and trained so that the lowest branch is about 5 to 6 feet above the ground for easy mechanical harvesting. After the training period, when the trees are about 7 years old, pruning is done only to remove dead wood and branches that cross.

Nitrogen is required for walnut trees on all soils and can be applied at a rate of 6 to 8 pounds of nitrogen per mature tree. On certain soils galvanized nails or strips of zinc metal are driven into the trees to supply zinc.

Cover crops of grasses and forbs are allowed to grow in the orchards during the winter. They are disked under

TABLE 2.—*Estimated average acre yields of principal crops on*

[All crops irrigated except barley;

Map symbol	Soil	Alfalfa	Barley	Pasture
		Tons	*Tons*	*Lbs. beef/acre yr.*
AbD	Altamont clay, 10 to 30 percent slopes	(1)	0. 5–1. 0	(1)
AcA	Altamont clay, terrace, 0 to 3 percent slopes	4–7	>1. 0	[2] >600
AcB	Altamont clay, terrace, 3 to 10 percent slopes	[2] 4–7	>1. 0	[2] 300–600
AcD	Altamont clay, terrace, 10 to 30 percent slopes	[2] 4–7	>1. 0	[2] 300–600
Ag	Anita clay, deep	(1)	0. 5–1. 0	300–600
Af	Anita clay, moderately deep	(1)	0. 5–1. 0	300–600
Ad	Anita clay	(1)	(1)	300–600
Ap	Anita gravelly clay, moderately deep	(1)	0. 5–1. 0	300–600
Au	Arbuckle gravelly fine sandy loam, 0 to 3 percent slopes	4–7	0. 5–1. 0	300–600
AvA	Arbuckle gravelly loam, 0 to 3 percent slopes	4–7	0. 5–1. 0	300–600
AvB	Arbuckle gravelly loam, 3 to 8 percent slopes	[2] 4–7	0. 5–1. 0	[2] 300–600
Aw	Arbuckle gravelly loam, clayey substratum, 0 to 3 percent slopes	<4	0. 5–1. 0	300–600
Bg	Berrendos clay loam, 0 to 3 percent slopes	4–7	>1. 0	>600
Bh	Berrendos clay loam, hardpan substratum, 0 to 3 percent slopes	<4	0. 5–1. 0	>600
Bc	Berrendos clay, 0 to 3 percent slopes	<4	0. 5–1. 0	>600
Bd	Berrendos clay, hardpan substratum, 0 to 3 percent slopes	<4	0. 5–1. 0	>600
Cc	Clear Lake clay	<4	0. 5–1. 0	>600
CpB	Columbia loamy fine sand, 1 to 8 percent slopes	[2] 4–7	0. 5–1. 0	(1)
CmA	Columbia fine sandy loam, 0 to 3 percent slopes	>7	0. 5–1. 0	>600
CmB	Columbia fine sandy loam, 3 to 8 percent slopes	[2] 4–7	0. 5–1. 0	[2] >600
Co	Columbia loam, 0 to 3 percent slopes	>7	>1. 0	>600
CsA	Columbia silt loam, 0 to 3 percent slopes	>7	>1. 0	>600
CsB	Columbia silt loam, 3 to 8 percent slopes	[2] 4–7	>1. 0	[2] 300–600
Ct	Columbia silt loam, moderately deep, 0 to 3 percent slopes	>7	0. 5–1. 0	300–600
CwA	Corning gravelly loam, 0 to 3 percent slopes	(1)	<0. 5	<300
CwB	Corning gravelly loam, 3 to 8 percent slopes	(1)	<0. 5	[2] <300
Cz	Cortina gravelly fine sandy loam	4–7	0. 5–1. 0	(1)
Czm	Cortina gravelly fine sandy loam, moderately deep	<4	<0. 5	(1)
Czs	Cortina very gravelly fine sandy loam	<4	<0. 5	(1)
DbD	Dibble silty clay loam, 10 to 30 percent slopes	(1)	0. 5–1. 0	[2] 300–600
Fa	Farwell clay loam, 0 to 3 percent slopes	>7	>1. 0	>600
GnD	Guenoc loam, 10 to 30 percent slopes	(1)	>0. 5	[2] 300–600
HgA	Hillgate loam, 0 to 3 percent slopes	(1)	0. 5–1. 0	300–600
HhB	Hillgate loam, shaly substratum, 0 to 8 percent slopes	(1)	0. 5–1. 0	[2] 300–600
HgB	Hillgate loam, 3 to 8 percent slopes	(1)	0. 5–1. 0	[2] 300–600
Hk	Hillgate gravelly loam, 0 to 3 percent slopes	(1)	0. 5–1. 0	300–600
Hl	Hillgate silt loam, 0 to 3 percent slopes	(1)	0. 5–1. 0	300–600
Kf	Keefers loam, 0 to 3 percent slopes	(1)	0. 5–1. 0	300–600
Km	Keefers loam, moderately deep, 0 to 3 percent slopes	(1)	0. 5–1. 0	300–600
KpA	Kimball loam, 0 to 3 percent slopes	(1)	0. 5–1. 0	300–600

late in March or early in April. New growth is generally disked under after each irrigation. In many places the tops of the grasses and forbs are chopped down and left in the orchard. The chopped material reduces soil compaction and improves infiltration of irrigation water.

Common insect pests are the frosted scale, red-humped caterpillar, codling moth, navel orangeworm, filbertworm, aphid, and red spider. Walnut blight, bark canker, malexema, branch wilt, crown rot, crown gall, and oak root fungus are prevalent in many orchards. Weeds that interfere with harvesting are puncturevine, johnsongrass, and morning-glory. High humidity in spring is likely to cause walnut blight. Four or five applications of spray reduce the severity of the blight but do not eliminate it.

Walnuts are harvested from the middle of September through November. The nuts are shaken from the trees with mechanical shakers and are picked up by hand or machine.

Estimated Yields and Storie Index Rating

The estimated average acre yields of principal crops on soils suitable for crops and the Storie index rating of the soils are given in table 2. Explanation of the estimated yields and of the Storie index ratings are in the paragraphs that follow.

Estimated yields.—The estimated yields in table 2 express the suitability of soils to produce certain crops. The estimates were made by extending yield data from a few areas. Because most crops in Tehama County must be irrigated to be grown profitably, all crops listed in the table are irrigated unless otherwise indicated.

The management for any one soil varies from farm to farm. It also varies for most crops from year to year, depending upon climate, diseases, insects, and the economic aspect of the crop. Because of these differences in management, yields vary considerably. The normal management for each crop listed in the table is that given in the

soils suitable for crops, and the Storie index rating of the soils

<=less than; >=more than]

Grain sorghum	Almonds	Olives (canning)	Prunes (dried)	Walnuts	Storie index				
					Rating-factors				Index rating
					A (profile)	B (texture)	C (slope)	X (other conditions)	
Tons	*Lbs.*	*Tons*	*Tons*	*Tons*					
(1)	(1)	(1)	(1)	(1)	80	70	75	100	42
>3.0	750–1,500	0.5–3.0	(1)	<0.5	95	70	100	100	66
[2]>3.0	[2]750–1,500	[2]0.5–3.0	(1)	(1)	95	70	95	100	63
[2]>3.0	[2]750–1,500	[2]0.5–3.0	(1)	(1)	95	70	70	100	47
1.5–3.0	(1)	(1)	(1)	(1)	80	50	100	56	22
1.5–3.0	(1)	(1)	(1)	(1)	70	50	100	56	20
1.5–3.0	(1)	(1)	(1)	(1)	50	50	100	56	14
(1)	(1)	(1)	(1)	(1)	70	45	100	56	17
1.5–3.0	750–1,500	>3.0	2–3	0.5–1.0	95	75	100	95	68
1.5–3.0	750–1,500	>3.0	2–3	0.5–1.0	95	75	100	95	68
[2]1.5–3.0	[2]750–1,500	[2]>3.0	[2]2–3	<0.5	95	75	95	95	65
1.5–3.0	(1)	0.5–3.0	(1)	(1)	80	75	100	95	57
>3.0	<750	>3.0	<2	<0.5	90	85	100	95	73
>3.0	(1)	0.5–3.0	<2	(1)	70	85	100	95	57
>3.0	(1)	0.5–3.0	<2	(1)	90	60	100	95	51
>3.0	(1)	0.5–3.0	<2	(1)	70	60	100	95	40
1.5–3.0	(1)	<0.5	(1)	(1)	90	60	100	80	43
[2]1.5–3.0	750–1,500	(1)	2–3	0.5–1.0	100	90	95	100	85
>3.0	750–1,500	(1)	>3	>1.0	100	100	100	100	100
[2]1.5–3.0	>1,500	(1)	[2]>3	[2]1.0	100	100	90	90	81
>3.0	>1,500	(1)	>3	>1.0	100	100	100	100	100
>3.0	>1,500	(1)	>3	>1.0	100	90	100	100	90
[2]1.5–3.0	>1,500	(1)	[2]>3	[2]>1.0	100	90	95	100	85
1.5–3.0	750–1,500	(1)	2–3	0.5–1.0	80	90	100	100	72
<1.5	(1)	<0.5	(1)	(1)	40	80	100	72	23
[2]<1.5	(1)	<0.5	(1)	(1)	40	80	95	72	22
1.5–3.0	750–1,500	>3.0	<2	<5	100	80	100	95	76
<1.5	<750	0.5–3.0	(1)	(1)	90	80	100	95	68
<1.5	<750	0.5–3.0	(1)	(1)	80	70	100	95	53
[2]1.5–3.0	[2]750–1,500	[2]0.5–3.0	(1)	(1)	70	85	70	100	42
>3.0	750–1,500	(1)	(1)	0.5–1.0	95	85	100	100	80
[2]1.5	(1)	(1)	(1)	(1)	70	80	80	90	40
1.5–3.0	(1)	0.5–3.0	(1)	(1)	60	100	100	95	57
[2]1.5–3.0	(1)	0.5–3.0	(1)	(1)	50	100	95	95	45
[2]1.5–3.0	(1)	[2]0.5–3.0	(1)	(1)	60	100	95	90	51
1.5–3.0	(1)	0.5–3.0	(1)	(1)	60	80	100	95	46
1.5–3.0	(1)	0.5–3.0	(1)	(1)	60	100	100	95	57
1.5–3.0	(1)	0.5–3.0	(1)	(1)	60	100	100	95	57
1.5–3.0	(1)	0.5–3.0	(1)	(1)	50	100	100	95	48
1.5–3.0	(1)	<0.5	(1)	(1)	50	100	100	90	45

See footnotes at end of table.

TABLE 2.—*Estimated average acre yields of principal crops on soils*

Map symbol	Soil	Alfalfa	Barley	Pasture
		Tons	*Tons*	*Lbs. beef/acre yr.*
KpB	Kimball loam, 3 to 8 percent slopes	(1)	0. 5–1. 0	[2] 300–600
KoA	Kimball gravelly loam, 0 to 3 percent slopes	(1)	0. 5–1. 0	300–600
KoB	Kimball gravelly loam, 3 to 8 percent slopes	(1)	0. 5–1. 0	[2] 300–600
LbB	Laniger fine sandy loam, deep, 0 to 8 percent slopes	<4	<0. 5	[2] 300–600
Lo	Los Robles loam, 0 to 3 percent slopes	>7	>1. 0	>600
Lk	Los Robles clay loam, 0 to 3 percent slopes	>7	>1. 0	>600
Lm	Los Robles clay loam, moderately deep, 0 to 3 percent slopes	4–7	>1. 0	>600
Mc	Maywood fine sandy loam, 0 to 3 percent slopes	>7	0. 5–1. 0	300–600
Md	Maywood fine sandy loam, moderately deep, 0 to 3 percent slopes	4–7	0. 5–1. 0	300–600
Me	Maywood loam, 0 to 3 percent slopes	>7	>1. 0	>600
Mf	Maywood loam, high terrace, 0 to 3 percent slopes	>7	>1. 0	>600
Mg	Maywood loam, moderately well drained, 0 to 3 percent slopes	4–7	0. 5–1. 0	>600
Mh	Maywood silt loam, 0 to 3 percent slopes	4–7	>1. 0	>600
Mp	Millrace gravelly fine sandy loam, 0 to 3 percent slopes	4–7	0. 5–1. 0	300–600
MtD	Millsholm clay loam, 10 to 30 percent slopes	(1)	0. 5–1. 0	(1)
Mx	Moda loam, 0 to 3 percent slopes	(1)	<0. 5	300–600
Mw	Moda gravelly loam	(1)	<0. 5	300–600
My	Molinos fine sandy loam	>7	<0. 5	>600
Mzd	Molinos fine sandy loam, deep over gravel	4–7	0. 5–1. 0	300–600
Mzm	Molinos fine sandy loam, moderately deep over gravel	<4	0. 5–1. 0	<300
Mzr	Molinos fine sandy loam, deep over rock	<4	0. 5–1. 0	>600
Mz	Molinos fine sandy loam, moderately deep over clay	<4	0. 5–1. 0	>600
Mzs	Molinos gravelly fine sandy loam	4–7	0. 5–1. 0	300–600
Mzy	Myers clay, 0 to 3 percent slopes	4–7	>1. 0	>600
NaD	Nacimiento silty clay loam, 10 to 30 percent slopes	(1)	>1. 0	[2] >600
NaD2	Nacimiento silty clay loam, 10 to 30 percent slopes, eroded	(1)	0. 5–1. 0	[2] 300–600
NrB	Newville gravelly loam, 3 to 10 percent slopes	(1)	0. 5–1. 0	[2] 300–600
NrB2	Newville gravelly loam, 3 to 10 percent slopes, eroded	(1)	<0. 5	[2] 300–600
NrD	Newville gravelly loam, 10 to 30 percent slopes	(1)	0. 5–1. 0	[2] 300–600
Of	Orland fine sandy loam	>7	0. 5–1. 0	300–600
Or	Orland loam, moderately deep over gravel	4–7	0. 5–1. 0	<300
Om	Orland loam	>7	>1. 0	>600
Op	Orland loam, moderately deep over clay loam	4–7	>1. 0	>600
Os	Orland silt loam	4–7	>1. 0	>600
PkA	Perkins gravelly loam, 0 to 3 percent slopes	<4	0. 5–1. 0	300–600
PkB	Perkins gravelly loam, 3 to 8 percent slopes	<4	0. 5–1. 0	[2] 300–600
PrB	Peters clay, 1 to 8 percent slopes	(1)	0. 5–1. 0	(1)
PvB	Pleasanton gravelly loam, 1 to 10 percent slopes	4–7	0. 5–1. 0	300–600
Rb	Red Bluff loam, 0 to 3 percent slopes	<4	<0. 5	300–600
Rg	Red Bluff gravelly loam, 0 to 3 percent slopes	<4	<0. 5	300–600
Rh	Red Bluff gravelly loam, hardpan substratum, 0 to 3 percent slopes	<4	<0. 5	300–600
Rm	Redding loam, 0 to 3 percent slopes	(1)	<0. 5	<300
RnA	Redding gravelly loam, 0 to 3 percent slopes	(1)	<0. 5	<300
RnB	Redding gravelly loam, 3 to 8 percent slopes	(1)	<0. 5	[2] <300
ScD	Sehorn clay and clay loam, 10 to 30 percent slopes	(1)	>1. 0	[2] 300–600
TaA	Tehama loam, 0 to 3 percent slopes	4. 7	0. 5–1. 0	300–600
TaB	Tehama loam, 3 to 8 percent slopes	[2] <4	0. 5–1. 0	[2] 300–600
Tc	Tehama silt loam, 0 to 3 percent slopes	4–7	0. 5–1. 0	300–600
Tb	Tehama gravelly loam, 0 to 3 percent slopes	4–7	0. 5–1. 0	300–600
VnA	Vina loam, 0 to 3 percent slopes	>7	>1. 0	>600
Vd	Vina loam, deep, 0 to 3 percent slopes	4–7	>1. 0	>600
Vw	Vina loam, water table, 0 to 3 percent slopes	<4	>1. 0	>600
VnB	Vina loam, 3 to 8 percent slopes	[2] >7	>1. 0	[2] >600
Vy	Vina clay loam, deep, 0 to 3 percent slopes	4–7	>1. 0	[2] >600
Wy	Wyo loam, 0 to 3 percent slopes	>7	>1. 0	[2] >600
Wz	Wyo silt loam, 0 to 3 percent slopes	4–7	>1. 0	>600
Yo	Yolo loam	>7	>1. 0	>600
Ys	Yolo loam, clay loam substratum	4–7	>1. 0	>600
Yt	Yolo clay loam	4–7	>1. 0	>600
Za	Zamora loam, 0 to 3 percent slopes	>7	>1. 0	>600
Zc	Zamora clay loam, 0 to 3 percent slopes	4–7	>1. 0	>600
Zm	Zamora silt loam, 0 to 3 percent slopes	4–7	>1. 0	>600
Zo	Zamora silty clay loam, 0 to 3 percent slopes	>7	>1. 0	>600

[1] Not suited.

suitable for crops, and the Storie index rating of the soils—Continued

Grain sorghum	Almonds	Olives (canning)	Prunes (dried)	Walnuts	Storie index				
					Rating-factors				Index rating
					A (profile)	B (texture)	C (slope)	X (other conditions)	
Tons	*Lbs.*	*Tons*	*Tons*	*Tons*					
[2] 1. 5–3. 0	(1)	[2] <0. 5	(1)	(1)	50	100	95	90	43
1. 5–3. 0	(1)	[2] <0. 5	(1)	(1)	50	80	100	90	36
1. 5–3. 0	(1)	[2] <0. 5	(1)	(1)	50	80	95	90	34
[2] 1. 5–3. 0	(1)	(1)	(1)	(1)	75	100	95	95	67
>3. 0	>1, 500	(1)	>3	>1. 0	95	100	100	100	95
>3. 0	>1, 500	(1)	>3	>1. 0	95	100	100	100	95
>3. 0	750–1, 500	(1)	2–3	(1)	70	85	100	100	59
1. 5–3. 0	750–1, 500	(1)	2–3	0. 5–1. 0	100	100	100	95	95
1. 5–3. 0	750–1, 500	(1)	<2	0. 5–1. 0	80	100	100	90	72
>3. 0	>1, 500	(1)	2–3	0. 5–1. 0	100	100	100	95	95
>3. 0	750–1, 500	>3. 0	2–3	0. 5–1. 0	95	100	100	95	90
>3. 0	(1)	0. 5–3. 0	(1)	(1)	95	100	100	66	63
>3. 0	750–1, 500	(1)	<2	0. 5–1. 0	100	100	100	95	95
1. 5–3. 0	750–1, 500	0. 5–3. 0	2–3	0. 5–1. 0	90	80	100	100	72
(1)	(1)	(1)	(1)	(1)	50	100	70	100	35
<1. 5	(1)	(1)	(1)	(1)	40	100	100	90	36
<1. 5	(1)	(1)	(1)	(1)	40	80	95	100	30
1. 5–3. 0	>1, 500	(1)	>3	>1. 0	100	100	100	100	100
1. 5–3. 0	750–1, 500	(1)	2–3	0. 5–1. 0	90	100	100	100	90
1. 5–3. 0	<750	(1)	<2	<0. 5	80	100	100	100	80
1. 5–3. 0	(1)	(1)	(1)	(1)	80	100	100	70	56
1. 5–3. 0	(1)	0. 5–3. 0	(1)	(1)	60	100	100	100	60
1. 5–3. 0	750–1, 500	(1)	2–3	0. 5–1. 0	100	70	100	100	70
>3. 0	750–1, 500	0. 5–3. 0	2–3	(1)	85	60	100	100	51
[2] 1. 5–3. 0	[2] 750–1, 500	[2] 0. 5–3. 0	(1)	(1)	80	90	70	100	50
[2] 1. 5–3. 0	(1)	(1)	(1)	(1)	80	90	80	60	35
[2] 1. 5–3. 0	[2] 750–1, 500	[2] 0. 5–3. 0	(1)	(1)	50	80	85	100	34
[2] 1. 5–3. 0	(1)	(1)	(1)	(1)	50	80	85	63	21
[2] 1. 5–3. 0	(1)	(1)	(1)	(1)	50	80	70	90	25
3. 0	>1, 500	(1)	>3	>1. 0	100	100	100	100	100
1. 5–3. 0	750–1, 500	(1)	2–3	0. 5–1. 0	80	100	100	100	80
>3. 0	>1, 500	(1)	>3	>1. 0	100	100	100	100	100
>3. 0	750–1, 500	0. 5–3. 0	(1)	(1)	80	100	100	100	80
1. 5–3. 0	750–1, 500	(1)	2–3	0. 5–1. 0	100	80	100	100	80
1. 5–3. 0	750–1, 500	0. 5–3. 0	<2	0. 5–1. 0	85	80	100	90	61
[2] 1. 5–3. 0	[2] <750	[2] 0. 5–3. 0	[2] <2	0. 5–1. 0	85	80	95	100	65
(1)	(1)	(1)	(1)	(1)	80	60	80	100	38
1. 5–3. 0	750–1, 500	0. 5–3. 0	2–3	0. 5–1. 0	90	70	100	95	59
<1. 5	<750	0. 5–3. 0	(1)	(1)	85	100	100	48	41
<1. 5	<750	0. 5–3. 0	(1)	(1)	85	80	95	48	31
<1. 5	(1)	(1)	(1)	(1)	80	80	100	48	31
<1. 5	(1)	(1)	(1)	(1)	30	100	100	72	21
<1. 5	(1)	(1)	(1)	(1)	30	80	100	72	17
[2] <1. 5	(1)	(1)	(1)	(1)	30	80	95	72	16
[2] 1. 5–3. 0	(1)	(1)	(1)	(1)	80	70	70	100	39
1. 5–3. 0	<750	0. 5–3. 0	<2	<0. 5	80	100	100	95	76
[2] 1. 5–3. 0	[2] <750	[2] 0. 5–3. 0	[2] <2	(1)	80	100	95	95	72
1. 5–3. 0	<750	0. 5–3. 0	<2	<0. 5	80	100	100	95	76
1. 5–3. 0	<750	0. 5–3. 0	<2	<0. 5	80	80	100	95	61
>3. 0	>1, 500	(1)	>3	>1. 5	100	100	100	100	100
>3. 0	750–1, 500	(1)	>3	(1)	80	100	100	100	80
>3. 0	(1)	(1)	(1)	(1)	80	100	100	70	56
[2] >3. 0	>1, 500	(1)	[2] >3	[2] 0. 5–1. 0	100	100	95	100	95
>3. 0	750–1, 500	(1)	>3	(1)	80	86	100	100	61
>3. 0	>1, 500	(1)	>3	>3. 0	100	100	100	100	100
>3. 0	750–1, 500	(1)	2–3	0. 5–1. 0	100	100	100	100	100
>3. 0	>1, 500	(1)	>3	>1. 0	100	100	100	100	100
>3. 0	<750	0. 5–4. 0	2–3	0. 5–1. 0	80	100	100	100	80
>3. 0	750–1, 500	(1)	>3	0. 5–1. 0	100	85	100	100	85
>3. 0	>1, 500	(1)	>3	>1. 0	100	100	100	100	100
>3. 0	750–1, 500	(1)	>3	0. 5–1. 0	100	85	100	100	85
>3. 0	750–1, 500	(1)	>3	0. 5–1. 0	100	100	100	100	100
>3. 0	>1, 500	(1)	2–3	0–5–1. 0	100	90	100	100	100

[2] Sprinkler irrigation.

section on crop management. If these practices are followed, the yields shown in the table can be expected most years. As new management methods are developed and applied, even greater yields can be expected.

Not all mapping units in the county are listed in this table. Only the mapping units that are expected to be used intensively for agriculture in the near future are listed. Also, some crops listed are not suitable for certain soils, because it has been proven uneconomical to grow them on those soils. This does not mean that the crop cannot be grown, and in places the crop could be grown profitably under improved management.

Many kinds of crops other than the principal crops listed in table 2 have been grown in the county. Some of these or others like them may become important in the future. Estimated yields for such crops can be made by relating characteristics of an unlisted crop with a crop listed in the table.

Storie index rating.—The Storie index is a system of rating soils according to their relative ability to produce crops (*6*, *7*). The rating is based on soil characteristics only and is obtained by evaluating such factors as depth, texture of the surface soil, density of subsoil, drainage, and relief. Other factors, such as availability of water for irrigation, climate, and distance from markets, which might determine the desirability of growing certain plants in a given locality, are not considered. Thus, in itself, the index cannot be considered as an index for land evaluation.

Relative ability to produce a crop refers to the ability of one soil to produce a crop with respect to another soil. This means that a soil that has a low Storie index rating produces less of a crop than a soil that has a high rating if other conditions of crop management remain the same. Or it can mean that a soil that has a low rating requires extra management to produce yields as good as those made under average management on a soil that has a high rating. Thus, the degree of management used is important in comparing yields.

A low Storie index rating also means that the particular soil has a narrow range of crop adaptability. On a shallow soil that has a low rating, for example, few crops can be grown profitably. On the other hand, on a soil that is deep, well drained, and medium textured and has a high Storie index rating, many kinds of crops can be grown successfully.

Storie index ratings (see table 2) are based on four factors. These factors are (A) the characteristics of the soil profile and soil depth; (B) the texture of the surface soil; (C) slope; and (X) other factors, such as drainage, erosion, nutrient level, and microrelief.

Each of these factors is evaluated separately in terms of percentage of ideal, or 100 percent. The index rating for a soil is obtained by multiplying the four factors A, B, C, and X.

Soils are placed in grades according to their suitability for general intensive agriculture as shown by their Storie index ratings. The five grades and their range in index ratings are—

	Index rating
Grade 1	80 to 100
Grade 2	60 to 80
Grade 3	40 to 60
Grade 4	20 to 40
Grade 5	Less than 20

Soils of grade 1 and grade 2 are suitable for a fairly wide range of crops and have few special management needs. Grade 3 soils are suited to a few crops or to special crops and require special management. Grade 4 soils have only a narrow range of agricultural possibilities. If used for crops, they are exacting in management requirements. Grade 5 consists of soils not suited to cultivated crops but that are used for pasture, range, forest, wildlife, watershed protection, and recreation.

Pasture and Range [22]

In Tehama County about 50 percent of the acreage, or nearly a million acres, is used for pasture and range. Included in this acreage are some areas that formerly were cultivated but are now in grass or are partly in grass and partly wooded. The areas used for pasture and range are mostly sloping to steep and are in foothills in the eastern, western, and northern parts of the county. Most of the acreage is in the Newville-Dibble, Corning-Redding, Toomes-Guenoc, Millsholm-Lodo, and Tuscan-Inks soil associations. The Hulls soils, minor soils of the Maymen-Los Gatos-Parrish soil association, however, and soils in other soil associations are also used for pasture and range at times.

Most of the early settlers in the county depended mainly on livestock for their livelihood. Consequently, large areas have been grazed for more than 100 years. The number of sheep grazing the areas has ranged from 100,000 to 300,000, and the cattle from 2,000 to 60,000. Management of the areas has changed from the early years when the areas were not fenced. Today much of the acreage is fenced and crossfenced, dense stands of blue oak have been removed, and stock ponds developed. Some reseeding and fertilizing have been done.

Some of the most common practices used in managing pasture and range in Tehama County are discussed in the paragraphs that follow, and the vegetation common to the county is listed. If the practices discussed are considered and properly applied, high yields of forage can be expected.

Fertilizing.—Applying fertilizer is not a general practice in the county, but tests have been made throughout the county to determine the fertilizer needs of the soils. Much of the information is experimental. In all of the areas where the tests were made there were several uncontrollable variables, such as the amount and distribution of rainfall, and temperature of the air and the soil. It was determined, however, that all the soils respond to nitrogen, that many respond to phosphate and sulfur, and that a few respond to such minor elements as molybdenum and copper.

Seeding.—Seeding may be feasible to establish stands of preferred forage plants after small grain is harvested and after clearing the brush and trees from areas by burning. Tests show, however, that it is not advisable to seed unless the soil has been disturbed or a seedbed prepared. Some of the most commonly used plants for seeding are rose clover, Mt. Barker subclover, crimson clover, Blando brome, and hardinggrass.

[22] LIN MAXWELL, farm advisor, University of California, assisted in preparing this section.

Clearing trees and brush.—The quantity and quality of forage is lowered by moderately dense and dense stands of oaks and brush. Thus, if the density of these plants can be reduced the grazing value of the areas increases. Methods of removing brush are discussed in the section "Brushland." The sprouting habits of some of the woody vegetation is also given in this section.

Oak trees are generally removed by bulldozing them or by applying chemicals. If a bulldozer is used, the trees are pushed over and are left for about 3 years before burning. In this way any sucker growth that starts is killed. If chemicals are used, the trees are killed by injecting chemicals, generally 2,4-D, into the base of the trees. Chemicals are also painted on the stumps of trees to prevent sprouting.

Stock pond development.—Stock ponds should be developed where needed. Natural sources of water are poorly located in many areas. Fencing has eliminated the water source from an area in some places. In other places the vegetation in open areas has been undergrazed because of lack of water.

Many stock ponds have been developed in the lower foothills on the west side of the county, mostly in the Tehama formation. These ponds are built by damming a small intermittent stream. If the dams are constructed correctly, they supply enough water the year around. On the east side of the county, it is more difficult to build small dams. Here stock ponds are built as small basins by removing the soil to the hard underlying rock. These basins hold enough water for livestock during winter and spring.

Stocking rates.—An important way of keeping the vegetation in good condition is that of grazing the proper number of cattle or sheep. Proper stocking requires that the manager understand the capabilities and limitations of the soil.

Cross fencing, rotation, and carrying capacity.—Cross fencing is needed so that grazing can be rotated between cattle and sheep. In this way the vegetation is grazed evenly and part of the area each year receives a minimum amount of use. Some of the less desirable forage also can be grazed, which reduces the seed crop of these plants and at the same time permits seed of the more desirable forage plants to mature. Also, soils that are trampled badly when wet can be protected from grazing during the wettest part of the winter.

In some areas in the lower foothills in the western part of the county, grazing is rotated with dryfarmed grain. A description of such a rotation is given in the discussion of barley in the section "Crop Management." Areas of brushland and woodland are also used for grazing, but the grazing on these areas is limited. The use of such areas for grazing is described in the sections "Brushland" and "Woodland."

Because the capacity of the soils for grazing varies, it is useful to know the carrying capacity of the various soils. Carrying capacity is the acres required to feed one cow or five sheep for 1 year. It has been determined for the soils used for grazing in Tehama County and is given in the list that follows. In the list a rating of *Good* means that the carrying capacity is less than 19 acres, and a rating of *Fair* that the carrying capacity is 20 to 39 acres. *Low* means that the carrying capacity is 40 to 59 acres, and *Very low* that it is more than 60 acres.

		Carrying capacity
AbD	Altamont clay, 10 to 30 percent slopes	Good.
AbE	Altamont clay, 30 to 50 percent slopes	Fair.
AcB	Altamont clay, terrace, 3 to 10 percent slopes.	Good.
AcD	Altamont clay, terrace, 10 to 30 percent slopes.	Good.
AcE	Altamont clay, terrace, 30 to 50 percent slopes.	Good.
Af	Anita clay, moderately deep	Fair.
Ad	Anita clay	Very low.
An	Anita cobbly clay	Very low.
Ao	Anita cobbly clay, moderately deep	Low.
Ap	Anita gravelly clay, moderately deep	Fair.
AsB	Anita stony clay, 0 to 8 percent slopes	Very low.
Ay	Arbuckle gravelly loam, clayey substratum, channeled.	Fair.
BuD	Burris stony clay, 10 to 30 percent slopes.	Low.
CaC	Childs gravelly loam, 5 to 15 percent slopes.	Very low.
Cb	Chummy soils, 0 to 3 percent slopes	Fair to good.
Cu	Columbia complex, channeled	Good.
CwA	Corning gravelly loam, 0 to 3 percent slopes.	Very low.
CwB	Corning gravelly loam, 3 to 8 percent slopes.	Very low.
Czx	Cortina complex	Fair.
DbD	Dibble silty clay loam, 10 to 30 percent slopes.	Fair.
DbE	Dibble silty clay loam, 30 to 50 percent slopes.	Fair.
DgD	Dibble-gullied land complex, 10 to 30 percent slopes.	Low.
DgE	Dibble-gullied land complex, 30 to 50 percent slopes.	Low.
GnD	Guenoc loam, 10 to 30 percent slopes	Fair.
GsD	Guenoc stony loam, 10 to 30 percent slopes.	Low.
GsE	Guenoc stony loam, 30 to 50 percent slopes.	Low.
HvD	Hulls gravelly loam, 10 to 30 percent slopes.	Fair.
HvE	Hulls gravelly loam, 30 to 50 percent slopes.	Low.
HvF	Hulls gravelly loam, 50 to 65 percent slopes.	Low.
IcD	Inks cobbly loam, 3 to 30 percent slopes.	Fair.
IcE	Inks cobbly loam, 30 to 50 percent slopes.	Low.
IrD	Iron Mountain rocky sandy loam, 10 to 30 percent slopes.	Very low.
IrE	Iron Mountain rocky sandy loam, 30 to 50 percent slopes.	Very low.
IrF	Iron Mountain rocky sandy loam, 50 to 65 percent slopes.	Very low.
Kf	Keefers loam, 0 to 3 percent slopes	Fair.
Km	Keefers loam, moderately deep, 0 to 3 percent slopes.	Fair.
Kc	Keefers cobbly loam, moderately deep, 0 to 3 percent slopes.	Fair.
Kn	Keefers complex, channeled	Low.
LaB	Laniger fine sandy loam, 0 to 8 percent slopes.	Fair.
LaD	Laniger fine sandy loam, 8 to 30 percent slopes.	Fair.
LaE	Laniger fine sandy loam, 30 to 50 percent slopes.	Low.
LbB	Laniger fine sandy loam, deep, 0 to 8 percent slopes.	Fair.
LdD2	Lodo and Maymen shaly loams, 10 to 30 percent slopes, eroded (Lodo part only).	Very low.
LdE2	Lodo and Maymen shaly loams, 30 to 65 percent slopes, eroded (Lodo part only).	Very low.
LfD	Lodo-Millsholm complex, 10 to 30 percent slopes.	Very low.

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		Carrying capacity
LfE	Lodo-Millsholm complex, 30 to 50 percent slopes.	Very low.
Ln	Los Robles cobbly loam, moderately deep, 0 to 3 percent slopes.	Good.
Mo	Millrace cobbly fine sandy loam, 0 to 3 percent slopes.	Fair to good.
Mr	Millrace complex, channeled	Fair to good.
MsD	Millsap loam, 10 to 30 percent slopes	Good.
MsE	Millsap loam, 30 to 50 percent slopes	Fair.
MsF	Millsap loam, 50 to 65 percent slopes	Low.
MtD	Millsholm clay loam, 10 to 30 percent slopes.	Good.
MtE	Millsholm clay loam, 30 to 50 percent slopes.	Fair.
MtF	Millsholm clay loam, 50 to 65 percent slopes.	Low.
MuE	Millsholm rocky sandy loam, 30 to 50 percent slopes.	Fair.
MuF	Millsholm rocky sandy loam, 50 to 65 percent slopes.	Low.
Mzt	Molinos complex, channeled	Good.
Mzy	Myers clay, 0 to 3 percent slopes	Good.
NaD	Nacimiento silty clay loam, 10 to 30 percent slopes.	Good.
NaD2	Nacimiento silty clay loam, 10 to 30 percent slopes, eroded.	Good.
NaE	Nacimiento silty clay loam, 30 to 50 percent slopes.	Good.
NaE2	Nacimiento silty clay loam, 30 to 50 percent slopes, eroded.	Fair.
NrB	Newville gravelly loam, 3 to 10 percent slopes.	Fair to low.
NrB2	Newville gravelly loam, 3 to 10 percent slopes, eroded.	Low.
NrD	Newville gravelly loam, 10 to 30 percent slopes.	Fair to low.
NrD2	Newville gravelly loam, 10 to 30 percent slopes, eroded.	Low.
NrE	Newville gravelly loam, 30 to 50 percent slopes.	Fair to low.
NrE2	Newville gravelly loam, 30 to 50 percent slopes, eroded.	Low.
NrF	Newville gravelly loam, 50 to 65 percent slopes.	Very low.
PrB	Peters clay, 1 to 8 percent slopes	Fair.
PrD	Peters clay, 8 to 30 percent slopes	Fair.
PrD2	Peters clay, 8 to 30 percent slopes, eroded.	Low to fair.
PrE	Peters clay, 30 to 50 percent slopes	Low.
PvB	Pleasanton gravelly loam, 1 to 10 percent slopes.	Fair.
Rg	Red Bluff gravelly loam, 0 to 3 percent slopes.	Low to very low.
Rh	Red Bluff gravelly loam, hardpan substratum, 0 to 3 percent slopes.	Fair to low.
Rb	Red Bluff loam, 0 to 3 percent slopes	Low to very low.
RnA	Redding gravelly loam, 0 to 3 percent slopes.	Low to very low.
RnB	Redding gravelly loam, 3 to 8 percent slopes.	Low to very low.
Ro	Redding gravelly loam, very shallow, 0 to 3 percent slopes.	Very low.
Rm	Redding loam, 0 to 3 percent slopes	Low to very low.
ScE	Sehorn clay and clay loam, 30 to 50 percent slopes.	Fair to good.
ScD	Sehorn clay and clay loam, 10 to 30 percent slopes.	Good.
SuD	Supan stony loam, 10 to 30 percent slopes.	Low.
SuE	Supan stony loam, 30 to 50 percent slopes.	Low.
TgD	Toomes very rocky loam, 10 to 30 percent slopes.	Very low.
TgE	Toomes very rocky loam, 30 to 50 percent slopes.	Very low.
ThE	Toomes extremely rocky loam, 1 to 50 percent slopes.	Very low.
TkB	Toomes very rocky silt loam, 1 to 10 percent slopes.	Low.
TkD	Toomes very rocky silt loam, 10 to 30 percent slopes.	Fair.
TfD	Toomes rocky loam, 10 to 30 percent slopes.	Low.
TfE	Toomes rocky loam, 30 to 50 percent slopes.	Low.
TmD	Toomes-Supan rocky loams, 10 to 30 percent slopes.	Low.
TmE	Toomes-Supan rocky loams, 30 to 50 percent slopes.	Very low.
TuB	Tuscan cobbly loam, 1 to 5 percent slopes.	Very low.
TvB	Tuscan cobbly loam, moderately deep, 1 to 5 percent slopes.	Very low.
TsB	Tuscan loam, 1 to 5 percent slopes	Very low.
TtB	Tuscan clay loam, 1 to 8 percent slopes.	Very low.
TwB	Tuscan stony loam, 1 to 5 percent slopes.	Very low.
TxC	Tuscan very stony loam, 3 to 15 percent slopes.	Very low.

Vegetation.—The common and scientific names of the principal plants in pasture and range in Tehama County are given in the list that follows.

GRASSES

Common name	*Scientific name*
Annual bluegrass	*Poa annua*
Cheatgrass	*Bromus tectorum*
Dogtail	*Cynosurus* spp.
Fescue	*Festuca* spp.
Foxtail barley	*Hordeum jubatum*
Hairgrass	*Deschampsia* spp.
Medusahead	*Elymus caput-medusae*
Melic	*Melica* spp.
Mouse barley	*Hordeum leporinum*
Needlegrass	*Stipa* spp.
Oatgrass	*Danthonia* spp.
Orchardgrass	*Dactylis glomerata*
Pine bluegrass	*Poa scabrella*
Red brome	*Bromus rubens*
Ripgut brome	*Bromus rigidus*
Rush	*Juncus* spp.
Sedge	*Carex* spp.
Soft chess	*Bromus mollis*
Squirreltail	*Sitanion* spp.
Three-awn	*Aristida* spp.
Timothy	*Phleum* spp.
Wild oats	*Avena* spp.

FORBS

Common name	*Scientific name*
Bedstraw	*Galium* spp.
Bracken fern	*Pteridium aguilinum*
Brodiaea	*Bordiaea* spp.
Broadleaf filaree	*Erodium botrys*
Bull thistle	*Cirsium lanceolatum*
Burclover	*Medicago hispida*
California poppy	*Eschscholtzia californica*
Chickweed	*Cerastium* spp.
Chicory	*Cichorium intybus*
Clover	*Trifolium* spp.
Cutleaf filaree	*Erodium cicutarium*
Deathcamas	*Zigadenus* spp.
Fiddleneck	*Amsinckia* spp.
Goldfields	*Baeria* spp.
Indian paintbrush	*Castilleja* spp.
Larkspur	*Delphinium* spp.
Lupine	*Lupinus* spp.
Mariposa-lily	*Calochortus* spp.
Milkweed	*Asclepias* spp.
Morning-glory	*Convolvulus* spp.
Mulesears	*Wyethia* spp.
Mustard	*Brassica* spp.
Pussypaws	*Calpytridium* spp.

FORBS—Continued

Common name	Scientific name
Shepherdspurse	*Capsella* spp.
Shootingstar	*Dodecatheon* spp.
Spikeweed	*Centromadia* spp.
Tarweed	*Hemizonia* spp, *Madia* spp.
Trefoil	*Lotus* spp.
Turkeymullein	*Eremocarpus setigerus*
Turpentineweed	*Trichostema laxum*
Wild buckwheat	*Eriogonum* spp.
Wild daisy	*Erigeron* spp.
Wild onion	*Allium* spp.
Yarrow	*Achillea* spp.
Yellow star-thistle	*Centaurea solstitialis*

Brushland

More than 200,000 acres in Tehama County are in brush. The areas lie between land in timber and land that is grazed. The extent of the brushland can be seen on the general soil map at the back of the report, for the areas are mainly in the Maymen-Los Gatos-Parrish, the Toomes-Guenoc, and the Windy-Iron Mountain soil associations.

Few of the owners of this kind of land live on it. It was used in the past mostly for grazing by goats. Now the areas are grazed by sheep or are used for hunting. The major value of brushland is protection of the watershed. Grasses and forbs and the litter from trees provide better protection from erosion than brush, but many steep and very steep areas in the county would most likely be very severely eroded if they did not have a cover of brush. The brush also provides cover and browse for wildlife.

Management of brushland.—Management of areas in brush is uncertain, because the cost is generally greater than expected returns. A few areas of brushland have developed because of indiscriminate burning and grazing after the county was settled, but most areas in brush have probably always been in brush. Until legislation was enacted in 1905, areas in brush were repeatedly burned. Many areas are now protected from fires and have firebreaks and roads to help in the control of wild fires. Unfortunately fires do get started, and they are difficult to control. As a result, most areas have been burned over at least once in the last 50 years.

If fire is carefully controlled, however, it is one of the best and quickest methods of controlling brush. Bulldozers provide another method. After the land is cleared of brush, sprouts must be kept down because the brush will come back quickly if the areas are burned or bulldozed. Although a bulldozer does not remove all roots and many of them sprout again, it disturbs the soil somewhat and thus aids in the reseeding and planting of trees. The use of both fire and bulldozers would probably be desirable in removing brush.

It is important to get a cover on areas that are cleared of brush as quickly as possible. This can be done by planting trees or seeding to grasses and legumes before the first rains in fall. Planting in fall before the heavy winter rains helps to control erosion and also takes advantage of plant nutrients made available after a fire. If seeding is done too early, however, rodents and birds are likely to carry away many of the seeds.

Sufficient plant nutrients are available in the soil after burning for adequate plant growth for a year or two. As the grasses and legumes grow and competition with the shrubs that have sprouted increases, however, the supply of some nutrients is depleted. Then grasses and legumes on the soils probably will require phosphorus and sulfur. If legumes were not included in the seeding mixture, nitrogen will also be needed. In some places potassium, molybdenum, copper, zinc, and other plant nutrients also become limited. Calcium is required, in addition, on soils that formed in material from serpentine rock. Proper use of fertilizer may decide whether or not brushland can be converted to grassland, but to be economically feasible, the soils in each site should be tested to determine the kind and amount of fertilizer needed.

Most of the shrubs growing in the brushland sprout after a fire. Buckbrush, common manzanita, and squawcarpet, however, normally do not sprout after a fire if the top is killed, and the sprouting habits of mountain alder are not yet known. Deerbrush ceanothus sprouts in some places after a fire, and in others does not. Of the trees in the brushland, blue oak, California black oak, canyon live oak, interior live oak, Fremont cottonwood, and valley white oak sprout following a fire. The others normally do not sprout if the top is killed by fire. Of the three common forbs in the brushland, the sprouting habits of Pacific mondarella are not known, but the other two sprout following a fire.

The common and scientific names of some of the native woody plants in brushland of the county are given in the list that follows.

SHRUBS

Common name	Scientific name
Birchleaf mountain-mahogany	*Cercocarpus betuloides*
Bitter cherry	*Prunus emarginata*
Brewer oak	*Quercus garryana breweri*
Bush chinquapin	*Castanopsis sempervirens*
Buckbrush (Wedgeleaf ceanothus)	*Ceanothus cuneatus*
California barberry	*Berberis californicum*
California redbud	*Cercis occidentalis*
California scrub oak	*Quercus dumosa*
California wild grape	*Vitis californica*
California yerba santa	*Eriodictyon californicum*
Chamise	*Adenostoma fasciculatum*
Chaparral coffeeberry	*Rhamus californica var. tomentella*
Common manzanita	*Arctostaphylos manzanita*
Creeping sage	*Salvia sonomensis*
Deerbrush ceanothus	*Ceanothus integerrimus*
Flannelbush	*Fremontia californica*
Foothill ash	*Fraxinus dipetala*
Fremont silktassel	*Garrya fremontii*
Greenleaf manzanita	*Arctostaphylos patula*
Hollyleaf coffeeberry	*Rhamnus crocea ilicifolia*
Huckleberry oak	*Quercus vaccinifolia*
Leather oak	*Quercus durata*
Mountain alder	*Alnus tenuifolia*
Mountain whitethorn	*Ceanothus cordulatus*
Pacific dogwood	*Cornus nuttallii*
Pacific poison-oak	*Toxicodendron diversilobum* (*Rhus diversiloba*)
Pine-mat manzanita	*Arctostaphylos nevadensis*
Sierra plum	*Prunus subcordata*
Snowbrush	*Ceanothus velutinus*
Squaw bush	*Rhus trilobata*
Squawcarpet	*Ceanothus prostratus*
Toyon (Christmas berry)	*Photinia arbutifolia*
Whiteleaf manzanita	*Arctostaphylos viscida*
Willow	*Salix* spp.

TREES

Common name	Scientific name
Blue oak	*Quercus douglasii*
California black oak	*Quercus kelloggii*
California buckeye	*Aesculus californica*
California juniper	*Juniperus californica*

TREES—Continued

Common name	Scientific name
California laurel	*Umbellularia californica*
California red fir	*Abies magnifica*
Canyon live oak	*Quercus chrysolepis*
Digger pine	*Pinus sabiniana*
Douglas-fir	*Pseudotsuga menziesii (P. taxifolia)*
Fremont cottonwood	*Populus fremontii*
Incense-cedar	*Libocedrus decurrens*
Interior live oak	*Quercus wislizenii*
Jeffrey pine	*Pinus jeffreyi*
Knobcone pine	*Pinus attenuata*
Lodgepole pine	*Pinus contorta*
Macnab cypress	*Cupressus macnabiana*
Madrone	*Arbutus menziesii*
Mountain hemlock	*Tsuga mertensiana*
Ponderosa pine	*Pinus ponderosa*
Sugar pine	*Pinus lambertiana*
Valley white oak	*Quercus lobata*
Western white pine	*Pinus monticola*
White fir	*Abies concolor*

FORBS

Common name	Scientific name
Pacific monardella	*Monardella odoratissima*
Western bracken	*Pteridium aquilinum pubescens*
Woolly mulesears	*Wyethia mollis*

Woodland

In Tehama County the major wooded areas are on soils of the uplands (fig. 7). These soils were mapped, and the vegetation on them was studied, by a State cooperative soil and vegetation survey, and the site index of the principal commercial conifers was determined. The principal commercial conifers are ponderosa pine, sugar pine, Jeffrey pine, Douglas-fir, white fir, red fir, and incense-cedar.

Table 3 lists the soils of the county used for timber, gives the site index for each, and lists the predominant commercial conifers in order of their abundance. Site index is based on the height of the dominant or codominant trees in the stand at stated years of age; generally the index is based on ponderosa pine in this county. Site index is determined mainly by the soil, but rainfall, temperature, and aspect (the direction the slope faces) also affect the index.

***Figure 7.*—A wooded area on soils in the eastern part of Tehama County; Lassen Peak is in the background.**

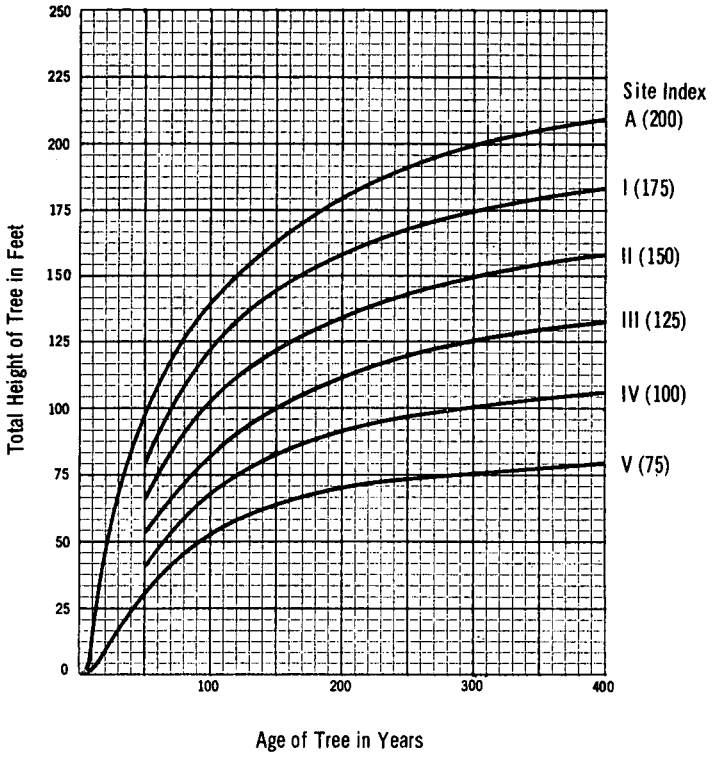

***Figure 8.*—Site indexes in Tehama County. (Adapted from *"A Site Classification for the Mixed Conifer Selection Forests of the Sierra Nevada,"* by Duncan Dunning *(4)*.**

Since the relationship of one plant to another changes with the aspect, predominant conifers are listed for some soils in table 3 on slopes that face both north and those that face south.

Site index curves are shown in figure 8. These allow interpretation of site index numbers in terms of age. For example, Aiken loam, 10 to 30 percent slopes, is shown in site index I in table 3. Reference to figure 8 shows that the site index is 175, or that at 300 years of age trees on this soil will be 175 feet tall.

The kinds of soils in a site influence the rate of tree growth and also affect management. Each site should therefore be considered in woodland management. Some of the main practices of woodland management are replanting of trees, logging, and control of fire.

Replanting in the forests of the county is expensive. The trees generally take a long time to mature. In addition, because of the climate and the many rodents in the areas, many of the seedlings are killed before they can become established. If seedling trees are planted without determining the suitability of the site for trees, they are likely to be wasted. After a brush fire in particular, it is important to determine if the area is made up of soils on which trees are likely to thrive. Trees grow well, for example, on Josephine soils, but they are not likely to thrive on Los Gatos soils. Both of these soils are steep to very steep and are in mountainous areas in the western part of the county.

Logging affects the future yields of timber through its effect on the soils. Practices that cause excessive erosion or soil compaction should therefore be avoided. Trees

TABLE 3.—*Soils in Tehama County used for timber, their site index, and the predominant commercial conifers*

Map symbol	Soil	Site index	Predominant commercial conifers
AaD	Aiken loam, 10 to 30 percent slopes	I	Ponderosa pine, white fir, sugar pine, Douglas-fir.
CdD	Cohasset loam, 10 to 30 percent slopes	I, II	Ponderosa pine, incense-cedar, Douglas-fir, white fir, sugar pine.
CdE	Cohasset loam, 30 to 50 percent slopes	I, II	Douglas-fir, white fir, sugar pine.[1] Ponderosa pine, incense-cedar.[2]
CdF	Cohasset loam, 50 to 65 percent slopes	III	Douglas-fir.[1]
CeD	Cohasset loam, very deep, 10 to 30 percent slopes	I, A	Ponderosa pine, incense-cedar, Douglas-fir, white fir, sugar pine.
CgD	Cohasset stony loam, 10 to 30 percent slopes	I, II	Ponderosa pine, incense-cedar, Douglas-fir, white fir, sugar pine.
CgE	Cohasset stony loam, 30 to 50 percent slopes	II	Douglas-fir, white fir, sugar pine.[1] Ponderosa pine, incense-cedar.[2]
ChD2	Cohasset stony loam, moderately deep, 10 to 30 percent slopes, eroded.	III, II	Ponderosa pine, incense-cedar.
CfD	Cohasset gravelly loam, 10 to 30 percent slopes	II, III	Ponderosa pine, incense-cedar.
CfE	Cohasset gravelly loam, 30 to 50 percent slopes	III, II	Ponderosa pine, incense-cedar, Douglas-fir.
CvD	Cone extremely gravelly sandy loam, 10 to 30 percent slopes.	III, II	Ponderosa pine (at low elevations); ponderosa pine, incense-cedar, Douglas-fir, white fir, sugar pine (at high elevations).
CvE	Cone extremely gravelly sandy loam, 30 to 50 percent slopes.	III, II	Ponderosa pine (at low elevations); ponderosa pine, incense-cedar, Douglas-fir, white fir, sugar pine (at high elevations).
DyD	Dubakella stony loam, 10 to 30 percent slopes	IV, III	Jeffrey pine, incense-cedar.
DyE	Dubakella stony loam, 30 to 50 percent slopes	IV, III	Jeffrey pine, incense-cedar.
EgB	Elam very gravelly loamy sand, 0 to 8 percent slopes	III, II	Ponderosa pine, white fir, sugar pine.
EmB	Elam very gravelly loamy sand, moderately deep, 0 to 8 percent slopes.	IV	Jeffrey pine, white fir.
FoD	Forward sandy loam, 10 to 30 percent slopes	III	Ponderosa pine, white fir, Douglas-fir, sugar pine.
IkD	Inskip very rocky silt loam, 10 to 30 percent slopes	III	Ponderosa pine, Douglas-fir, white fir, sugar pine.
IkE	Inskip very rocky silt loam, 30 to 50 percent slopes	III, IV	Ponderosa pine, Douglas-fir, white fir, sugar pine.
ImD	Inskip very rocky silt loam, moderately deep, 10 to 30 percent slopes.	III, IV	Ponderosa pine.
ImE	Inskip very rocky silt loam, moderately deep, 30 to 50 percent slopes.	IV	Ponderosa pine.
JgD	Jiggs stony sandy loam, 10 to 30 percent slopes	III	Douglas-fir, white fir, sugar pine.[1] Ponderosa pine, incense-cedar.[2]
JgD2	Jiggs stony sandy loam, 10 to 30 percent slopes, eroded	IV	Ponderosa pine, incense-cedar.[2]
JgE	Jiggs stony sandy loam, 30 to 50 percent slopes	III	Douglas-fir, white fir, sugar pine.[1] Ponderosa pine, incense-cedar.[2]
JgE2	Jiggs stony sandy loam, 30 to 50 percent slopes, eroded	IV	Pondeorsa pine, incense-cedar.
JgF	Jiggs stony sandy loam, 50 to 65 percent slopes	III, IV	Douglas-fir, white fir, sugar pine.[1] Ponderosa pine, incense-cedar.[2]
JgF2	Jiggs stony sandy loam, 50 to 65 percent slopes, eroded	IV	Ponderosa pine, incense-cedar.
JoD	Josephine gravelly loam, 10 to 30 percent slopes	II, I	Ponderosa pine, incense-cedar, Douglas-fir, white fir, sugar pine.
JoE	Josephine gravelly loam, 30 to 50 percent, slopes	II	Ponderosa pine, incense-cedar, Douglas-fir, white fir, sugar pine.
JoE2	Josephine gravelly loam, 30 to 50 percent slopes, eroded	III	Ponderosa pine, incense-cedar, Douglas-fir, white fir.
JoF2	Josephine gravelly loam, 50 to 65 percent slopes, eroded	III, IV	Ponderosa pine, incense-cedar, Douglas-fir.
LvD	Lyonsville and Jiggs gravelly sandy loams, 10 to 30 percent slopes.	II, III	Ponderosa pine, Douglas-fir, white fir, sugar pine.
LvE	Lyonsville and Jiggs gravelly sandy loams, 30 to 50 percent slopes.	II, III	Douglas-fir, white fir, sugar pine.[1] Ponderosa pine, incense-cedar.[2]
LvF	Lyonsville and Jiggs gravelly sandy loams, 50 to 65 percent slopes.	III	Douglas-fir, white fir, sugar pine.[1] Ponderosa pine, incense-cedar.[2]
LyD	Lyonsville and Jiggs stony sandy loams, 10 to 30 percent slopes.	II, III	Ponderosa pine, Douglas-fir, white fir, sugar pine.
LyE	Lyonsville and Jiggs stony sandy loams, 30 to 50 percent slopes.	II, III	Douglas-fir, white fir, sugar pine.[1] Ponderosa pine, incense-cedar.[2]
LyF	Lyonsville and Jiggs stony sandy loams, 50 to 65 percent slopes.	III, IV	Douglas-fir, white fir, sugar pine.[1] Ponderosa pine, incense-cedar.[2]
MaD	Manton sandy loam, 10 to 30 percent slopes	III, II	Ponderosa pine, white fir, Douglas-fir, sugar pine.
MbD	Masterson gravelly loam, 10 to 30 percent slopes	III, II	White fir, red fir, sugar pine.
MkD	McCarthy sandy loam, 10 to 30 percent slopes	III, II	Douglas-fir, white fir, sugar pine, ponderosa pine, incense-cedar.
MkE	McCarthy sandy loam, 30 to 50 percent slopes	III	Douglas-fir, white fir, sugar pine.[1]
MkF	McCarthy sandy loam, 50 to 65 percent slopes	III	Douglas-fir, white fir, sugar pine.[1]
NkB	Nanny stony loam, 0 to 8 percent slopes	III, II	White fir, Douglas-fir, sugar pine, ponderosa pine.
NmB	Nanny stony loam, moderately deep, 0 to 8 percent slopes	III	White fir, Douglas-fir, sugar pine, Jeffrey pine.
NnD	Neuns stony loam, 10 to 30 percent slopes	III, II	Douglas-fir, white fir, sugar pine, ponderosa pine.
NnE	Neuns stony loam, 30 to 50 percent slopes	III	Douglas-fir, white fir, sugar pine.[1] Ponderosa pine, incense-cedar.[2]

See footnotes at end of table.

TABLE 3.—*Soils in Tehama County used for timber, their site index, and the predominant commercial conifers*—Continued

Map symbol	Soil	Site index	Predominant commercial conifers
NnF	Neuns stony loam, 50 to 65 percent slopes	III	Douglas-fir, white fir, sugar pine.[1] Ponderosa pine, incense-cedar.[2]
NoF	Neuns stony loam, deep, 50 to 65 percent slopes	III	Douglas-fir, white fir, sugar pine.[1] Ponderosa pine, incense-cedar.[2]
SnD	Sheetiron gravelly loam, 10 to 30 percent slopes	III, II	Ponderosa pine, incense-cedar, Douglas-fir, white fir, sugar pine.
SnE	Sheetiron gravelly loam, 30 to 50 percent slopes	III, II	Douglas-fir, white fir, sugar pine.[1] Ponderosa pine, incense-cedar.[2]
SnF	Sheetiron gravelly loam, 50 to 65 percent slopes	III	Douglas-fir, white fir, sugar pine.[1] Ponderosa pine, incense-cedar.[2]
SrE	Sheetiron rocky loam, 30 to 50 percent slopes	III	Douglas-fir, white fir, sugar pine.[1] Ponderosa pine, incense-cedar.[2]
SrF	Sheetiron rocky loam, 50 to 65 percent slopes	III	Douglas-fir, white fir, sugar pine.[1] Ponderosa pine, incense-cedar.[2]
WsD	Windy stony sandy loam, 10 to 30 percent slopes	III	White fir, ponderosa pine, sugar pine, red fir.
WsE	Windy stony sandy loam, 30 to 50 percent slopes	III	White fir, ponderosa pine, sugar pine, red fir.
WsF	Windy stony sandy loam, 50 to 65 percent slopes	III	White fir, sugar pine, red fir.[1] Ponderosa pine, white fir.[2]
WgD	Windy gravelly sandy loam, 10 to 30 percent slopes	III	Red fir, white fir.
WgE	Windy gravelly sandy loam, 30 to 50 percent slopes	III	Red fir, white fir.
WnD	Windy rocky sandy loam, 10 to 30 percent slopes	III	Red fir, white fir.
WnE	Windy rocky sandy loam, 30 to 50 percent slopes	III	Red fir, white fir, sugar pine.
WnF	Windy rocky sandy loam, 50 to 65 percent slopes	III, IV	White fir, sugar pine, red fir.
WrE2	Windy rocky sandy loam, moderately deep, 10 to 50 percent slopes, eroded.	IV	White fir, red fir, sugar pine, Jeffrey pine.
YbD	Yollabolly very rocky loam, 10 to 30 percent slopes	IV	Jeffrey pine, white fir, red fir.
YbE	Yollabolly very rocky loam, 30 to 65 percent slopes	IV	Jeffrey pine, white fir, red fir.

[1] On slopes that face north.

[2] On slopes that face south.

grow poorly or do not grow at all in eroded or compacted soils. The value of such soils as recreation areas and wildlife areas is also reduced and in places is destroyed.

Logging roads are one of the main causes of erosion in forests. Too many logging roads, and logging roads that are poorly located cause excessive runoff. This, in turn, causes erosion and soil compaction. In places damage to the soils can be reduced if the roadway is returned to its natural state after logging is done. Landings or tree loading sites should also be given special attention after they have served their purpose. In addition care is required in using skid trails to prevent gullies from starting.

The Forward, Jiggs, Manton, Josephine, and Cohasset soils are more susceptible to erosion than other soils used for timber. When logging is done on areas of these soils, extra care is needed to help control erosion.

Fire control is more difficult on gravelly, stony, or rocky soils than on soils that contain few or no rock fragments. Fire lines are difficult to establish through such soils, and fire lines must be established quickly to control fires. If areas of gravelly, stony, or rocky soils are known, plans can be made accordingly when it is necessary to control a particular forest fire.

Formation and Classification of Soils

In this section the factors that have affected the formation of the soils in Tehama County are discussed. Also discussed is the classification of the soils by higher categories.

Factors of Soil Formation

Soil is a natural body on the surface of the earth in which plants grow, and it is composed of organic and mineral materials (*9*). Soils differ in their appearance, composition, management requirements, and productivity in different localities or even within very short distances in the same locality. The factors that cause soils to differ are (1) the physical and mineralogical composition of the parent material; (2) the climate under which the soil material has accumulated; (3) the biological forces, or the plant and animal life in and on the soil; (4) the relief, or lay of the land; and (5) the length of time the forces of formation have acted on the soil material. These five factors work together in many different combinations, and the soils that result differ from place to place. The influence of each soil-forming factor on the soils in Tehama County is described in the pages that follow.

Parent material

The development of soil is influenced by the composition and structure of the underlying geologic formations. Much of the valley part of the county is filled with sediments deposited within the last million years. Some of these sediments, such as the bedrock under the Tuscan soils, is now relatively hard. Other sediments, for example, those that underlie the Newville soils, are relatively soft. The bedrock east of the Sacramento River is of volcanic origin and is mostly hard. The rock formations west of the Sacramento River are mostly hard and are chiefly of sedimentary origin.

Figure 9 shows in a general way the distribution of the material underlying the soils of Tehama County. The

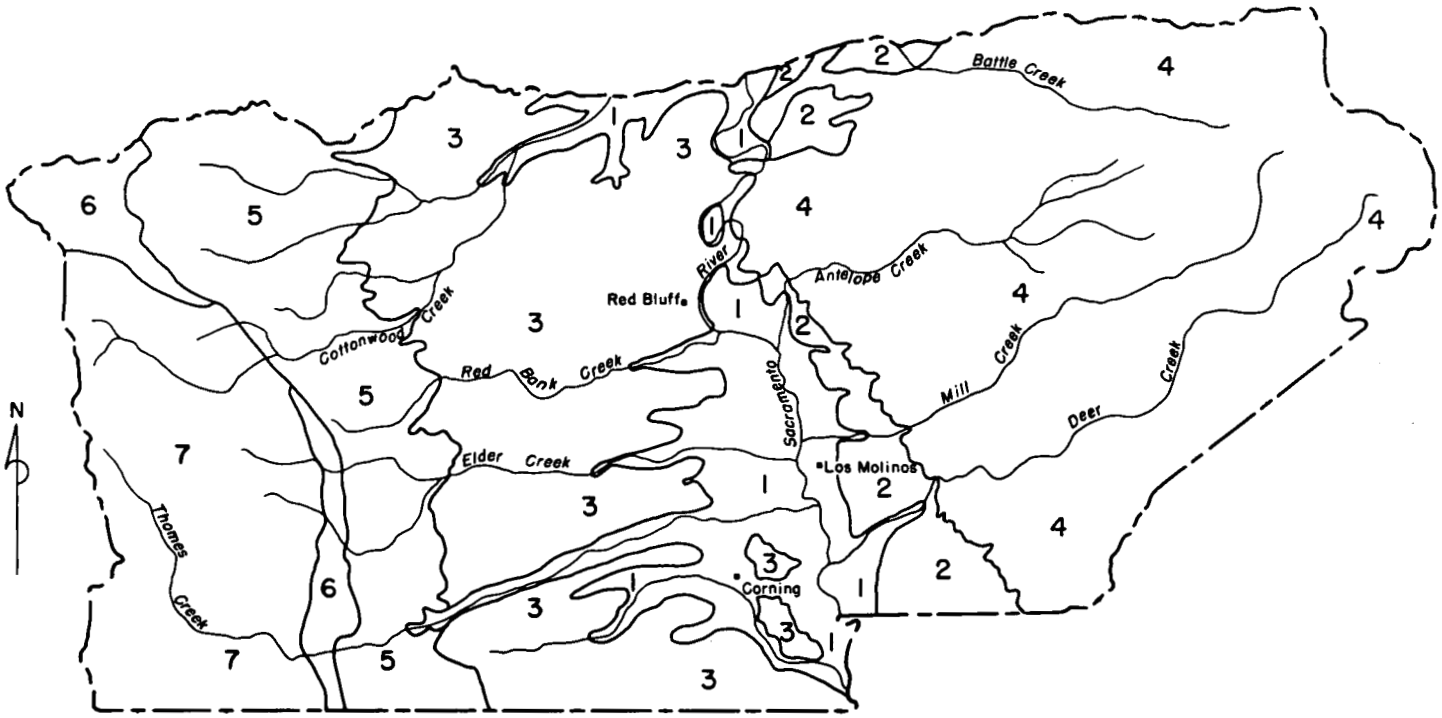

Figure 9.—**Diagram showing sources of parent material in Tehama County, 1, Recent alluvium; 2, Old alluvium from volcanic rock; 3, Old alluvium from sedimentary rock; 4, Volcanic rocks; 5, Hard sedimentary rocks; 6, Hard metamorphic and volcanic rocks; 7, Hard metamorphic sedimentary rocks.**

map is based partly on information gathered during the course of the soil survey and partly on publications about the geology of the county (*1*, *2*). The various kinds of parent materials are described in the paragraphs that follow.

Recent alluvium.—This material consists of unconsolidated sediments deposited on flood plains and low terraces. Alluvium is still being deposited on flood plains of the most active streams when the streams overflow, but the low terraces have not been flooded for many years and receive little fresh material.

Soils developed in alluvium eroded from areas of similar rocks tend to have similar characteristics. For example, the Berrendos, Farwell, Los Robles, Millrace, Molinos, and Vina soils developed in alluvium derived from basic igneous rocks. Except for the Molinos soils, all of these soils are silty, or nearly so, and are nearly free of gravel. Molinos soils are adjacent to stream channels and contain some sand and gravel. Differences among the other soils derived from basic igneous rocks are in the quantity of clay they contain or in the degree and kind of profile development.

Soils developed in areas in which the alluvium was derived from sedimentary rocks are of the Arbuckle, Cortina, Hillgate, Kimball, Maywood, Moda, Orland, Perkins, Tehama, Yolo, and Zamora series. Many of these soils have some gravel throughout or have gravelly lenses or layers because cherty lenses are common in the sedimentary rocks and the chert is resistant to weathering. The Yolo and Zamora soils, however, are nearly free of gravel, at least in the upper 5 feet, because the parent materials of those soils were probably carried by slow-moving water.

Old alluvium from volcanic rock.—This strongly weathered and relatively consolidated material was deposited on terraces along the edges of foothills in the eastern part of the county during the Pleistocene epoch. Soils of the Tuscan, Anita, and Keefers series are on the top of the terraces. On dissected slopes of these terraces are the Inks soils.

Old alluvium from sedimentary rocks.—This material deposited late in the Pliocene and Pleistocene epochs covers a fairly large area west of the Sacramento River. The material is relatively unweathered and is weakly consolidated. Soils formed in material from the deposits are of the Redding, Corning, and Red Bluff series. Profiles of these soils express a high degree of weathering. The subsoil of the Redding soil is consolidated to a depth of a few inches to a few feet. In much of the area the old alluvium from sedimentary rock has been eroded away. Here are the Newville, Dibble, Nacimiento, and Altamont terrace soils.

Volcanic rocks.—Rocks formed as the result of volcanic activity are dominant in the uplands east of the Sacramento River. These rocks are relatively hard and range from basalt to rhyolite in composition, although andesitic rock predominates. Hard volcanic breccia, which covers most of the area, underlies the Toomes, Supan, Cohasset, Iron Mountain, and Windy soils. The Inskip, Cone, and Windy soils formed on some of the more recent basaltic and andesitic flows, and the Forward and Laniger soils formed on deposits of volcanic tuff. On the light-colored rhyolitic rock are the Lyonsville soils.

Hard sedimentary rocks.—These are the dominant rocks in the high foothills and low mountain areas west of the Sacramento River. The rocks are hard sandstone, shale,

and conglomerate of the Cretaceous and the Upper Jurassic periods. Soils of the Millsholm, Millsap, Altamont, Sehorn, Lodo, Maymen, Los Gatos, Parrish, Hugo, and Josephine series formed in material weathered from these rocks.

Hard metamorphic and volcanic rocks.—These hard, dense rocks are in the uplands west of the Sacramento River and are associated with sedimentary rocks. They consist of metamorphosed volcanic rocks, andesite, breccia, and serpentine. The Stonyford soils and some of the Cohasset soils formed in material weathered from the metamorphosed volcanic rock, andesite, and breccia, and the Henneke soils from the serpentine.

Hard metamorphic sedimentary rocks.—These rocks are in high mountainous areas west of the Sacramento River and are part of the Coast Range Mountains. They consist of hard, platy, sedimentary and metamorphosed mica-schist rocks. The Tyson, Hulls, Sheetiron, Josephine, Masterson, and Yollabolly soils formed in material from these rocks.

Climate

The climate in Tehama County varies according to differences in elevation. In the valley and foothills the summers are hot and dry, and the winters are cool and moist. In the mountains the summers are warm and slightly moist, and the winters are cold and humid.

Moisture and temperature strongly affect the soils that form. Water from rainfall, for example, moves dissolved and suspended materials downward as it passes through the soil. The clay accumulation in the subsoil of the Hillgate, Kimball, and other soils in the county is partly the result of downward movement by water. Also, because of the downward movement of calcium and magnesium in solution, lime has accumulated in the subsoil of some soils.

Weathering processes slowly break down minerals in the soil. Plants use some of the weathered materials, but in mountainous areas where rainfall is more than 35 inches, many of them are washed out of the soil. Some of the minerals are returned to the surface layer through decomposition of plant residues on the surface and of roots in the soil. Organic acids also form. The loss of bases, particularly of calcium, magnesium, potassium, and sodium and their replacement by hydrogen, causes the soils to become acid. In the mountains where rainfall is high and bases from decomposing residues are present at the surface, the surface layer of the soils is less acid than the horizons below. At lower elevations rainfall is sufficient to move the bases into the subsoil but not out of the soil. Here bases tend to accumulate in the lower part of the solum, and the soils are more alkaline with increasing depth. Throughout Tehama County there are apparently enough years when precipitation is higher than average that the more soluble salts are moved deep into the subsoil. Appreciable amounts of soluble salts therefore do not accumulate in the subsoil.

Soil temperatures are related to air temperatures, but at a depth of more than 6 inches the variability in temperature during 24 hours is negligible. Likewise the variation in temperature of the soil at a depth of more than 6 feet is slight between seasons.

The temperature of soil affects the rate at which water is lost through evaporation. Soils on slopes that face south and west warm up more quickly and lose water more rapidly than soils on slopes that face north and east. The Iron Mountain soils, for example, are on slopes that face south, and they dry out more rapidly than the McCarthy soils, which are on slopes that face north.

As the temperature of a soil increases, chemical and biological activity in the soil increases and decomposition of rocks and minerals also increases. Clay accumulation from the decomposition of rocks and minerals is therefore greater in the lower horizons of soils than in the upper horizons, because soil moisture in the lower horizons is generally adequate for chemical reaction when the soil temperature increases late in spring. This is particularly so in the valley and foothills where the grasses and forbs exhaust the first foot or so of soil moisture shortly after the rains stop in spring.

Biological forces

In Tehama County vegetation is dominant among the biological forces that affect soil formation. Plants, animals, insects, and bacteria add organic matter to the soils and stir and aerate it. Their activity, however, depends upon the vegetation that grows on the soil and provides their food.

Distinct patterns of vegetation are readily apparent in the county. Dense stands of hardwoods grow on the alluvial soils of the valley and foothills. Grasses and forbs together or intermingled with blue oak are on soils of the terraces and foothills. These plants add organic matter to soils in the valleys and foothills, but because of the warm, moist weather in spring decomposition is rapid. In these soils the content of organic matter in the surface layer is generally less than 1 percent, and it decreases with increasing depth. In a few of the soils, however, particularly those on recent alluvium, the content of organic matter is almost 2 percent in places. The weak structure of the soils on the terraces and foothills is mainly related to their low content of organic matter.

Dense shrubs grow between grass-oak areas in the foothills and timber areas in the mountains. Here large amounts of woody vegetation are produced. The content of organic matter in the surface layer of the soils is nevertheless low. It is between 1 and 2 percent in places, which is slightly higher than that in soils in the valley. Because of the kind and amount of organic matter present, the structure of the surface layer of the soils under brush is weak granular or is fine subangular blocky. In sloping areas where sheet erosion is slight to moderate, some organic matter has been lost through erosion.

Soils in the mountains under timber contain more organic matter than other soils in the county. The large amount of woody vegetation and the relatively cool temperatures favor the accumulation of organic matter. The content of organic matter in the surface layer of these soils is as much as 5 percent. Structure is also stronger than in other soils in Tehama County. All of the soils in the Sheetiron, Cohasset, and Windy series, which formed under timber in mountainous areas, for example, have either strong granular structure or crumb structure.

Relief

Relief, through its effect on drainage and the erosion or wearing away of the mountains and the filling of the valleys has had an important effect on soil development in Tehama County.

In the valley the deposits of recent alluvium are nearly level and most of the rainfall moves into the soil. Depth to the water table, however, is generally more than 5 feet because the areas are drained by streams that are well entrenched.

On the older terraces are a few local basins where water stands for long periods during winter and spring. In these places weathering of the parent material has been rapid and much clay has accumulated. Organic matter also has accumulated in these basins and has given the soil a very dark color.

The soils on the high terraces are nearly level to steep. Water drains very slowly from the tops of the terraces. Runoff from the slopes, however, is slow to rapid. Here erosion ranges from slight to moderate, depending mainly on the amount of vegetative cover and the degree of slope.

In the mountains where the rock that makes up the parent material is harder than in other areas in the county, the depth of the soil and the degree of weathering of the parent rock depend on the slope and its aspect. Areas where the soils are deepest and the rock most weathered are on the very gently sloping ridgetops. Examples of such soils are the Cohasset, Josephine, and Masterson. Soils on the slopes that face north are shallower than those on the gently sloping ridgetops but deeper than those on steep slopes that face south and west.

Time

The effect of time on soil formation in Tehama County is striking in areas where alluvium has been deposited. In many places on separate terraces are deposits of alluvium from the most recent time to those laid down on old high terraces. On each terrace the soil material is weathered a little less than on the terrace above and a little more than on the terrace below. An example is the sequence of soils extending from the Cortina, formed in recent alluvium, to the somewhat older, but nevertheless young, Arbuckle soils, to the moderately old Perkins soils, and the very old Red Bluff soils. Each of these soils is on a terrace above the other, in the sequence listed.

In the uplands the time factor is not so well expressed, although the soil material on the gently sloping ridgetops in many places shows the greatest degree of weathering. There is apparently less soil loss from these areas than from the steep side slopes, which would account for some difference in relative age of the soils.

Classification of Soils

In the system of classification followed in the United States since 1938 (*9*), soils are classified in six categories. These are the order, suborder, great soil group, family, series, and type. This system, with later modifications, (*8*, *3*) has been followed to place soils of the county in great soil groups.

The order, great soil group, series, and type are the categories that are used most. The classes in the highest category of the classification system are the azonal, intrazonal, and zonal orders. Each of these orders is represented by soils in Tehama County.

Zonal soils formed through processes dominated by climate and biological forces. They are well developed and have formed from parent materials of mixed mineralogy that have been in place a long time and have not been subject to extreme conditions of relief.

Intrazonal soils are well developed and reflect the dominant influence of some local factor of relief or parent material rather than of climate and biological factors.

Azonal soils lack development or are weakly developed, mainly because they are forming in recently deposited sediments, are from highly resistant materials, or are on steep slopes where runoff and removal of soil materials are rapid.

The classification of soil series in Tehama County into great soil groups is shown in the following list.

Order and great soil group	*Series*
Zonal—	
Brunizems	Berrendos, Childs, Tyson.
Noncalcic Brown soils (typical).	Arbuckle, Corning, Dibble, Hillgate, Keefers, Kimball, Millsap, Moda, Newville, Perkins, Red Bluff, Redding, Tehama, Tuscan.
Intergrading toward Brunizems.	Farwell, Henneke, Inks, Los Gatos, Los Robles, Pleasanton, Stonyford, Supan, Wyo, Zamora.
Intergrading toward Reddish-Brown Lateritic soils.	Guenoc, Parrish.
Yellowish-Brown Lateritic soils.	Lyonsville, Manton, Masterson, Nanny.
Reddish-Brown Lateritic soils.	Aiken, Cohasset, Dubakella, Josephine.
Intrazonal—	
Andolike soils	McCarthy, Windy.
Grumusols	Altamont, Anita, Burris, Clear Lake, Myers, Nacimiento, Peters, Sehorn.
Humic Gley soils	Chummy.
Sols Bruns Acides	Forward, Hugo, Laniger, Neuns, Sheetiron.
Azonal—	
Alluvial soils	Columbia, Cortina, Elam, Maywood, Millrace, Molinos, Orland, Vina, Yolo.
Lithosols	Goulding, Iron Mountain, Lodo, Maymen, Millsholm, Toomes, Yollabolly.
Regosols	Cone, Hulls, Inskip, Jiggs.

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A representative profile of each soil series is described in the section "Descriptions of the Soils." Laboratory data on samples of each horizon in a representative profile of each of several soil series are given in the section "Laboratory Analyses."

According to the amount of clay in the B horizon relative to that in the A horizon, some of the soils in the county are considered to have minimal, maximal, or medial development. Other of the soils have essentially no profile development. A soil with minimal development has thin clay films on soil aggregates in the B2t horizon and about 5 percent more clay in the B2t horizon. A soil that has maximal development has a marked increase in clay content in the B2t horizon and the upper boundary of the horizon is clear or abrupt; clay films are continuous in pores and on aggregates. A soil that has medial development has a distinct B2t horizon and an intermediate amount of clay accumulation. The degree of development of the soils within each group is indicated in the discussion of each group.

The great soil groups represented in the county are Brunizems, Noncalcic Brown soils, Yellowish-Brown Lateritic soils, Reddish-Brown Lateritic soils, Andolike soils, Grumusols, Humic Gley soils, Sols Bruns Acides, Alluvial soils, Lithosols, and Regosols. Discussion of each group follows.

Brunizems

Soils of the Berrendos, Childs, and Tyson series are in the Brunizem great soil group. These soils have an A horizon that is dark gray to brown and that is about 2 percent or more organic matter in the uppermost 10 inches. They have a B2t horizon that is weakly expressed and typically is slightly acid. All of these soils have minimal development.

Berrendos soils are moderately well drained and are fine textured. They developed under grass and oak on narrow flood plains at elevations of less than 1,000 feet. The average annual rainfall in areas of Berrendos soils is 20 to 25 inches, and the average annual temperature is about 63°F. Slickensides, similar to those in Grumusols, are in the B2t horizon of the Berrendos soils.

Childs soils developed under grass in gravelly alluvium at elevations of 4,000 to 6,000 feet. Here the average annual precipitation is more than 45 inches, and the average annual temperature is about 45°. The A horizon has a high content of organic matter. The B2t horizon has distinct clay films, and it is likely that stratification masks the increase in clay content of the B2t horizon as shown in the data for a Childs soil given in table 5.

Tyson soils formed under shrubs in mountainous areas. Precipitation there ranges from 40 to 60 inches annually.

Noncalcic Brown soils

In Tehama County Noncalcic Brown soils predominate at the low elevations. They are on terraces and fans in the valley of the Sacramento River and in the low foothills. All of the soils have been in place long enough to have developed a B2t horizon, although the degree of expression of the B2t horizon ranges from minimal to maximal and the more strongly developed soils are on the old terraces. The majority of the soils have parent materials that are unconsolidated or are weakly consolidated. A few soils, particularly in the foothills, overlie weathered rock.

Noncalcic Brown soils are in areas where the average annual precipitation is between 15 and 35 inches and the average annual temperature is about 60° or is slightly higher. The dominant vegetation is annual grasses and forbs, but in areas where rainfall is moderate there are a few scattered oaks. Most of the precipitation falls as rain in winter. The soils do not freeze, and because evaporation and transpiration are low, leaching in most winters is deep. In summer the average temperature is about 80° and rainfall is negligible. The soils thus dry out thoroughly in summer.

The typical Noncalcic Brown soils have an A horizon that is brown to reddish brown, hue 10YR to 5YR, value of 5 or 6 when dry, and chroma of 3 to 6 when dry. This horizon is 10 to 20 inches thick. It is hard and essentially massive when dry and contains less than 1 percent organic matter. The B2t horizon is similar in color, but it tends to have a redder hue and the chroma is likely to be one or two units higher. Structure of the B2t horizon is variable. It ranges from nearly massive to strong blocky and is more pronounced where the B2t horizon is distinct.

In Noncalcic Brown soils clay films are present on faces of peds, but in most places the colloid is in bridges between mineral grains and in pores. In areas underlain by soft sediments, the solum ranges from 3 to more than 5 feet in thickness. Reaction is commonly slightly acid or neutral and tends to increase slightly with increasing depth. A few of the soils are calcareous in the C horizon, but most of them are noncalcareous or contain some intermittent carbonates below the solum.

Arbuckle, Corning, Dibble, Hillgate, Keefers, Kimball, Millsap, Moda, Newville, Perkins, Red Bluff, Redding, Tehama, and Tuscan are typical Noncalcic Brown soils. Of these, the Arbuckle and Dibble have minimal development; the Hillgate, Millsap, Newville, Perkins, Red Bluff, Tehama, and Tuscan have medial development; and the Corning, Keefers, Kimball, Moda, and Redding have maximal development. The Moda, Redding, and Tuscan soils contain an indurated hardpan of iron-silica at a moderate depth. The Corning, Red Bluff, and Redding soils are more acid than the other soils in this group. They developed in old sediments and are low in fertility. Other than the typical Noncalcic Brown soils, there are in the county Noncalcic Brown soils that intergrade toward Brunizems and toward Reddish-Brown Lateritic soils.

Noncalcic Brown soils that are intergrading toward Brunizems are in the Farwell, Henneke, Inks, Los Gatos, Los Robles, Pleasanton, Stonyford, Supan, Wyo, and Zamora series. These soils differ from the typical Noncalcic Brown soils in having a slightly darker colored A horizon that is most commonly grayish brown and is between 1 and 2 percent organic matter. Most of the soils are nearly neutral throughout, but they tend to be more alkaline with increasing depth.

The Henneke, Inks, Pleasanton, and Supan soils in this group have medial development, but the others have minimal development. Henneke and Stonyford soils are shallow or very shallow over bedrock and have a dense cover of shrubs. Inks soils are shallow and are under a cover of grass and shrubs. Supan soils are moderately deep, and shrubs and hardwoods grow on them. The vegetation on the remaining soils is mostly grass and forbs but

includes some oaks. These soils have a higher content of organic matter than typical Noncalcic Brown soils. This is probably because of the shrub vegetation on some of them and because the soil material in others is more favorable for roots.

The Guenoc and Parrish soils are Noncalcic Brown soils that are intergrading toward Reddish-Brown Lateritic soils. Guenoc soils have medial development and Parrish have maximal development. Both soils have a darker A horizon than typical Noncalcic Brown soils. The A horizon of Guenoc soils has a moderate content of organic matter and is nearly massive. Parrish soils have a relatively thin A horizon. The B2t horizon of both soils is reddish brown. The soils tend to become more acid with increasing depth.

Yellowish-Brown Lateritic soils

The Lyonsville, Manton, Masterson, and Nanny soils are representative of Yellowish-Brown Lateritic soils. These soils developed under a forest of various kinds of conifers at elevations of 3,000 to more than 6,000 feet. The average annual precipitation generally exceeds 35 inches, and the average annual temperature ranges from about 45° to 55°. The Lyonsville soils in this group have medial development, and the others have minimal development.

In areas under native vegetation, these soils have O1, A1, B2t, C, and R horizons. The A1 horizon is generally dark-brown to light brownish-gray loam that is sandy or gravelly. The B2t horizon is pale brown to yellowish brown and is slightly finer textured than the A1 horizon. Depth to the underlying rock or alluvium ranges from 20 to more than 60 inches, but in most places it is 30 to 40 inches. The acidity of the soils increases with increasing depth, and typically the soils range from medium acid in the A horizon to strongly acid or very strongly acid in the B3 or C horizon. The content of organic matter in the upper 12 inches ranges from about 2 to more than 4 percent.

Reddish-Brown Lateritic soils

The soils of the Aiken, Cohasset, Dubakella, and Josephine series are Reddish-Brown Lateritic soils. These soils developed under a coniferous forest at elevations of generally more than 3,000 feet. The average annual precipitation ranges from about 30 inches to more than 60 inches, and the average annual temperature ranges from about 45° to 55°. The Aiken soils have maximal development, the Dubakella have minimal development, and the Cohasset and Josephine have medial development.

In undisturbed areas Reddish-Brown Lateritic soils have an O1 horizon 2 to 4 inches thick. The A horizon is brown to reddish brown, is granular, and is medium acid. It is 2 to more than 4 percent organic matter in the upper 12 inches or more. The B2t horizon is red, reddish brown, or yellowish red and is medium acid to very strongly acid. Depth to weathered rock ranges from about 3 feet to more than 10 feet.

Dubakella soils differ somewhat from other soils of this group. These soils developed in material from serpentine or ultrabasic rock and contain considerable amounts of easily weathered mineral. They are closely associated with Sols Bruns Acides and Reddish-Brown Lateritic soils, but they are typically neutral throughout. The content of clay in the Dubakella soils increases with increasing depth, and the B2t horizon is yellowish brown. Hard fractured bedrock is at a moderate depth.

Andolike soils

The McCarthy and Windy soils are Andolike soils. These soils formed under conifers and shrubs at elevations that range from 2,000 to more than 7,000 feet. The Windy soils are at the higher elevations and on the cooler sites at the lower elevations. The average annual precipitation in areas of the Andolike soils ranges from about 35 to 60 inches, and the average annual temperature ranges from about 45° to 55°. The soils have weak development.

In undisturbed areas Andolike soils have an O1 horizon that is as much as 4 inches thick and a brown or dark-brown A horizon that is soft, granular, and medium acid. The B2 horizon is brown or strong brown and is medium acid or strongly acid. The soils formed in material that is mostly from volcanic flow or breccia of basic composition but that contains some volcanic ash. At high elevations the soils have hues of 10YR or 2.5Y and have a high content of organic matter. At lower elevations the soils are generally redder and have hues of 7.5YR. Here the content of organic matter in the soils is high in the upper part of the A horizon and decreases rapidly with increasing depth but is more than 1 percent in all horizons.

Grumusols

The Altamont, Anita, Burris, Clear Lake, Myers, Nacimiento, Peters, and Sehorn soils are Grumusols. All of these soils formed in material from fine-textured sediments that were partly consolidated or were unconsolidated They are at low elevations in the Sacramento River Valley or are in the low foothills. The vegetation is mostly grasses and forbs but includes some scattered oaks. The average annual rainfall ranges from about 15 to 25 inches, and the average annual temperature is about 60°.

Grumusols are fine textured and crack appreciably on drying. Material from the surface soil falls down the cracks when the soil is dry, and when the subsoil is moistened the resulting increase in volume causes the soil to move. Slickensides are therefore present, generally at a depth between 10 and 30 inches. Dark masses of surface soil are also evident in the lighter colored subsoil.

These soils all have a thick A horizon that ranges from brown to very dark gray or gray in color. The Anita, Burris, Clear Lake, and Myers soils, which are in the valley, developed in fine-textured alluvium and, except for the well-drained Myers soils, are imperfectly drained or are poorly drained. The other Grumusols developed in the low foothills in sediments that were partly consolidated. These soils differ mainly in mineralogy and in the amount of carbonates present in the profile.

Humic Gley soils

The only Humic Gley soils mapped in the county are soils of the Chummy series. These soils are not extensive. They are at elevations of more than 4,000 feet in nearly level, wet meadows under a dense cover of grass and forbs. The average annual temperature is about 45°. Precipitation ranges from 45 to 60 inches. The water table is near the surface in spring and early in summer, but in places it drops to a depth below 5 feet in fall. These soils have weak development. They have an organic horizon 2 to 8 inches thick, a dark-gray upper A horizon that is high in

organic matter, and a gleyed C horizon. They are typically medium acid.

Sols Bruns Acides

In the Sols Bruns Acides great soil group are soils of the Forward, Hugo, Laniger, Neuns, and Sheetiron series. These soils developed under a coniferous forest at elevations of 2,000 to more than 6,000 feet. The average annual precipitation is more than 30 inches, and the average annual temperature ranges from about 45° to 57°. These soils have weak development.

In undisturbed areas Sols Bruns Acides have an O1 horizon that is about 2 inches thick and a pale-brown to light brownish-gray A horizon that has granular structure and is 6 to 12 inches thick. The B2 horizon is very pale brown to light gray and has weak, subangular blocky structure. Clay films in the B2 horizon are few or are absent. In places the uppermost inch or two of the surface soil is darker colored than the rest of the horizon. The A horizon is slightly acid or medium acid, and the B2 and C horizons are medium acid or strongly acid. Depth to underlying bedrock is generally 20 to 40 inches but may be deeper.

Alluvial soils

The Columbia, Cortina, Elam, Maywood, Millrace, Molinos, Orland, Vina, and Yolo soils are Alluvial soils. These soils are mostly under grass and oak in the low foothills or are in the Sacramento River Valley at elevations of less than about 1,000 feet. Elam soils, however, are at elevations of 4,000 to 5,000 feet and are under conifers. The average annual rainfall ranges from about 15 to 35 inches, and, except for the Elam soils, the average annual temperature is about 62°. These soils have essentially no development.

Alluvial soils have indistinct horizons, are typically neutral or slightly acid, and commonly are stratified. Differences among these soils are mainly in texture and mineralogy, but Elam soils have a thin O1 horizon and are generally medium acid.

Lithosols

The Goulding, Iron Mountain, Lodo, Maymen, Millsholm, Toomes, and Yollabolly soils are Lithosols. These soils are at elevations similar to those of Regosols and formed under a similar climate and have a similar profile. They have essentially no development.

The soils in this group are shallow or very shallow to bedrock. Vegetation is relatively sparse. The soils generally are on steep slopes or are along the crests of narrow ridges, but the Toomes soils are on recent volcanic flow.

Regosols

The soils of the Cone, Hulls, Inskip, and Jiggs series are Regosols. They are in the foothills and mountains at elevations that range from 400 to 6,000 feet. At low elevations the vegetation consists of oak and grass, but at high elevations shrubs and conifers generally predominate. Hulls soils, however, are in grassy openings in forested areas in the upper foothills and mountains. The average annual temperature ranges from 47° to 62°. Precipitation ranges from 20 to 60 inches. The lower temperatures and the higher rainfall are at the higher elevations.

These soils have essentially no development. They are moderately deep or deep to bedrock. Under shrubs and conifers they have an O horizon and a thin A1 horizon that is darker colored in the upper part. The soils are neutral to medium acid.

Laboratory Analyses

Tables 4 and 5 give the results of laboratory analyses of representative soils of Tehama County. The analyses were made by Esther P. Perry, University of California, and the State Cooperative Soil-Vegetation Survey.

General Nature of the County

In this section facts about the settlement and development of the county are given. Then the climate, water for irrigation, and agriculture are discussed.

Settlement and Development

Settlement of Tehama County began around 1843 after explorations in the area by Peter Lassen and Gen. John Bidwell. The area was officially recognized as a county in 1856 and was named for the Tehama Indians who lived there.

The early settlers raised cattle and sheep, grew grain, and cut timber from the forests. Sawmills and flour mills were built along some of the streams to process products grown in the county. After irrigation systems were developed, many kinds of crops were grown, among them grapes for wine. At one time the county had the largest vineyard in the Nation, but only part of this enterprise remains. The chief enterprises in the county now are the raising of livestock and the growing of timber. Irrigated orchards, row crops, and field crops are grown in some areas, and dryfarmed grain is grown in others.

The population of the county has more than doubled from 10,996 in 1900 to 25,305 in 1960. Red Bluff, which has always had the largest population of the towns in the county, now numbers 7,202. Other communities in Tehama County are Corning, Los Molinos, Vina, Mineral, Manton, Gerber, and Paskenta.

Industries in Tehama County are mostly those that process forest and agricultural products. Several sawmills and wood-finishing mills are in the county and also a large plant that makes paper and pressed wood products. Other plants process meat, olives, and grain.

Transportation in the county is supplied by rail, highway, and air facilities. The main line of the Southern Pacific Railroad passes through the central part of the county. U.S. Highways 99E and 99W join at Red Bluff to form U.S. Highway 99, which proceeds northward through the county. State Highway 36 passes east and west through the northern part of the county. Regularly scheduled airlines stop at the airport near Red Bluff. Another public airport is at Corning, and many private landing strips are located throughout the county.

Schools are available throughout the county. Easily available but outside the county are a junior college in

TABLE 4.—*Mechanical analyses of samples of representative soils of Tehama County, Calif.*

[Gravel content is percent by weight of field sample; sand content determined by wet sieving and is percent by weight of soil less than 2 mm. in diameter; clay content determined by Bouyoucos hydrometer method. Dashes indicate data were not determined or material was not present]

Soil	Depth	Gravel					Sand						Silt (0.05–0.002 mm.)	Clay (<0.002 mm.)
		>2 in.	2 in.–½ in.	½ in.–5 mm.	5.2 mm.	Total gravel (>2 mm.)	Very coarse sand (2.0–1.0 mm.)	Coarse sand (1.0–0.5 mm.)	Medium sand (0.5–0.25 mm.)	Fine sand (0.25–0.10 mm.)	Very fine sand (0.10–0.05 mm.)	Total sand (2.0–0.05 mm.)		
	Inches	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
Aiken loam.	1–0	Litter.												
	0–8	------	5	7	13	25	7.2	7.9	5.9	12.6	7.9	41.5	40	18
	8–17	------	1	4	11	16	3.6	5.0	5.2	12.3	8.6	34.7	39	26
	17–25	------	2	3	4	9	1.5	2.3	3.8	10.1	7.8	25.5	38	36
	25–37	------	3	3	7	13	.2	1.0	2.3	10.8	9.1	23.4	35	42
	37–49	------	1	1	1	3	.3	1.3	3.6	11.7	10.0	26.9	34	39
	49–62+	------	------	------	------	------	.9	2.6	4.7	11.8	9.8	29.8	31	39
Altamont clay.	0–2	------	1	(1)	(1)	1	1.5	1.5	.9	1.8	2.4	8.1	40	52
	2–7	------	1	1	(1)	2	.5	.7	.6	1.4	2.3	5.5	41	53
	7–17	------	1	1	1	3	.8	.7	.4	1.3	2.1	5.3	44	51
	17–24	------	(1)	1	1	2	1.0	1.0	.5	1.3	2.3	6.1	42	52
	24–35	------	5	16	7	28	1.2	1.6	1.1	2.1	4.0	10.0	46	44
	35–42+	Shale bedrock.												
Anita clay.	0–1	------	------	(1)	(1)	(1)	1.0	1.4	1.3	4.6	6.4	14.7	37	48
	1–3	------	------	(1)	(1)	(1)	.2	1.0	1.4	4.1	6.4	13.1	35	52
	3–10	------	------	(1)	(1)	(1)	.4	.7	1.2	4.5	6.3	13.1	34	53
	10–15	------	------	(1)	(1)	(1)	.8	.7	1.1	3.9	6.1	12.6	33	54
	15+	Hardpan.												
Arbuckle gravelly fine sandy loam.	0–1	------	16	8	7	31	11.2	16.6	7.3	8.2	10.2	53.5	35	11
	1–7	------	14	11	9	34	12.6	16.9	7.7	8.2	10.3	55.7	30	14
	7–14	------	17	10	11	38	12.4	19.3	7.9	7.7	10.1	57.9	26	16
	14–25	------	25	15	14	54	20.6	25.4	9.6	5.5	5.3	66.9	14	20
	25–42	------	44	23	13	80	26.0	41.0	11.4	3.4	1.2	83.0	3	14
	42–59	------	34	25	17	76	39.2	38.0	6.4	1.9	1.0	86.5	------	13
	59–72+	7	17	13	16	53	22.7	17.8	6.8	7.0	7.3	61.6	17	21
Berrendos clay.	0–5	------	------	------	(1)	(1)	.7	.7	.8	1.6	2.7	6.5	50	44
	5–14	------	------	------	------	.0	.4	.5	.7	1.3	3.0	5.9	46	48
	14–24	------	------	.2	------	.2	.6	.7	.3	.9	2.0	4.5	43	53
	24–43	------	------	------	(1)	(1)	.7	.4	.4	.7	2.9	5.1	41	54
	43–54	------	------	------	------	.0	.6	.4	.3	.8	3.5	5.6	42	52
	54–67+	------	.6	------	------	.6	(1)	(1)	.1	1.4	14.0	15.5	51	34
Childs gravelly loam.	0–5	------	13	23	6	42	5.2	5.1	11.6	19.0	8.9	49.8	34	16
	5–16	------	10	18	7	35	4.9	6.2	8.3	17.7	9.5	46.6	32	21
	16–24	------	13	20	7	40	5.7	5.5	12.2	19.8	10.0	53.2	28	19
	24–31	------	17	15	7	39	4.6	7.4	10.1	21.1	11.4	54.6	27	18
	31–40	15	10	17	5	47	4.0	4.4	9.4	15.6	11.2	44.6	36	19
	40–50	30	10	21	9	70	9.1	12.8	14.0	18.3	8.0	62.2	23	15
	50–64	------	26	17	7	50	5.7	7.1	15.7	22.1	10.7	61.3	26	13
Chummy silty clay.	2–0	------	.2	1.3	1.5	3.0	1.7	23.4	12.5	16.2	8.4	62.2	15	23
	0–9	------	.9	2.3	3.5	6.7	2.6	1.9	3.3	6.9	4.5	19.2	41	40
	9–23	------	.5	3.4	4.8	8.7	3.5	3.1	4.1	13.7	8.5	22.9	40	27
	23–29	------	1.3	5.3	7.4	14.0	4.8	4.8	6.9	32.5	14.2	63.2	16	21
	29–39	------	.5	1.4	3.5	5.4	2.2	2.9	3.0	20.1	17.9	46.1	24	30
	39–60+	------	.4	.5	.8	1.7	.5	.5	1.9	18.5	21.3	42.7	29	28
Clear Lake clay.	0–3	------	------	.6	.4	1.0	2.0	1.2	.8	1.8	1.4	7.2	35	58
	3–13	------	.4	1.4	.5	2.3	.7	.7	1.0	1.9	2.6	6.9	29	64
	13–19	------	1.9	1.7	1.4	5.0	1.1	1.1	.8	1.5	1.0	5.5	30	65
	19–27	------	2.5	.9	1.4	4.8	2.2	1.4	1.0	2.5	4.1	11.2	27	62
	27–43	------	3.1	6.5	8.5	18.1	6.4	6.2	6.6	9.9	13.9	43.0	35	22
	43–60+	------	------	.4	1.0	1.4	2.2	2.3	1.7	4.6	6.2	17.0	34	49

See footnotes at end of table.

TABLE 4.—*Mechanical analyses of samples of representative soils of Tehama County, Calif.*—Continued

Soil	Depth	Gravel					Sand						Silt (0.05–0.002 mm.)	Clay (<0.002 mm.)
		>2 in.	2 in.–½ in.	½ in.–5 mm.	5.2 mm.	Total gravel (>2 mm.)	Very coarse sand (2.0–1.0 mm.)	Coarse sand (1.0–0.5 mm.)	Medium sand (0.5–0.25 mm.)	Fine sand (0.25–0.10 mm.)	Very fine sand (0.10–0.05 mm.)	Total sand (2.0–0.05 mm.)		
	Inches	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
Cohasset loam.	3–0	Litter.												
	0–4	------	1.0	3.7	16.3	21.1	8.8	6.6	4.6	10.4	10.8	41.2	42	17
	4–15	------	2.0	2.7	15.5	20.2	4.0	3.4	8.0	8.6	11.6	32.6	43	24
	15–29	------	1.5	2.7	13.2	17.4	5.4	5.0	3.4	7.4	9.6	30.8	33	36
	29–40	------	1.2	3.2	7.8	12.3	2.9	3.0	5.4	8.8	9.8	29.9	35	35
	40–55	1.3	1.4	3.3	9.0	14.9	3.0	4.2	4.1	8.8	11.0	31.1	26	43
Cohasset gravelly loam.	0–2	------	4.1	6.9	3.9	14.9	6.7	9.1	14.5	16.2	13.4	61.9	19	19
	2–8	------	.8	3.2	3.1	7.1	6.8	12.2	11.1	15.2	10.1	55.4	19	26
	8–24	------	3.2	5.3	5.0	13.5	5.4	7.8	13.3	13.4	11.2	51.1	19	30
	24–39	------	1.2	5.4	2.5	9.1	7.6	9.5	7.5	11.6	11.0	47.2	19	34
	39–54+	------	5.6	2.4	4.0	12.0	4.6	4.7	6.0	8.5	12.1	35.9	26	38
Columbia silt loam.	0–9	------	------	------	------	------	.9	.8	.6	5.4	14.8	22.5	59	18
	9–19	------	------	------	------	------	------	------	.1	10.8	33.6	44.5	41	14
	19–26	------	------	------	------	------	------	.1	.3	14.0	27.7	42.1	42	16
	26–40	------	------	------	------	------	------	.4	3.4	40.7	22.6	67.1	20	13
	40–44	------	------	------	------	------	.1	7.5	32.3	39.4	7.0	80.3	6	8
	44–72	------	------	------	------	------	------	1.8	9.6	35.5	20.9	67.8	20	12
Cone extremely gravelly sandy loam.	0–3	------	48.3	33.3	4.0	85.6	11.2	13.1	8.1	14.6	15.9	62.9	31	6
	3–7	------	46.4	25.4	10.6	82.4	9.9	4.8	6.1	12.3	22.6	55.7	39	5
	7–31	------	34.0	28.7	14.6	77.3	10.1	6.0	3.9	9.2	20.4	49.6	46	4
	31–70	------	49.6	16.7	8.4	74.7	11.5	5.0	4.2	4.6	18.3	43.6	50	6
Corning gravelly loam.	0–8	(2)	(2)	(2)	(2)	24	10.5	9.4	5.6	9.5	12.5	47.5	42.3	10.2
	8–15	------	------	------	------	21	8.4	8.9	5.3	10.0	13.3	45.9	41.5	12.6
	15–21	------	------	------	------	23	7.9	8.4	5.2	9.5	12.8	43.8	41.8	14.4
	21–29	------	------	------	------	29	5.4	3.6	2.2	4.4	6.0	21.6	26.7	51.7
	29–36	------	------	------	------	34	9.9	6.8	3.8	7.9	8.4	36.8	28.6	34.6
	36–45	------	------	------	------	31	16.8	15.9	5.6	9.0	8.8	56.1	20.9	23.0
	45–54+	------	------	------	------	8	17.2	16.8	7.1	6.1	4.6	51.8	15.3	32.9
Cortina gravelly fine sandy loam.	0–3	------	3	7	8	18	6.9	21.4	22.6	17.0	6.4	74.3	16	10
	3–15	------	8	25	20	53	26.0	22.6	11.8	9.8	5.4	75.6	12	12
	15–36	------	11	22	30	63	34.2	46.5	11.9	2.8	.5	95.9	------	4
	36–56	------	5	32	35	72	34.6	25.5	6.6	4.8	1.6	93.1	------	7
	56–72+	------	4	12	22	38	14.1	16.8	9.8	13.1	8.1	61.9	22	16
Dibble silty clay loam.	0–2	------	------	1.2	2.5	3.7	3.1	3.6	3.3	8.3	9.7	28.0	51	21
	2–6	------	1.6	.6	1.5	3.7	2.8	2.5	3.9	8.5	9.4	27.1	43	30
	6–9	------	.3	.6	1.8	2.7	2.3	3.5	3.4	8.8	8.6	26.6	35	38
	9–17	------	------	.5	2.2	2.7	1.7	2.3	3.6	7.8	8.2	23.6	35	41
	17–24	------	------	------	1.0	1.0	.9	1.6	1.5	7.1	12.3	23.4	42	35
	24–34	------	.4	------	1.0	1.4	.7	.7	1.3	7.7	16.1	26.5	38	36
	34+	Siltstone.												
Dubakella stony loam.	2–0	Litter.												
	0–2	------	18	15	11	44	8.1	5.7	5.9	7.9	4.8	32.4	40	28
	2–11	------	15	5	7	27	4.1	5.0	4.0	6.9	5.2	25.2	35	40
	11–19	------	7	19	9	35	2.5	3.1	3.5	5.0	4.0	18.1	37	45
	19+	Bedrock.												
Forward sandy loam.	3–0	Litter.												
	0–1	------	2.0	4.9	7.6	15.1	3.9	20.1	13.2	18.0	13.4	73.8	17	9
	1–7	------	1.2	4.1	6.2	11.5	9.4	14.5	16.9	17.4	12.3	70.5	22	8
	7–15	------	2.1	5.7	7.2	15.0	9.0	20.4	12.9	16.9	12.0	71.2	21	8
	15–24	------	3.3	7.9	10.3	21.5	12.8	17.5	16.4	14.0	11.2	71.9	21	7
	24+	Rhyolitic tuff bedrock.												
Goulding stony loam.	0–6	------	24	4	2	30	4.7	6.4	4.5	6.5	5.7	27.8	48	24
	6–13	------	32	9	4	45	4.6	5.5	7.0	7.4	5.1	29.6	43	27
	13+	Parent rock.												

See footnotes at end of table.

TABLE 4.—*Mechanical analyses of samples of representative soils of Tehama County, Calif.*—Continued

Soil	Depth	Gravel					Sand						Silt (0.05–0.002 mm.)	Clay (<0.002 mm.)
		>2 in.	2 in.–½ in.	½ in.–5 mm.	5.2 mm.	Total gravel (>2 mm.)	Very coarse sand (2.0–1.0 mm.)	Coarse sand (1.0–0.5 mm.)	Medium sand (0.5–0.25 mm.)	Fine sand (0.25–0.10 mm.)	Very fine sand (0.10–0.05 mm.)	Total sand (2.0–0.05 mm.)		
	Inches	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
Guenoc loam.	0–2	------	8.7	5.3	4.0	18.0	3.1	3.1	4.0	11.7	14.7	36.6	43	20
	2–16	------	.7	3.7	3.4	7.8	1.9	1.8	4.3	11.3	14.4	33.7	38	28
	16–30	------	4.4	8.7	1.9	15.0	2.2	2.0	3.0	9.0	10.0	26.2	32	42
	30+	Parent rock.												
Henneke stony loam.	0–3	------	19	12	16	47	13.0	10.0	7.8	7.8	5.2	43.8	31	25
	3–10	17	5	14	18	54	16.9	13.0	6.0	7.2	4.7	47.8	22	30
	10–19	6	9	14	16	45	15.9	10.7	8.3	7.3	4.3	46.5	20	33
	19+	Bedrock.												
Hillgate silt loam.	0–5	------	------	.2	2.4	2.6	1.3	2.1	3.4	9.2	14.0	30.0	53	17
	5–11	------	------	.4	3.0	3.4	1.9	2.0	3.4	11.3	12.3	30.9	52	17
	11–17	------	------	.2	3.3	3.5	1.8	2.5	3.7	12.0	13.4	33.4	47	20
	17–26	------	------	.2	2.1	2.3	2.2	2.2	3.3	11.2	12.1	31.0	37	32
	26–39	------	------	(1)	(1)	(1)	.6	1.7	3.0	13.3	11.9	30.5	33	36
	39–51	------	------	2.9	3.0	5.9	1.0	1.7	3.2	17.1	15.7	38.7	34	27
	51–70+	------	11.1	16.9	41.6	69.6	22.0	23.4	9.6	7.5	2.9	65.4	11	24
Hulls gravelly loam.	0–7	------	10	30	24	64	19.5	14.4	6.6	9.8	5.7	56.0	27	17
	7–23	------	4	24	22	50	17.8	14.9	7.2	10.4	6.4	56.7	23	20
	23+	Parent material.												
Inks cobbly loam.	0–6	------	23.1	5.1	5.2	33.3	5.8	12.5	11.5	15.5	12.3	57.6	21	21
	6–10	35.6	7.8	3.2	3.1	49.7	6.5	5.9	9.0	10.8	9.2	41.4	31	28
	10–13	------	13.8	2.2	5.0	21.0	8.2	9.9	8.1	12.0	9.9	48.1	33	19
	13+	Weakly consolidated parent rock.												
Inskip very rocky silt loam.	0–3	11.0	24.4	11.5	3.6	50.5	1.8	4.5	6.6	13.7	24.4	50.3	49	<2
	3–10	------	51.1	4.3	2.2	57.6	2.1	3.7	8.5	13.8	29.4	57.5	42	<2
	10–33	10.3	25.9	9.5	3.2	48.9	3.2	6.0	7.8	14.0	25.7	56.7	43	<2
	33+	Parent rock.												
Iron Mountain rocky sandy loam.	0–5	2.6	3.6	10.1	11.2	27.6	11.4	10.4	8.3	16.3	14.0	60.4	28	12
	5–9	------	10.6	7.1	10.1	27.8	10.4	11.0	9.2	16.4	14.0	61.0	25	14
	9+	Tuscan formation.												
Jiggs stony sandy loam.	1–0	Litter.												
	0–2	------	4.8	9.6	16.9	31.3	22.5	12.5	11.3	14.8	10.2	71.3	23	6
	2–5	1.1	2.6	7.8	5.3	16.8	21.9	14.6	10.0	17.8	11.1	75.4	20	5
	5–10	------	.5	4.9	15.5	20.9	24.0	12.4	11.4	15.6	10.5	73.9	18	8
	10–20	------	1.2	3.5	12.9	17.6	23.6	17.0	8.9	13.2	9.2	72.1	20	8
	20+	Parent rock.												
Josephine gravelly loam.	1–0	Litter.												
	0–4	------	5	16	19	.10	8.7	8.0	5.6	5.1	3.9	31.3	49	20
	4–15	------	7	12	15	34	6.4	8.0	4.0	4.7	3.8	26.9	47	26
	15–26	------	14	13	17	44	7.1	6.6	4.7	4.1	3.2	25.7	43	31
	26–38	------	28	21	14	63	13.3	12.0	5.0	5.4	3.1	38.8	29	32
	38–50	------	15	15	21	51	10.0	9.0	6.4	6.0	5.0	36.4	40	24
	50+	Parent rock.												
Keefers cobbly loam.	0–3	------	24	13	12	49	14.6	17.0	10.0	10.1	5.1	56.8	25	18
	3–7	------	8	18	16	42	17.1	17.8	10.0	9.9	5.0	59.8	19	21
	7–16	------	18	12	13	43	8.8	15.8	11.9	12.6	6.3	55.4	22	23
	16–24	31	9	6	9	55	11.7	16.9	11.3	11.2	5.1	56.2	18	26
	24–37	56	15	4	6	81	14.8	17.1	10.4	8.3	3.1	53.7	6	40
	37–51	------	41	13	13	67	14.7	19.0	11.4	7.9	3.2	56.2	5	39
	51–68+	31	31	9	7	78	9.8	16.2	13.6	13.7	5.8	59.2	11	30
Kimball loam.	0–3	------	1.2	2.2	4.2	7.6	1.4	2.8	3.8	10.9	8.5	27.4	59	14
	3–6	------	.6	4.5	7.0	12.1	1.4	1.8	4.1	11.9	11.8	31.0	53	16
	6–11	------	------	2.0	6.9	8.9	1.6	2.2	3.5	11.6	13.7	32.6	49	18
	11–21	------	------	.8	4.2	3.0	1.1	1.2	3.1	9.1	6.4	20.9	33	46
	21–34	------	------	1.0	21.9	22.9	1.1	3.4	4.6	16.9	15.6	41.6	30	28
	34–55+	------	------	10.0	15.7	25.7	.5	2.1	7.4	21.3	11.1	42.4	32	26

See footnotes at end of table.

TABLE 4.—*Mechanical analyses of samples of representative soils of Tehama County, Calif.*—Continued

Soil	Depth	Gravel					Sand						Silt (0.05–0.002 mm.)	Clay (<0.002 mm.)
		>2 in.	2 in.–½ in.	½ in.–5 mm.	5.2 mm.	Total gravel (>2 mm.)	Very coarse sand (2.0–1.0 mm.)	Coarse sand (1.0–0.5 mm.)	Medium sand (0.5–0.25 mm.)	Fine sand (0.25–0.10 mm.)	Very fine sand (0.10–0.05 mm.)	Total sand (2.0–0.05 mm.)		
	Inches	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percen*
Laniger fine sandy loam.	0–1	------	1.7	1.9	3.7	7.3	[3] 4.7	[3] 12.2	25.8	26.6	5.9	75.2	15	[3] 10
	1–4	------	1.2	.3	.5	2.0	1.5	11.5	19.7	30.5	11.4	74.6	14	11
	4–9	------	.4	.3	.8	1.5	.8	6.1	23.8	32.4	11.6	74.7	12	13
	9–16	------	.4	.8	1.6	2.8	.8	9.7	18.9	31.9	11.7	73.0	13	14
	16–34	------	------	.5	.5	1.0	1.0	6.5	24.1	31.2	11.3	74.1	13	13
	34+	Parent rock.												
Lodo shaly loam.	0–2	------	------	.1	7.1	7.2	16.6	23.2	7.0	3.9	2.0	52.7	21	26
	2–6½	------	------	.5	13.2	13.7	21.1	17.2	8.0	2.8	1.8	50.9	24	25
	6½+	------	7.4	39.6	30.9	77.9	15.6	14.3	4.6	2.8	2.2	39.5	33	28
Los Gatos gravelly loam.	0–1	------	6	4	11	22	15.7	15.7	7.9	16.3	12.0	67.1	25	8
	1–4	------	1	2	12	15	12.3	11.9	6.2	12.9	10.3	53.6	36	10
	4–10	------	1	3	8	12	9.4	9.1	5.6	12.0	8.7	44.8	34	21
	10–20	17	23	5	7	52	6.6	8.1	5.3	11.4	9.1	40.5	33	26
	20+	Parent rock.												
Los Robles clay loam.	0–6	------	------	------	1	1	.6	.7	.5	3.6	8.9	14.3	57	29
	6–13	------	------	------	------	------	.0	.1	.3	3.6	11.2	15.2	52	33
	13–20	------	------	------	------	------	.0	.1	.2	4.6	11.6	16.2	51	33
	20–29	------	------	------	------	------	.0	.1	.1	4.3	11.6	16.4	50	34
	29–44	------	------	------	------	------	.0	.1	.2	4.6	10.6	15.2	50	35
	44–60+	------	------	------	------	------	.0	.1	.2	5.5	11.8	17.6	48	34
Manton sandy loam.	2–0	Litter.												
	0–2	------	1.6	7.1	12.4	21.1	4.5	10.8	11.2	17.3	12.0	56.6	30	13
	2–10	------	.8	3.8	10.8	15.4	4.7	8.1	14.5	18.4	11.0	56.6	29	14
	10–22	------	.5	4.5	9.4	14.4	4.3	9.9	10.0	15.2	11.0	50.4	34	16
	22–36	------	.5	4.0	8.9	13.4	4.6	7.1	13.1	15.9	10.8	51.5	28	20
	36–56	------	2.4	7.1	9.3	18.8	6.0	12.7	11.2	16.7	10.3	56.9	25	18
	56+	Parent material.												
Masterson gravelly loam.	1½–0	Litter.												
	0–3	------	13	24	24	61	24.6	14.3	5.9	8.8	7.2	60.8	24	15
	3–19	8	17	17	15	57	14.1	11.7	6.2	9.9	9.7	51.6	31	17
	19–37	------	17	28	18	63	17.5	14.8	7.1	10.2	9.1	58.7	28	13
	37+	Parent material.												
Maymen gravelly loam.	0–1	------	2	2	13	17	16.7	19.6	8.1	9.2	5.9	59.5	26	14
	1–7	------	2	6	21	29	15.9	17.2	7.1	6.9	4.7	51.8	33	15
	7+	Parent material.												
Maywood silt loam.	0–3	------	------	.1	.4	.5	.5	.8	1.4	7.3	13.0	23.0	55	22
	3–14	------	1.2	.1	.3	1.6	.1	.3	1.5	6.2	9.6	17.7	61	21
	14–34	------	------	.2	.8	1.0	.8	3.4	8.6	20.5	16.0	49.3	32	19
	34–43	------	16.2	22.3	20.7	59.2	16.2	15.0	24.6	13.8	5.5	75.1	12	13
	43–62	------	.3	.5	.2	1.0	.2	.2	.2	6.0	18.5	25.1	54	21
Maywood loam, high terrace.	0–10	------	[1]	5	13	18	3.3	3.9	8.3	17.1	15.1	47.7	39	13
	10–25	------	1	2	9	12	3.5	4.4	6.2	17.6	16.2	47.9	37	15
	25–37	------	[1]	2	6	8	3.3	3.7	8.6	21.0	17.0	53.6	28.	18
	37–46	------	[1]	4	15	19	12.0	9.3	6.6	16.2	16.0	60.1	25	15
	46–58+	------	1	3	10	14	4.8	3.4	3.6	17.4	21.6	50.8	31	18
McCarthy stony sandy loam.	1–0	Litter.												
	0–3	------	3.7	10.4	13.0	27.1	13.4	11.2	13.8	17.4	15.0	70.8	21	8
	3–18	12.7	14.1	6.7	8.1	41.6	10.2	13.0	10.6	16.2	17.2	67.2	20	13
	18–30	6.2	41.5	10.0	5.0	62.7	9.2	9.6	11.6	16.0	13.8	60.2	21	19
	30+	Parent rock.												

See footnotes at end of table.

TABLE 4.—*Mechanical analyses of samples of representative soils of Tehama County, Calif.*—Continued

Soil	Depth	Gravel					Sand						Silt (0.05–0.002 mm.)	Clay (<0.002 mm.)
		>2 in.	2 in.–½ in.	½ in.–5 mm.	5.2 mm.	Total gravel (>2 mm.)	Very coarse sand (2.0–1.0 mm.)	Coarse sand (1.0–0.5 mm.)	Medium sand (0.5–0.25 mm.)	Fine sand (0.25–0.10 mm.)	Very fine sand (0.10–0.05 mm.)	Total sand (2.0–0.05 mm.)		
	Inches	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
Millsap loam.	0–2	------	1. 9	2. 5	3. 0	7. 4	4. 8	3. 4	3. 7	6. 4	8. 7	27. 0	47	26
	2–9	------	1. 4	. 8	2. 5	4. 7	2. 0	2. 0	1. 9	4. 8	8. 7	19. 4	44	37
	9–21	------	. 3	. 7	2. 4	3. 4	1. 5	1. 6	2. 1	3. 6	5. 3	14. 1	33	53
	21–31	------	5. 6	6. 6	5. 4	17. 6	1. 3	2. 3	1. 6	2. 9	4. 5	12. 6	34	53
	31–39	------	21. 2	29. 3	12. 6	63. 1	2. 6	2. 9	1. 7	1. 6	4. 8	13. 6	36	50
	39+	Parent rock.												
Millsholm clay loam.	0–2	------	------	1. 8	8. 2	10. 0	9. 7	8. 6	3. 8	7. 1	8. 0	37. 2	40	23
	2–9	------	. 4	1. 0	4. 1	5. 5	5. 8	5. 3	3. 5	5. 9	7. 6	28. 1	42	30
	9–14	------	6. 2	7. 2	5. 9	19. 3	4. 8	6. 4	3. 3	7. 1	6. 9	29. 5	38	33
	14–16	------	30. 5	24. 6	7. 4	62. 5	4. 7	5. 5	4. 3	6. 5	8. 5	29. 5	34	37
	16+	Parent rock.												
Nacimiento silty clay loam.	0–6	------	------	(1)	2	2	1. 8	1. 2	1. 2	5. 2	9. 1	18. 5	51	30
	6–12	------	------	(1)	5	5	. 9	1. 2	1. 2	5. 3	9. 9	18. 5	52	29
	12–18	------	------	------	(1)	(1)	. 7	. 7	. 7	3. 2	7. 5	12. 8	51	36
	18–25	------	------	------	------	------	. 8	1. 1	1. 3	5. 6	9. 0	17. 8	52	30
	25–35	------	------	2	5	7	2. 6	2. 6	1. 8	6. 9	9. 2	23. 1	45	32
Nanny stony loam.	0–5	------	6	15	12	33	8. 3	9. 9	15. 1	18. 2	7. 9	59. 4	26	15
	5–12	------	5	10	10	25	11. 3	14. 3	13. 1	18. 8	8. 5	66. 0	19	15
	12–20	------	5	11	11	27	8. 1	10. 4	15. 9	20. 2	8. 9	64. 5	18	17
	20–31	------	2	12	12	26	10. 7	14. 2	12. 8	19. 0	8. 2	64. 9	17	18
	31–44	------	8	13	9	30	7. 2	10. 9	18. 4	22. 2	8. 5	67. 2	19	14
	44–60	------	11	8	8	27	8. 2	15. 9	15. 6	23. 1	8. 7	71. 5	16	12
Neuns stony loam.	1½–0	Litter.												
	0–2	------	29	29	16	74	18. 6	10. 4	10. 0	10. 2	10. 0	54. 8	38	7
	2–10	------	24	18	15	57	11. 7	7. 6	7. 9	11. 5	10. 4	49. 1	42	9
	10–17	------	.25	20	12	57	10. 3	9. 9	6. 3	11. 6	11. 0	49. 1	42	9
	17+	Parent rock.												
Newville gravelly loam.	0–2	------	5. 2	10. 7	8. 0	23. 9	7. 7	5. 8	4. 4	9. 8	10. 3	38. 0	47	15
	2–6	------	6. 2	4. 9	9. 6	20. 7	6. 4	4. 3	5. 0	9. 0	9. 9	34. 6	47	18
	6–9	8. 3	8. 2	2. 6	7. 1	26. 2	5. 5	4. 3	4. 8	8. 8	9. 6	33. 0	44	23
	9–13	------	12. 1	10. 7	12. 3	35. 1	7. 1	6. 6	5. 1	8. 8	8. 3	35. 9	28	36
	13–20	------	21. 0	13. 2	14. 5	48. 7	10. 3	9. 7	6. 7	9. 5	6. 5	42. 7	18	39
	20–42	13. 7	26. 8	16. 5	10. 0	53. 3	12. 1	12. 1	14. 4	10. 1	5. 1	53. 8	12	34
	42–56+	------	15. 3	17. 9	16. 8	50. 0	17. 4	17. 3	10. 1	8. 4	3. 9	57. 1	12	31
Orland silt loam.	0–4	------	1. 4	. 6	1. 2	3. 2	1. 2	. 5	. 9	2. 6	10. 0	15. 2	66	19
	4–18	------	------	. 7	. 5	1. 2	. 1	. 3	. 3	2. 9	15. 3	18. 9	67	14
	18–34	------	------	------	. 4	. 4	(1)	(1)	. 1	1. 7	11. 5	13. 3	71	16
	34–48	------	------	. 5	. 9	1. 4	. 4	. 5	. 9	6. 8	9. 2	17. 8	61	21
	48–60+	------	------	. 6	. 4	1. 0	. 2	. 5	. 8	7. 7	16. 7	25. 9	53	21
Parrish gravelly loam.	0–2	------	------	2. 4	8. 4	10. 8	8. 6	10. 0	6. 7	10. 8	7. 5	43. 6	29	27
	2–7	------	------	1. 7	5. 4	7. 1	4. 0	4. 8	7. 4	9. 9	7. 1	33. 2	29	38
	7–17	------	1. 8	1. 5	14. 8	18. 1	4. 4	5. 4	4. 5	7. 9	6. 5	28. 7	23	48
	17–26	------	. 6	2. 7	14. 0	17. 3	7. 5	9. 1	10. 0	11. 1	7. 8	45. 5	22	33
	26–35	------	1. 5	6. 8	20. 6	28. 9	13. 3	16. 2	8. 6	10. 8	6. 5	55. 4	18	27
	35+	Parent material.												
Perkins gravelly loam.	0–4	------	24. 0	14. 7	12. 1	50. 8	9. 3	9. 9	6. 7	11. 2	9. 1	46. 2	41	13
	4–9	------	9. 5	15. 1	13. 9	38. 5	10. 2	8. 2	8. 2	10. 7	12. 6	49. 9	32	18
	9–20	------	16. 4	11. 8	10. 8	39. 0	10. 0	10. 0	6. 6	11. 7	12. 2	50. 0	30	20
	20–36	------	12. 3	10. 7	15. 5	38. 5	8. 5	7. 5	8. 7	11. 6	9. 5	45. 8	28	26
	36–52	------	29. 2	19. 7	18. 5	67. 4	20. 9	11. 6	11. 5	8. 9	5. 7	58. 6	15	26
	52–60+	------	26. 8	22. 1	20. 2	69. 1	35. 9	26. 5	5. 9	4. 3	3. 9	76. 5	10	14

See footnotes at end of table.

TABLE 4.—*Mechanical analyses of samples of representative soils of Tehama County, Calif.*—Continued

Soil	Depth	Gravel					Sand						Silt (0.05–0.002 mm.)	Clay (<0.002 mm.)
		>2 in.	2 in.–½ in.	½ in.–5 mm.	5.2 mm.	Total gravel (>2 mm.)	Very coarse sand (2.0–1.0 mm.)	Coarse sand (1.0–0.5 mm.)	Medium sand (0.5–0.25 mm.)	Fine sand (0.25–0.10 mm.)	Very fine sand (0.10–0.05 mm.)	Total sand (2.0–0.05 mm.)		
	Inches	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
Peters clay.	0–1	------	------	------	------	------	4.1	4.0	2.5	9.2	10.7	30.5	19	50
	1–4	------	------	------	------	------	3.1	3.5	2.6	6.9	11.6	27.7	14	58
	4–9	------	------	------	------	------	.0	.3	.8	6.7	11.4	19.2	17	54
	9–12	------	------	------	------	------	.1	.2	.7	7.2	12.7	20.9	23	56
	12+	Parent material.												
Pleasanton gravelly loam.	0–3	------	5	7	8	20	6.6	8.8	6.5	13.5	10.6	46.0	27	27
	3–11	------	3	6	7	16	5.7	9.4	7.1	13.8	12.5	48.5	31	20
	11–16	------	3	8	6	17	6.2	9.8	7.6	13.2	12.3	49.1	25	26
	16–25	------	3	6	6	15	6.4	7.0	5.2	10.9	10.6	40.1	29	31
	25–34	------	3	1	4	8	5.2	6.6	5.4	10.7	9.8	37.7	29	33
	34–44	------	3	5	8	16	7.4	9.8	7.8	12.8	9.9	47.7	24	28
	44–56	------	(1)	1	2	3	2.6	4.0	5.0	16.9	17.1	45.6	25	29
	56–72+	------	------	(1)	(1)	(1)	1.3	2.4	3.0	14.0	15.4	36.1	32	32
Red Bluff gravelly loam.	0–3	------	4.5	5.9	11.0	21.4	6.4	10.3	6.8	11.0	10.1	44.6	40	15
	3–8	------	6.7	6.2	8.7	21.6	7.5	8.6	6.6	10.8	13.1	46.6	33	20
	8–14	------	7.6	6.4	8.2	22.2	6.7	7.2	8.6	10.8	10.0	43.3	36	21
	14–22	------	4.5	4.7	8.3	17.5	6.0	8.9	6.4	10.3	9.9	41.5	33	26
	22–40	------	1.3	4.5	11.8	17.6	6.2	5.3	6.6	8.9	12.1	39.1	23	33
	40–58+	------	2.2	4.7	11.3	18.2	7.2	8.0	6.2	11.0	9.3	4.7	27	29
Redding gravelly loam.	0–2	------	5.4	6.7	8.0	20.1	5.8	5.2	4.3	14.6	20.9	50.8	35	14
	2–7	------	2.2	5.2	7.7	15.1	5.4	3.9	5.3	14.5	16.5	45.6	38	16
	7–13	------	.8	3.0	8.2	12.0	5.7	4.8	4.1	13.5	15.3	43.4	37	20
	13–19	------	.8	.8	4.2	5.8	4.2	3.7	4.8	10.0	9.0	31.7	20	48
	19–23	------	------	1.0	3.5	4.5	1.0	3.6	9.6	22.7	13.7	50.6	32	17
	23–35	Hardpan.												
	35+	Siltstone and conglomerate.												
Sehorn clay.	0–3	------	2.1	.2	3.6	5.9	.3	.7	1.2	2.4	4.2	8.8	40	51
	3–10	------	------	.5	.2	.7	.4	.7	.6	2.0	3.5	7.2	36	57
	10–18	------	------	.8	1.7	2.5	.5	.5	.7	1.9	4.2	7.8	37	55
	18–26	------	.2	3.6	8.2	12.0	.4	.8	.6	1.6	3.3	6.7	38	55
	26–33	------	3.1	28.9	16.2	48.2	1.1	1.9	1.6	1.7	3.0	9.3	36	55
	33+	Parent rock.												
Sheetiron gravelly loam.	1½–0	Litter.												
	0–2	------	6	18	23	47	14.9	13.9	5.7	7.0	7.5	49.0	36	15
	2–8	------	17	15	17	49	12.6	13.6	5.9	7.6	6.6	46.3	36	18
	8–19	8	26	16	13	63	12.4	13.2	5.5	7.1	6.5	44.7	38	17
	19+	Parent rock.												
Stonyford stony loam.	0–1	------	18	13	11	42	14.5	11.1	4.8	6.5	5.8	42.7	32	25
	1–5	------	9	4	9	22	9.9	9.7	5.6	8.5	7.0	40.7	33	27
	5–11	------	45	17	12	74	9.1	9.6	4.8	5.9	5.9	35.3	33	32
	11–21	11	47	14	6	78	13.4	11.6	4.3	5.2	5.3	39.8	27	33
	21+	Parent rock.												
Tehama silt loam.	0–8	------	------	2.7	1.9	4.6	2.6	3.9	4.4	10.7	12.3	33.9	52	14
	8–13	------	(1)	(1)	(1)	(1)	1.7	3.3	3.7	10.8	13.4	32.9	51	16
	13–19	------	------	.8	1.2	2.0	1.1	2.6	3.6	11.3	13.4	32.0	51	17
	19–31	------	------	------	------	------	.7	.9	1.5	7.3	12.3	22.7	47	30
	31–42	------	------	------	------	------	.6	.6	1.3	10.1	14.8	27.5	44	28
	42–50	------	(1)	(1)	(1)	(1)	.9	.5	1.6	13.2	16.0	32.2	44	24
	50–58+	------	27.1	19.1	9.1	55.3	------	------	------	------	------	4.5	71	24
Toomes very rocky silt loam.	0–1	------	3.7	3.4	1.5	8.6	.7	2.6	2.1	5.7	11.9	23.0	59	18
	1–9	------	3.2	3.4	1.4	8.0	2.1	1.6	2.5	6.3	10.7	23.2	52	25
	9–12	------	17.6	2.6	3.0	23.2	2.1	1.6	2.5	3.6	10.2	22.7	50	27
	12+	Parent rock.												

See footnotes at end of table.

TABLE 4.—*Mechanical analyses of samples of representative soils of Tehama County, Calif.*—Continued

Soil	Depth	Gravel					Sand						Silt (0.05–0.002 mm.)	Clay (<0.002 mm.)
		>2 in.	2 in.–½ in.	½ in.–5 mm.	5.2 mm.	Total gravel (>2 mm.)	Very coarse sand (2.0–1.0 mm.)	Coarse sand (1.0–0.5 mm.)	Medium sand (0.5–0.25 mm.)	Fine sand (0.25–0.10 mm.)	Very fine sand (0.10–0.05 mm.)	Total sand (2.0–0.05 mm.)		
	Inches	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
Tuscan cobbly loam.	0–3	------	10	4	5	19	8.4	10.2	6.3	8.9	7.3	41.1	39	20
	3–7	------	12	3	3	18	5.4	7.6	5.7	9.3	7.6	35.6	36	28
	7–12	------	9	3	2	14	5.7	7.9	5.2	8.2	7.0	34.0	36	30
	12–18	17	25	5	9	56	8.3	7.7	4.6	7.2	6.1	33.9	30	36
	18+	Hardpan and bedrock.												
Tyson gravelly sandy loam.	1–0	Litter.												
	0–5	------	6	23	20	49	17.2	17.4	7.7	10.6	5.5	58.4	24	18
	5–18	------	3	19	21	43	15.9	14.9	6.7	8.7	5.4	51.6	26	22
	18+	Parent rock.												
Vina loam.	0–6	------	(1)	(1)	(1)	(1)	2.1	5.5	5.0	11.8	10.9	35.3	47	18
	6–11	------	------	(1)	(1)	(1)	1.2	4.8	5.4	11.9	12.6	35.9	48	16
	11–22	------	------	------	1	1	1.7	4.6	4.8	11.6	13.7	36.4	50	14
	22–36	------	------	------	(1)	(1)	.7	3.4	5.5	13.3	12.8	35.7	49	15
	36–66	------	------	------	1	1	.3	1.6	7.6	27.8	19.2	56.5	33	10
Windy gravelly sandy loam.	2–0	Litter.												
	0–2	------	5.5	8.0	9.5	23.0	9.1	11.1	16.7	24.7	17.6	79.2	15	6
	2–12	------	6.0	4.8	10.3	21.1	9.1	13.5	12.7	22.7	17.5	75.5	19	6
	12–25	27.0	4.2	5.5	7,0	43.7	10.0	11.0	15.2	20.8	16.0	73.0	20	7
	25–45	12.6	8.2	7.2	8.6	42.6	8.7	11.6	10.6	18.0	13.3	62.2	26	12
	45+	Parent material.												
Windy stony sandy loam.	4–0	Litter.												
	0–3	------	12.9	7.5	15.8	36.2	18.3	15.3	14.6	16.2	9.7	74.1	18	8
	3–8	------	25.7	9.8	13.9	49.4	14.7	16.4	11.0	16.3	10.5	68.9	20	11
	8–15	9.0	12.7	12.5	12.4	46.6	12.5	11.8	14.5	16.5	9.3	64.6	20	15
	15–29	------	26.2	16.9	12.0	55.1	15.9	14.9	11.4	14.2	8.4	64.8	21	14
	29+	Bedrock.												
Yollabolly very rocky loam.	½–0	------	64	31	5	100	------	------	------	------	------	------	------	------
	0–4	------	2	13	25	40	15.4	11.9	10.7	11.4	6.1	55.5	37	7
	4–10	------	23	11	15	49	11.7	13.9	8.2	10.5	5.4	49.7	33	17
	10+	Parent rock.												
Yolo loam.	0–11	------	------	(1)	(1)	(1)	.2	.7	.5	3.8	9.0	14.2	68	18
	11–34	------	------	(1)	(1)	(1)	.2	.4	.5	1.9	9.4	12.4	68	20
	34–68	------	2	1	1	4	1.1	2.1	1.7	4.1	16.2	25.2	59	16
	68–80+	------	33	21	15	69	36.0	32.8	10.6	7.2	2.2	88.8	4	7
Zamora silt loam.	0–1	------	1	8	14	23	3.4	3.3	4.1	8.2	9.3	28.3	50	22
	1–10	------	1	5	10	16	2.4	2.9	2.5	7.1	8.7	23.6	54	22
	10–18	------	(1)	(1)	(1)	(1)	------	.1	.9	6.7	10.5	18.2	53	29
	18–34	------	------	(1)	(1)	(1)	.1	.2	.8	6.5	11.6	19.2	50	31
	34–47	------	(1)	(1)	(1)	(1)	.1	.3	.8	6.8	11.3	19.3	51	30
	47–78+	------	------	(1)	(1)	(1)	.1	.8	2.4	15.3	17.7	36.3	41	23

[1] Trace.
[2] Only total gravel reported.
[3] High in organic matter.

TABLE 5.—*Selected physical and chemical data on samples of representative soils of Tehama County, Calif.*

[Dashes indicate data were not determined]

Soil	Depth	Bulk density [1]	Moisture equivalent [2]	Moisture held at tension of 15 atmospheres	pH [3]	$CaCO_3$ equivalent [4]	Phosphate [5]	Organic carbon	Organic nitrogen	Carbon-nitrogen ratio
	Inches	*Gm./cc.*	*Percent*	*Percent*		*Percent*	*P.p.m.*	*Percent*	*Percent*	
Aiken loam.	1–0				5.7			37.10	0.796	47
	0–8		37.3	18.3	6.5		0.03	2.21	.072	31
	8–17	>1.1	36.7	21.5	6.3		.04	1.58	.058	27
	17–25	>1.2	39.6	25.9	6.1		.03	1.00	.043	23
	25–37	<1.5	41.6	28.6	6.1		<.03	.45	.026	17
	37–49	>1.4	40.6	28.7	6.0		<.03	.34	.016	
	49–62+	>1.4	40.3	28.4	5.9		.03	.28	.014	
Altamont clay.	0–2	1.8	35.5	24.5	6.8		.92	2.15	.202	11
	2–7	1.9	33.5	23.4	7.1	0.07	.07	1.08	.106	10
	7–17	1.8	30.2	21.9	7.5	3.23	.06	.90	.090	10
	17–24	1.9	30.0	22.0	7.6	6.95	.04	.78	.085	9
	24–35	1.6	29.1	17.1	7.6	20.2	.03	.44	.058	8
Altamont clay, terrace.	0–9	1.7	22.3	12.6	6.4		.05	1.03	.108	10
	9–18	1.9	21.8	13.3	6.6		.04	.60	.079	8
	18–28	2.0	23.5	14.5	6.9		.04	.50	.068	7
	28–36	2.0	24.6	14.9	7.3		.04	.34	.056	6
	36–50+	1.8	22.5	10.0	7.9	8.3	<.03	.00	.037	
Anita clay.	0–1	1.6	34.0	22.8	6.3		.10	1.32	.141	12
	1–3	1.9	35.0	23.8	6.0		.03	.83	.074	11
	3–10	1.9	37.9	25.7	6.0		<.03	.52	.044	12
	10–15	1.9	39.9	22.7	6.2		.03	.53	.045	12
	15+	1.3–1.6	[6]		7.5	31				
Arbuckle gravelly fine sandy loam.	0–1		18.1	7.9	6.1		2.03	2.57	.254	10
	1–7	1.9	13.2	4.1	6.0		.50	.71	.064	11
	7–14	1.9	12.2	4.6	6.2		.40	.35	.039	9
	14–25	1.9	11.7	6.1	6.2		.20	.21	.024	9
	25–42		5.8	4.4	6.5		.18	.12	.011	
	42–59		5.9	4.8	6.6		.18	.10	.007	
	59–72+	1.9	14.9	6.8	6.5		.17	.11	.817	
Berrendos clay.	0–5	1.8	28.1	18.0	6.0		1.8	1.48	.149	10
	5–14	>2.0	29.1	18.1	6.3		1.3	.93	.086	10
	14–24	>2.0	33.8	19.2	6.5		.38	.59	.055	11
	24–43	1.9	31.4	19.0	6.7		.29	.49	.042	12
	43–54	>2.0	31.1	19.0	6.9		.55	.36	.040	9
	54–67+	1.8	28.9	17.6	7.2		.76	.17	.028	6
Childs gravelly loam.	0–5		29.9	15.9		0	.22	4.28	.291	15
	5–16	<1.2	30.3	17.6			.09	3.31	.199	17
	16–24	1.5	24.5	12.5			.07	1.31	.083	16
	24–31	>1.5	23.9	11.0			.03	1.00	.053	19
	31–40	1.5	25.4	11.0			.04	.83	.049	17
	40–50	<1.7	19.5	8.8			.06	.41	.027	15
	50–64	>1.6	22.4	10.4			.05	.21	.012	
Chummy silty clay.	2–0	<1.0	67.9	56.2			1.5	15.60	1.16	13
	0–9	1.2	39.5	23.7			.11	3.77	.375	10
	9–23	1.2	30.7	11.4			<.02	.70	.084	8
	23–29	1.5	22.5	12.0			<.02	.48	.046	10
	29–39	1.3	31.1	17.8			<.02	.60	.038	16
	39–60+	1.2	33.8	16.6			<.02	.37	.015	24
Clear Lake clay.	0–3	2.0	42.4	32.4	7.0	0	.30	2.24	.170	13
	3–13	>2.0	43.9	29.0	6.9		.08	1.14	.077	15
	13–19	>2.0	44.2	28.1	6.8		.06	.91	.053	17
	19–27	>2.0	47.5	25.6	6.8		.06	.71	.049	14
	27–43	>2.0	18.2	8.2	7.2	0	.04	.11	.008	
	43–60+	>2.0	[7] 58.1	22.1	7.2	0	<.03	.10	.012	
Cohasset loam.	0–4		32.9	17.5	6.1		.06	3.50	.12	29
	4–15		28.6	16.1	5.9		.02	1.30	.048	27
	15–29		30.0	20.6	5.4		<.02	.60	.025	24
	29–40		34.6	25.2	5.1		<.02	.35	.021	17
	40–55		35.9	26.1	5.0		<.02	.23	.018	13

See footnotes at end of table.

TABLE 5.—*Selected physical and chemical data on samples of representative soils of Tehama County, Calif.*—Continued

Soil	Depth	Bulk density [1]	Moisture equivalent [2]	Moisture held at tension of 15 atmospheres	pH [3]	CaCO3 equivalent [4]	Phosphate [5]	Organic carbon	Organic nitrogen	Carbon-nitrogen ratio
	Inches	*Gm./cc.*	*Percent*	*Percent*		*Percent*	*P.p.m.*	*Percent*	*Percent*	
Cohasset gravelly loam	0–2	1.3	28.1	19.0	5.8		0.03	3.50	0.12	29
	2–8	1.5	25.9	19.3	5.6		.02	1.70	.067	25
	8–24	1.3	24.9	18.8	5.8		<.02	.65	.042	15
	24–39	1.4	32.0	23.9	5.8		.02	.28	.022	13
	39–54+	1.4	42.5	29.8	5.8		<.02	.35	.025	14
Columbia silt loam.	0–9	1.4	25.2	9.8	6.5		3.33	2.08	.035	59
	9–19	1.3	17.0	7.0	6.7		1.58	.60	.056	11
	19–26	1.4	18.5	7.4	7.0		.49	.58	.052	11
	26–40	1.3	13.1	6.4	7.1		.28	.40	.036	11
	40–44	1.4	6.4	4.4	7.3		.22	.17		
	44–72	1.4	13.1	6.4	7.4		.26	.37	.032	12
Cone extremely gravelly sandy loam.	0–3		80.3	54.0	6.3		.11	28.00	.67	42
	3–7		59.8	25.7	6.5		.03	6.80	.20	34
	7–31		36.3	26.5	6.6		<.02	2.90	.11	26
	31–70		36.7	24.6	6.5		<.02	.72	.059	18
Corning gravelly loam.	0–8				5.5			.22	.033	7
	8–15				5.7			.10	.025	4
	15–21				5.4			.09	.023	
	21–29				5.2			.14	.032	
	29–36				5.2			.08	.020	
	36–45				5.2			.04	.018	
	45–54+				5.2			.06	.020	
Cortina gravelly fine sandy loam.	0–3	1.8	10.0	4.2	5.8		1.09	.94	.105	9
	3–15	1.9	8.1	3.1	6.2		.25	.28	.024	12
	15–36		2.1	1.5	6.4		.06	.08	.004	
	36–56		3.1	2.3	6.8		.06	.11	.007	
	56–72+	2.0	12.8	4.9	6.8		.07	.41	.028	
Dibble silty clay loam.	0–2	1.7	25.4	9.6	5.8		.59	1.58	.166	10
	2–6	1.7	22.6	10.5	5.8		.12	.55	.074	7
	6–9	1.7	22.8	13.3	5.8		.07	.32	.060	5
	9–17	1.8	24.9	14.8	5.8		.09	.24	.057	4
	17–24	1.9	25.9	14.8	5.8		.20	.13	.048	3
	24–34	1.8	26.4	13.4	5.7		.21	.08	.044	2
	34+	1.7	[8]							
Dubakella stony loam.	2–0				5.2			40.90	.885	46
	0–2		33.3	16.1	6.9		.08	4.25	.128	33
	2–11	1.2	36.7	21.8	6.8		.07	2.36	.079	30
	11–19		51.5	35.5	6.6		.05	.90	.038	24
Forward sandy loam.	0–1	1.1	17.6	11.6	6.2		1.84	3.50	.11	32
	1–7	1.2	15.4	5.7	6.2		.84	1.20	.042	29
	7–15	1.3	13.8	5.4	5.9		.25	.73	.028	26
	15–24	1.3	12.1	5.3	5.5		.19	.46	.020	23
	24+	[9]								
Goulding stony loam.	0–6	1.3	28.3	11.5	6.4		.55	2.83	.154	18
	6–13	1.3	24.0	10.9	6.1		.07	1.13	.074	15
Guenoc loam.	0–2	1.4	27.9	23.0	6.1		.03	.58	.050	12
	2–16	1.4	27.3	19.7	6.1		.03	1.20	.094	13
	16–30	1.7	30.1	18.3	5.7		.02	2.10	.15	14
Henneke stony loam.	½–0				5.6			23.80	.559	43
	0–3	1.1	35.0	23.4	6.8		.07	3.93	.154	26
	3–10	1.1	34.3	24.7	6.9		.04	1.10	.060	18
	10–19		36.4	25.1	6.9		.03	.70	.043	16
Hillgate silt loam.	0–5	1.6	18.4	6.1	5.9		.06	.63	.067	9
	5–11	1.6	17.8	6.0	5.6		.04	.47	.057	8
	11–17	>1.7	17.6	7.2	6.0		.15	.28	.042	7
	17–26	1.6	20.8	11.7	6.3		.05	.25	.046	5
	26–39	1.9	23.5	13.3	6.5		.06	.22	.049	4
	39–51	1.8	22.0	11.5	7.0		.08	.13	.038	
	51–70+	2.0	15.8	8.2	7.0		.12	.09	.023	

See footnotes at end of table.

TABLE 5.—*Selected physical and chemical data on samples of representative soils of Tehama County, Calif.*—Continued

Soil	Depth	Bulk density [1]	Moisture equivalent [2]	Moisture held at tension of 15 atmospheres	pH [3]	$CaCO_3$ equivalent [4]	Phosphate [5]	Organic carbon	Organic nitrogen	Carbon-nitrogen ratio
	Inches	*Gm./cc.*	*Percent*	*Percent*		*Percent*	*P.p.m.*	*Percent*	*Percent*	
Hulls gravelly loam.	0–7	1. 5	18. 6	6. 4	5. 8	----------	0. 68	1. 57	0. 139	11
	7–23	1. 8	12. 0	6. 3	5. 7	----------	. 16	1. 01	. 098	10
Inks cobbly loam.	0–6	1. 6	23. 0	14. 8	5. 9	----------	. 05	. 67	. 055	12
	6–10	1. 5	24. 3	17. 2	5. 9	----------	. 04	. 59	. 046	13
	10–13	1. 5	26. 5	19. 8	5. 9	----------	. 02	. 20	. 027	8
Inskip very rocky silt loam.	0–3	----------	40. 1	27. 2	6. 5	----------	<. 02	6. 60	. 28	24
	3–10	----------	40. 2	29. 7	6. 7	----------	<. 02	3. 50	. 20	18
	10–33	----------	43. 0	33. 7	7. 0	----------	. 03	1. 80	. 11	16
Iron Mountain rocky sandy loam.	0–5	----------	22. 9	10. 5	6. 1	----------	. 11	2. 00	. 17	12
	5–9	----------	22. 8	11. 4	6. 2	----------	. 07	1. 30	. 12	11
Jiggs stony sandy loam.	0–2	1. 0	26. 7	12. 8	6. 0	----------	. 10	7. 10	. 19	37
	2–5	1. 3	17. 8	5. 6	5. 8	----------	. 05	1. 90	. 050	37
	5–10	1. 3	14. 4	6. 1	5. 6	----------	. 05	. 94	. 025	38
	10–20	1. 4	13. 8	5. 5	5. 7	----------	. 04	. 85	. 014	60
Josephine gravelly loam.	1–0	----------	----------	----------	4. 9	----------	----------	34. 70	. 589	59
	0–4	1. 4	27. 4	10. 2	5. 8	----------	. 53	2. 31	. 058	40
	4–15	1. 4	25. 8	12. 0	5. 6	----------	. 06	1. 05	. 036	29
	15–26	1. 7	25. 8	13. 8	5. 5	----------	. 03	. 63	. 024	26
	26–38	1. 5	27. 7	18. 6	5. 5	----------	. 03	. 37	. 019	19
	38–50	1. 7	23. 2	14. 4	5. 4	----------	. 03	. 29	. 037	8
	50+	----------	----------	----------	5. 6	----------	----------	----------	----------	----------
Keefers cobbly loam.	0–3	>1. 6	19. 2	8. 9	5. 8	----------	. 51	1. 85	. 150	12
	3–7	1. 7	16. 5	7. 8	6. 3	----------	. 16	. 57	. 043	13
	7–16	>1. 7	16. 8	8. 6	6. 4	----------	. 15	. 36	. 030	12
	16–24	>1. 6	18. 1	10. 1	6. 5	----------	. 12	. 33	. 029	11
	24–37	>1. 8	26. 4	15. 9	6. 5	----------	. 05	. 24	. 025	10
	37–51	----------	26. 4	16. 2	6. 6	----------	. 06	. 18	. 019	----------
	51–68+	----------	23. 3	13. 0	6. 7	----------	. 08	. 16	. 013	----------
Kimball loam.	0–3	1. 6	17. 5	4. 9	6. 1	----------	. 04	1. 14	. 091	13
	3–6	1. 8	16. 6	4. 8	6. 0	----------	<. 03	. 54	. 057	9
	6–11	1. 8	16. 5	5. 9	5. 8	----------	<. 03	. 40	. 053	8
	11–21	>2. 0	29. 8	16. 8	5. 7	----------	<. 03	. 37	. 059	6
	21–34	>2. 0	21. 4	11. 5	6. 4	----------	<. 03	. 10	. 037	----------
	34–55+	2. 0	19. 8	9. 8	6. 5	----------	. 03	. 12	. 036	----------
Laniger fine sandy loam.	0–1	1. 6	30. 3	26. 8	5. 8	----------	6. 7	7. 91	. 600	13
	1–4	1. 6	11. 5	4. 1	5. 9	----------	2. 6	1. 40	. 093	15
	4–9	1. 6	8. 6	3. 4	6. 2	----------	1. 2	. 32	. 035	9
	9–16	1. 5	9. 0	3. 8	6. 2	----------	. 59	. 19	. 026	7
	16–34	1. 5	8. 2	3. 7	6. 0	----------	. 42	. 06	. 021	3
Lodo shaly loam.	0–2	1. 5	17. 4	9. 7	6. 4	----------	. 42	1. 60	. 112	14
	2–6½	1. 5	16. 4	9. 6	6. 5	----------	. 14	1. 17	. 095	12
	6½+	----------	17. 8	10. 7	6. 7	----------	. 20	1. 16	. 076	15
Los Gatos gravelly loam.	0–1	1. 6	18. 1	9. 3	6. 0	----------	. 85	2. 44	. 136	18
	1–4	1. 5	17. 4	7. 3	6. 1	----------	. 39	. 97	. 069	14
	4–10	>1. 6	19. 3	8. 5	5. 9	----------	. 14	. 90	. 073	12
	10–20	1. 7	20. 1	10. 7	5. 8	----------	. 05	. 59	. 065	9
Los Robles clay loam.	0–6	1. 5	20. 7	13. 0	6. 5	----------	1. 94	1. 63	. 140	12
	6–13	1. 6	27. 0	14. 9	6. 6	----------	. 77	. 95	. 076	12
	13–20	1. 6	27. 3	15. 2	6. 6	----------	. 51	. 73	. 059	12
	20–29	>1. 5	28. 9	15. 2	6. 6	----------	. 32	. 56	. 049	11
	29–44	----------	28. 9	15. 7	6. 5	----------	. 27	. 53	. 047	11
	44–60+	1. 6	27. 3	15. 2	6. 5	----------	. 29	. 40	. 037	11
Manton sandy loam.	0–2	----------	22. 9	10. 8	6. 0	----------	. 04	3. 0	. 11	27
	2–10	----------	19. 3	8. 0	6. 1	----------	<. 02	1. 4	. 057	25
	10–22	----------	18. 3	8. 5	6. 0	----------	<. 02	. 57	. 034	17
	22–36	----------	18. 6	7. 9	5. 8	----------	<. 02	. 32	. 024	13
	36–56	----------	17. 9	9. 7	6. 0	----------	. 02	. 13	. 017	8

See footnotes at end of table.

TABLE 5.—*Selected physical and chemical data on samples of representative soils of Tehama County, Calif.*—Continued

Soil	Depth	Bulk density [1]	Moisture equivalent [2]	Moisture held at tension of 15 atmospheres	pH [3]	$CaCO_3$ equivalent [4]	Phosphate [5]	Organic carbon	Organic nitrogen	Carbon-nitrogen ratio
	Inches	*Gm./cc.*	*Percent*	*Percent*		*Percent*	*P.p.m.*	*Percent*	*Percent*	
Masterson gravelly loam.	1½–0				5.7			42.6	0.887	48
	0–3	1.3	31.0	16.1	6.1		0.68	5.37	.252	21
	3–19	1.3	26.8	10.2	5.3		.04	2.22	.112	20
	19–37		20.6	7.8	5.0		.03	.82	.065	13
Maymen gravelly loam.	0–1	1.5	19.4	10.3	6.1		.55	2.22	.136	16
	1–7	>1.5	18.1	10.3	6.4		.21	1.04	.088	12
Maywood silt loam.	0–3	1.3–1.7	24.2	9.1	6.5		1.5	1.71	.144	12
	3–14	1.6	20.2	7.6	6.3		.28	.60	.067	9
	14–34	1.6	16.3	6.4	6.6		.27	.24	.039	8
	34–43	1.7	8.6	3.9	6.3		.19	.13	.022	
	43–62	1.8	21.5	3.3	6.3		.18	.20	.034	
Maywood loam, high terrace.	0–10	1.7	14.7	5.0	6.4		.16	.68	.069	11
	10–25	1.7	14.8	5.3	6.8		.10	.33	.050	11
	25–37	1.8	15.5	6.7	6.8		.08	.14	.023	6
	37–46	>1.8	13.9	6.2	7.1		.10	.10	.016	6
	46–58+	<1.8	16.6	7.3	7.0		.09	.17	.019	9
McCarthy stony sandy loam.	0–3	1.0	36.5	27.7	6.2		.07	7.70	.24	32
	3–18	1.2	29.9	19.2	5.9			.79		
	18–30	1.2	35.3	20.9	6.0		.03	.75	.029	26
Millsap loam.	0–2	1.7	29.4	11.7	6.6		.91	2.22	.197	11
	2–9	1.8	26.8	12.3	6.5		.35	.75	.087	9
	9–21	1.9	32.4	18.0	6.4		.04	.50	.073	7
	21–31	2.0	34.6	19.7	6.3		.14	.43	.068	7
	31–39	1.9	33.5	18.8	6.4		.08	.46	.065	7
Millsholm clay loam.	0–2	1.7	22.5	10.3	6.7		.96	1.92	.173	11
	2–9	1.7	19.6	10.4	6.6		.13	.62	.080	8
	9–14	1.7	20.6	12.0	6.4		.06	.51	.069	7
	14–16	1.7	21.9	13.3	6.5		.06	.61	.069	9
Nacimiento silty clay loam.	0–6	>1.5	23.8	9.9	7.6	10.3	.08	.67	.099	7
	6–12	1.6	23.4	9.6	7.8	8.7	.08	.70	.099	7
	12–18	1.6	25.1	11.2	7.8	18.9	.04	.48	.076	6
	18–25	>1.7	25.5	10.1	7.8	9.2	.03	.20	.046	4
	25–35	1.7	28.4	12.7	7.7	9.8	.04	.16	.038	4
Nanny stony loam.	0–5		26.5	15.4	6.1		.10	5.91	.232	25
	5–12	1.4	20.2	11.2	6.2		.04	2.05	.099	21
	12–20	1.4	18.1	9.7	5.9		.03	.88	.046	20
	20–31	>1.3	16.9	9.2	5.9		.03	.43	.022	20
	31–44	<1.4	16.2	8.9	5.7		.04	.26	.013	20
	44–60	1.5	15.5	7.9	5.7		.04	.14	.008	
Neuns stony loam.	1½–0				4.6			39.80	.892	45
	0–2		22.6	9.9	5.7		.46	3.85	.094	41
	2–10		21.2	6.5	5.8		.14	1.87	.049	38
	10–17		20.3	6.0	5.5		.05	1.33	.033	40
Newville gravelly loam.	0–2	1.9	26.1	7.2			.26	1.57	.160	10
	2–6	1.9	23.5	7.0			.04	.44	.063	7
	6–9	1.8	23.5	8.9			.05	.30	.054	6
	9–13	1.9	25.4	12.3			.04	.25	.057	4
	13–20	2.0	26.6	13.2			.05	.13	.044	3
	20–42	2.0	19.3	11.1			.19	.03	.034	1
	42–56+	2.0	18.6	10.6			.33	.03	.029	1
Orland silt loam.	0–4	1.3	27.5	7.2	6.9		.98	2.50	.187	13
	4–18	1.3	22.2	5.9	7.2		.08	1.15	.105	11
	18–34	1.3	22.4	5.8	8.3	.89	.05	.72	.078	9
	34–48	1.7	22.3	7.1	8.4	1.80	.05	.73	.076	10
	48–60+	1.7	22.3	7.0	8.4	3.69	.04	.60	.063	10

See footnotes at end of table.

TABLE 5.—*Selected physical and chemical data on samples of representative soils of Tehama County, Calif.*—Continued

Soil	Depth	Bulk density [1]	Moisture equivalent [2]	Moisture held at tension of 15 atmospheres	pH [3]	$CaCO_3$ equivalent [4]	Phosphate [5]	Organic carbon	Organic nitrogen	Carbon-nitrogen ratio
	Inches	*Gm./cc.*	*Percent*	*Percent*		*Percent*	*P.p.m.*	*Percent*	*Percent*	
Parrish gravelly loam.	0–2	1.5	29.2	12.0	6.2		0.35	2.76	0.141	20
	2–7	1.5	28.1	13.7	6.0		.13	1.50	.091	17
	7–17	1.9	30.3	16.5	5.8		.08	.31	.037	8
	17–26	1.9	28.0	14.6	5.7		.04	.16	.022	7
	26–35	2.0	26.6	13.6	5.8		.07	.14	.017	8
Perkins gravelly loam.	0–4	1.5	18.3	7.3	6.4		.30	2.81	.201	14
	4–9	1.7	14.2	5.9	6.1		.04	.63	.057	11
	9–20	1.4–1.8	13.5	6.5	6.0		.03	.26	.033	8
	20–36	1.9	14.9	8.3	5.9		<.03	.17	.030	6
	36–52	2.0	14.0	8.7	6.0		<.03	.12	.026	
	52–60		8.6	4.8	6.1		<.03	.07	.014	
Peters clay.	0–1	1.6	35.3	23.9	6.3		.18	2.53	.180	14
	1–4	1.8	36.1	24.5	6.1		.07	1.53	.114	13
	4–9	>1.8	39.6	26.6	6.2		.05	.85	.079	11
	9–12	1.7	45.1	30.6	5.9		.06	.65	.065	10
Pleasanton gravelly loam.	0–3	1.8	18.9	8.2	6.1		1.67	1.60	.151	11
	3–11	1.7	17.4	8.0	6.2		.74	.81	.069	12
	11–16	1.7	19.0	9.3	6.3		.66	.53	.050	11
	16–25	1.8	21.8	11.0	6.3		.60	.52	.048	11
	25–34	2.0	23.3	12.2	6.7		.35	.34	.034	10
	34–44	1.9	20.9	10.4	6.8		.30	.20	.023	9
	44–56	1.7	22.7	11.2	6.9		.17	.17	.021	8
	56–72+	1.8	24.6	12.4	6.9		.09	.20	.021	10
Red Bluff gravelly loam.	0–3	1.5	19.2	5.8			.16	1.56	.126	12
	3–8	1.6	15.5	5.7			.05	.46	.056	8
	8–14	1.7	15.1	6.4			.04	.25	.039	6
	14–22	1.5–1.8	15.8	7.7			.03	.14	.031	
	22–40	>2.0	17.6	9.8			.04	.09	.032	
	40–58+	>2.0	17.1	2.3			.04	.08	.027	
Redding gravelly loam.	0–2	1.8	14.0	4.3			.05	.59	.056	10
	2–7	1.8	13.3	4.5			<.03	.38	.033	12
	7–13	1.9	14.9	6.4			.04	.21	.027	8
	13–19	>2.0	34.0	19.5			.04	.27	.044	6
	19–23	1.8	25.0	18.8			.03	.09	.023	
	23–35	1.8	24.8	17.8		.62	.07	.09	.019	
	35–48	2.0	24.9	16.2		3.00	.10	.06	.019	
	48–60	>2.0	27.7	17.6		3.10	.20	.09	.019	
Sehorn clay.	0–3	1.9	30.7	19.1	6.2		.26	1.44	.149	10
	3–10	1.9	29.7	21.3	6.1		.02	.62	.077	8
	10–18	1.9	28.7	19.2	6.2		.03	.54	.069	8
	18–26	2.0	28.8	19.0	6.9		<.02	.49	.065	8
	26–33	2.0	29.0	19.3	6.7		.02	.52	.059	8
Sheetiron gravelly loam.	1½–0				5.3			43.20	.967	45
	0–2		25.6	7.2	6.0		1.13	2.45	.110	23
	2–8		23.9	7.1	5.3		1.13	1.40	.088	16
	8–19		20.8	6.4	5.3		.59	.55	.062	9
Stonyford stony loam.	0–1		31.3	17.9	6.1		.13	5.94	.232	20
	1–5	1.5	27.9	16.1	6.4		.03	2.03	.103	20
	5–11	1.5	27.3	18.1	6.2		<.03	1.25	.063	20
	11–21		25.9	17.2	6.1		<.03	.71	.035	20
Tehama silt loam.	0–8	1.5	19.5	5.0	5.5		.24	.86	.090	10
	8–13	1.6	17.8	5.6	5.8		.13	.36	.056	6
	13–19	1.7	17.8	6.2	6.0		.13	.31	.051	6
	19–31	2.0	21.8	11.3	6.5		<.03	.25	.052	6
	31–42	2.0	20.8	10.0	7.0		.04	.12	.043	
	42–50	1.9	21.3	9.4	7.1		.07	.14	.040	
	50–58+	>2.0	17.4	14.6	7.1		.11	.13	.037	
Toomes very rocky silt loam.	0–1	1.3	27.0	16.6			.05	2.30	.18	13
	1–9	1.5	24.6	15.6			.02	.81	.074	11
	9–12	1.3	26.0	17.3			.03	.70	.064	11

See footnotes at end of table.

TABLE 5.—*Selected physical and chemical data on samples of representative soils of Tehama County, Calif.*—Continued

Soil	Depth	Bulk density [1]	Moisture equivalent [2]	Moisture held at tension of 15 atmospheres	pH [3]	$CaCO_3$ equivalent [4]	Phosphate [5]	Organic carbon	Organic nitrogen	Carbon-nitrogen ratio
	Inches	*Gm./cc.*	*Percent*	*Percent*		*Percent*	*P.p.m.*	*Percent*	*Percent*	
Tuscan loam.	0–3	1. 6	22. 3	10. 7	6. 1		0. 05	1. 08	0. 115	9
	3–7	1. 8	21. 2	11. 5	6. 3		<. 03	. 50	. 044	11
	7–12	1. 7	21. 2	12. 1	6. 5		<. 03	. 43	. 040	11
	12–18	1. 6	26. 2	16. 7	6. 5		<. 03	. 35	. 039	9
Tyson gravelly sandy loam.	1–0				5. 9			28. 00	1. 211	23
	0–5	1. 1	39. 1	22. 8	6. 6		2. 07	8. 26	. 519	16
	5–18	1. 3	27. 1	10. 3	5. 9		. 38	2. 24	. 171	13
Vina loam.	0–6	1. 5	25. 0	10. 5	7. 0		3. 76	2. 27	. 167	14
	6–11	1. 6	22. 5	9. 7	6. 9		1. 56	1. 25	. 097	13
	11–22	1. 3	22. 5	9. 5	6. 8		. 54	. 85	. 058	15
	22–36	1. 3	23. 8	9. 9	6. 7		. 28	. 66	. 047	14
	36–66	1. 4	26. 9	8. 1	7. 3		. 18	. 35	. 021	17
Windy gravelly sandy loam.	2–0				5. 2			8. 00	1. 10	35
	0–2		27. 0	21. 6	5. 6		. 04	[10] 8. 00	. 446	[10] 18
	2–12		23. 7	18. 7	5. 6		<. 02	[10] 4. 37	. 245	[10] 18
	12–25		23. 7	15. 9	5. 9		<. 02	[10] 2. 93	. 150	[10] 20
	25–45		25. 4	14. 1	5. 3		<. 02	1. 13	. 077	15
Windy stony sandy loam.	0–3	>1. 0			5. 6		. 05	[10] . 2	. 340	30
	3–8		28. 2	22. 9	5. 5		<. 02	[10] 3. 90	. 165	24
	8–15	1. 1	29. 7	21. 8	5. 3		<. 02	[10] 1. 56	. 079	20
	15–29		32. 9	23. 5	4. 9		<. 02	[10] . 94	. 040	24
	29+	[11]								
Yollabolly very rocky loam.	1–0				4. 9			39. 2	. 722	54
	0–4		16. 6	5. 7	5. 6		. 26	1. 68	. 104	16
	4–10		16. 2	6. 7	5. 3		. 30	. 92	. 079	12
Yolo loam.	0–11	1. 5	23. 8	9. 7	6. 7		. 48	1. 29	. 118	11
	11–34	1. 6	23. 6	9. 9	7. 1	0. 10	. 26	. 86	. 086	10
	34–68	1. 5	20. 1	8. 6	7. 7	. 12	. 15	. 33	. 040	8
	68–80+		3. 8			. 13	. 14			
Zamora silt loam.	0–1	>1. 3	26. 3	11. 0	6. 7		5. 17	[10] 2. 60	. 224	12
	1–10	<1. 5	25. 9	10. 9	6. 8		4. 75	2. 15	. 190	11
	10–18	>1. 6	24. 8	11. 9	7. 0		1. 14	1. 39	. 111	13
	18–34	<1. 6	24. 4	12. 9	7. 0		1. 12	. 88	. 081	11
	34–47	1. 5	24. 8	12. 9	7. 1		1. 04	. 68	. 068	10
	47–78+		23. 0	11. 0				. 22		

[1] Determined by paraffin coating of dry clods.
[2] Determined by centrifuge.
[3] Determined by glass electrode method, on saturation paste.
[4] Determined by CO_2 gas solution.
[5] Determined by water soluble phosphate method.
[6] Hardpan.
[7] Water standing on sample after centrifugation.
[8] Siltstone.
[9] Rhyolitic tuff bedrock.
[10] Charcoal present.
[11] Bedrock.

Redding, 32 miles north of Red Bluff, and a State college at Chico, 42 miles south of Red Bluff. Many denominations have one or more churches in the county.

Many recreational activities are available in the county. Trout fishing is the major sport on many of the streams, and fishing for salmon and steelhead is available on the Sacramento River. In the foothills and mountainous areas, deer hunting is popular. Other game hunted in the county are geese, duck, pheasant, quail, dove, and black bear.

Excellent camping areas are available in the mountains. Many of these are in the Lassen National Park, which extends into the northeast corner of the county. Winter sports are also available in the Lassen National Park.

Climate [23]

The climate of Tehama County is influenced by the topography of the county. Mountainous areas at the eastern and western sides of the county receive large amounts of precipitation, but the valleys receive only moderate amounts. At the lower elevations summers are hot and winters are cool, but at the higher elevations summers are warm and winters are cold.

The direction of wind at low elevations is influenced by the Sacramento Valley, which runs in a north to south direction. At higher elevations, however, wind movement

[23] By C. ROBERT ELFORD, State climatologist for California, U.S. Weather Bureau, Dept. of Commerce.

conforms more closely to the free flow of air over northern California.

Temperature.—The average annual temperature ranges from about 63°F. in the Red Bluff area to the lower 40's at an elevation of about 5,000 feet at the extreme eastern end of the county. At higher elevations, it is even colder. Records of temperatures in the mountains in the western part of the county are not available, but it is likely that the annual average temperature for this area is in the middle and upper 50's.

Summers in Tehama County are generally hot. An extreme of 100° or higher has been recorded in most parts of the county, and 120° was recorded near the southern border of Tehama County. The daily maximum temperature in July is nearly 100° at lower elevations and in the 80's and 90's in the mountainous areas. At Red Bluff there are, on the average, 98 days a year when the maximum temperature reaches 90° or higher.

The daily minimum temperature in January is in the upper 30's in the Sacramento Valley and in the middle and lower 20's in the mountains at either side of the county. The daily minimum temperature is generally somewhat below freezing in the valley, and it drops to well below zero in the mountains. At Red Bluff an average of 17 days a year have a temperature of 32° or colder.

In protected areas on the valley floor, the last 32° temperature in spring generally comes during the last week of February or the first week of March. The first freezing temperature in fall can be expected about the end of November or early in December. The growing season therefore ranges from 270 to 280 days. In most orchard areas, however, freezing temperature occurs occasionally in March or April and sometimes in May. The average date of the last 32° temperature in orchard areas over a period of 26 years is April 2, and the first in fall is about November 21.

In the higher mountains the last freezing temperature occurs as late as the middle or the end of June, and the first in fall is in the latter part of August. Here the growing season for frost-sensitive crops is only about 70 days.

Precipitation.—The heaviest rainfall in Tehama County is along the western and eastern edges of the county. Complete records are not available for this area, but 60 to 70 inches of precipitation falls in these areas each year. The amount of precipitation received decreases with decrease in elevation. It is less than 25 inches a year in areas below 1,000 feet and less than 20 inches in the south-central part of the county near the Sacramento River.

Table 6 shows the frequency with which various annual precipitation totals can be expected at representative stations in or near Tehama County. It shows, for example, that at Red Bluff, where the annual total averages 21.57 inches, a total of more than 23 inches can be expected 1 year out of 2, and a total of more than 15 inches can be expected 9 years out of 10. The totals in the table are tabulated to the nearest whole inch.

Most of the precipitation comes in winter. Little rain falls during July and August. In December and January, however, precipitation of 3 or 4 inches a month occurs at low elevations, and as much as 10 to 12 inches falls in places at higher elevations. In wet years substantially greater amounts are likely to be recorded.

Thundershowers are generally of short duration but occasionally bring rainfall of high intensity. Such storms come during any month of the year but are most frequent in May and June. In winter thunderstorms sometimes bring rainfall of longer duration, especially in mountainous areas.

At Red Bluff thundershowers occur on an average of about 5 days a year, and on about 70 days each year rainfall of 0.01 inch or more occurs. It is estimated that at least once in every 2 years a 1-hour rainfall amounting to 0.50 inch can be expected in the southwestern part of the county and 0.80 inch in the eastern part of the county. Comparable figures for a 24-hour period are 2.50 inches in the southwestern part of the county and 4.50 inches in the eastern part. It is also estimated that at least once every hundred years, a 1-hour precipitation of 1.25 inches in the southwestern part of the county and 2.00 inches in the eastern part is possible. Comparable figures for a 24-hour period increase the totals to 5.25 inches and 10.00 inches, respectively.

Snowfall within the county is roughly proportional to the elevation. Near the line of elevations of 1,000 feet, about 5 inches of snow is received annually, but the amount of snow received at lower elevations is less. At the 3,000-foot level, approximately 50 inches of snow is received, and at about 5,000 feet many areas receive 100 inches or more of snow annually. Some of the heaviest accumulations of snow in the State are in the Lassen Park area. Here, just outside the northeastern corner of the county, in late winter from 100 to 250 inches of snow generally accumulates in some areas, and in a few areas the accumulation is even deeper.

Wind.—At Red Bluff, which is representative of conditions at lower elevations in Tehama County, the average

TABLE 6.—*Probable frequency of more than specified amounts of annual precipitation at representative weather stations*

Station	Elevation	Average annual precipitation	1 out of 20 years	1 out of 10 years	1 out of 4 years	1 out of 3 years	1 out of 2 years	2 out of 3 years	3 out of 4 years	9 out of 10 years	19 out of 20 years
	Feet	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*
Coleman Fish Hatchery	420	24.98	34	31	27	26	23	20	19	16	14
Corning	280	21.16	33	30	25	23	20	18	17	13	12
Mineral	4,850	51.15	72	67	58	54	49	43	41	37	31
Paskenta Ranger Station	760	23.85	39	35	29	27	23	19	18	14	12
Red Bluff	340	21.57	37	33	28	26	23	20	18	15	13
Rosewood	870	27.46	43	39	33	31	27	23	21	17	15

windspeed recorded for a period of 66 years is about 6 to 8 miles per hour. The highest winds are generally in spring. Prevailing winds are from the northwest and southeast along the valley floor. In general, northwesterly winds prevail in summer and southeasterly winds in winter.

A wind of 63 miles per hour from the southeast is the fastest wind recorded at Red Bluff for a period of 35 years, but gusts of 80 miles per hour have occurred. Winds of more than 50 and 60 miles per hour have been observed in each of the months from October through March, except November, but in summer the fastest winds are about 20 miles per hour less.

It is estimated that windspeeds of 85 or 90 miles per hour are possible within the county at least once every 50 years.

In summer winds in the higher areas of the east side of Tehama County are mostly from the southwest, though northeasterly winds develop in many areas during the night. Little information is available for mountain locations in the western part of the county, but it is likely that most of the winds in this area are from the southwest and west. Windspeed data are lacking for higher elevations, but it is likely that exposed locations would receive somewhat more wind than areas in the Sacramento Valley. Areas that are sheltered by surrounding terrain would probably receive considerably less wind.

During February and March cold north winds occasionally blow across the county. These winds sometimes cause cold temperatures and also damage trees and buildings. North winds also develop in summer. These winds are generally very dry and deplete the soil and plants of moisture. Then the risk of fire in areas of grassland and forest is critical.

Sunshine.—From April through October the sun shines more than 75 percent of the time between sunrise and sunset. In July, August, and September the sun is visible more than 90 percent of the time, but in winter it is visible about 50 percent of the time. On the average, there are about 177 clear days, 71 partly cloudy days, and 117 cloudy days annually. On 9 days a year there is heavy fog.

Relative humidity.—In the valley the relative humidity on the average is less than 20 percent on summer afternoons and occasionally is less than 5 percent. At night, the humidity in summer averages about 50 percent. In winter, however, the relative humidity on the average remains around 60 to 80 percent throughout the 24 hours.

Water for Irrigation [21]

Irrigation started early in the history of Tehama County. A map made of Peter Lassen's Spanish Land Grant, Rancho Bosque, between 1847 and 1852 shows a gristmill operated by waterpower. Below the mill is a "water field," thought to be the start of irrigation in Tehama County.

Sources of irrigation water.—Both surface and underground water are important to irrigated agriculture in Tehama County. Deep wells that tap the underground aquifers now furnish about 60 percent of the total water required for irrigation. The balance is water diverted from streams (*5*). In 1959, according to the census of agriculture, a total of 57,717 acres was irrigated on 1,164 farms. The acreage irrigated has steadily increased since 1940. Crops were harvested from 31,680 acres, and the rest was mainly in pasture. Orchard crops of various kinds made up 12,963 acres of the cropland. Other crops grown were corn, sorghum, small grains, and hay crops.

Most of the land that can be supplied water by diversion of streams is now being irrigated. Farmers depending on irrigation water from streams are likely to be short of water during dry years; yet in years of high rainfall, some streams flood and damage crops. There is therefore need for developing storage dams on some streams in the county. A new canal, the Red Bluff-Corning Canal, has been developed on the west side of the Sacramento River. Water pumped from the Sacramento River provides water for about 30,000 acres. Most of the surface water otherwise diverted from streams is distributed by irrigation districts or by water companies that are mutually owned. The principal irrigation water service agencies in Tehama County in 1960, the source of water, and the acreage irrigated are shown in table 7.

TABLE 7.—*Principal irrigation water service agencies in Tehama County in 1960, sources of water, and acreage irrigated*

Name	Source of water	Acreage [1] irrigated
Anderson-Cottonwood Irrigation District.	Sacramento River	1,730
Bend Water Users (Mutual)	Battle Creek	600
Corning Irrigation Company (Mutual).	Thomes Creek	400
Deer Creek Irrigation District	Deer Creek	1,800
El Camino Irrigation District	Wells	4,500
Los Molinos Mutual Water Company.	Antelope and Mill Creeks.	10,586
Stanford Vina Ranch Irrigation Company.	Deer Creek	5,200
		24,816

[1] Figures from managers of each organization.

Most water for land brought under irrigation in the late 1940's and early 1950's is from wells. The wells range from less than 30 feet to nearly 1,000 feet in depth, depending on the location. The distance water must be lifted varies from a few feet to more than 100 feet. Most of the wells are privately owned, though the El Camino Irrigation District obtains its water supply from wells. The underground water table fluctuates from year to year, and there appears to be a drop of about 1 foot or more a year. Also the level of the water declines markedly from spring to fall as the pumping season advances. The rate of decline and recovery varies from place to place.

The quality of most of the surface and underground water in Tehama County is excellent, except for the high boron content in some wells in the Salt Creek drainage area. A high boron content is also a problem in a few other places on the east side of the Sacramento River.

From 1938 to 1954, farmers and stockmen constructed 554 stock ponds and reservoirs in Tehama County. They have an estimated storage of 3,349 acre-feet; and in areas

[21] By LELAND FREY, farm advisor, University of California.

of grassland, ponds and reservoirs are used to store water for stock. Some farmers have constructed reservoirs to improve the efficiency of their irrigation systems.

Agriculture

In this section the agriculture of the county is discussed. The statistics used are from reports of the U.S. Census Bureau unless otherwise stated.

Land use.—About 50 percent of the acreage in Tehama County is used for pasture and range; only about 9 percent is cultivated. Brushland accounts for 16 percent of the acreage. It consists mostly of chaparral but includes some hardwoods and conifers that have no commercial value. Forests of commercial conifers make up about 23 percent of the county, and nearly 50 percent of these are federally owned. About 0.5 percent of the area is in urban uses, and 1.5 percent is water.

The cultivated areas are mostly on alluvial flood plains and terraces where the deepest and most fertile soils are. Much of the intensively cultivated land is irrigated and used for orchards, row crops, and field crops. Dryfarmed grain, which is less intensively cultivated, is grown on gently sloping foothills and terraces in the western part of the county.

Areas in pasture and range lie to the east and west of the cultivated areas. They include foothills that have a cover of grass or of grass and oak. Sheep and cattle graze the areas from November to May; only a few areas are used the year round.

Timber is harvested from the commercial forest lands, which are at elevations of more than 3,500 feet on the east and west sides of the county. Between areas of grassland and the forests are areas of brushland. Here the vegetation is chaparral or shrubs that have little use other than to provide cover and food for wildlife and protection for the watershed. Most of the commercial forest land, and part of the land in brush, is within the Lassen, Trinity, and Mendocino National Forests.

Crops.—The main crops in the county are alfalfa, barley, grain sorghum, irrigated pasture, almonds, olives, prunes, and walnuts. A fairly small acreage of apples, peaches, oats, wheat, beans, strawberry plants, corn, sugarbeets, safflower, melons, and pumpkins is also grown. The acreage of these crops has fluctuated from time to time. Yields of most crops are good, but problems of marketing and other factors keep the acreages small.

Fairly large acreages of figs, grapes, pears, apricots, and oranges have been grown in the county at some time. Yields of these crops were also good, but they are no longer grown because of poor varieties, poor marketing conditions, or other management problems.

The acreage of the principal crops in Tehama County for stated years is shown in table 8.

Livestock.—The sale of livestock is the principal source of income on farms in the county. Sheep and beef cattle are the main kinds of livestock raised but dairy cattle, swine, and poultry are also raised. The kinds of livestock and their number in stated years are given in table 9.

TABLE 8.—*Acreage of principal crops in Tehama County for stated years* [1]

Crop	Year		
	1939	1949	1959
Alfalfa	5, 514	6, 429	5, 629
Barley	20, 872	24, 574	20, 954
Grain sorghum	1, 455	1, 068	2, 600
Irrigated pasture	8, 960	17, 100	26, 037
Almonds	1, 866	2, 101	1, 596
Olives	2, 233	3, 571	4, 385
Prunes	2, 207	2, 064	4, 111
Walnuts	445	1, 819	3, 710

[1] Figures are from the U.S. Bureau of the Census and the California Crop Reporting Service.

TABLE 9.—*Number of livestock in Tehama County in stated years*

	1939	1949	1959
Cattle and calves	[1] 29, 953	45, 804	59, 236
Sheep and lambs	[2] 138, 766	107, 385	98, 353
Goats and kids	[3] 7, 469	([4])	235
Swine	[3] 12, 574	12, 302	9, 805
Horses and mules	[1] 2, 775	2, 100	1, 796
Chickens	[3] 134, 388	[3] 110, 959	[3] 54, 700
Turkeys	[3] 14, 450	34, 547	43, 716

[1] More than 3 months old.
[2] More than 6 months old.
[3] More than 4 months old.
[4] Not reported.

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Glossary

Acre-foot. The quantity of water, soil, or other material that will cover 1 acre to a depth of 1 foot.

Aggregate, soil. Many fine particles held in a single mass or cluster, such as a clod, crumb, block, or prism.

Alluvium. Fine material, such as gravel, sand, silt, or clay, that has been deposited on land by streams.

Available moisture holding capacity. The differences between the amount of water in a soil at field capacity and the amount in the same soil at the permanent wilting point. Commonly expressed as inches of water per inch depth of soil.

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.

Claypan. A compact horizon, or layer, rich in clay and separated more or less abruptly from the overlying horizon. A claypan is commonly very hard when dry and plastic and sticky when wet.

Concretions. Local concentrations of certain chemical compounds such as calcium carbonate or compounds of iron, that form hard grains or nodules of mixed composition and are of various sizes, shapes, and colors.

Consistence. 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; will not hold together in a mass.

Friable. When moist, crushes easily under gentle to moderate 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; tends to stretch somewhat and pull apart, rather than 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. A *weakly cemented* mass is brittle and hard, but it can be broken in the hands. A *strongly cemented* mass is brittle; it is too hard to be broken in the hand but can easily be broken with a hammer. An *indurated* mass is very strongly cemented and brittle, does not soften under prolonged wetting, and a sharp blow with a hammer is required to break it.

Cover crops. Close-growing crops grown primarily to improve the soil and to protect it between periods of regular crop production.

Depth, effective rooting. The depth of soil material which plant roots can penetrate readily to obtain water and plant nutrients.

Drainage, natural. Refers to moisture conditions 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 drainage are recognized.

Excessively drained soils are commonly very porous and very rapidly permeable and have a low water-holding capacity.

Somewhat excessively drained soils are rapidly permeable and are free from mottling throughout their profile.

Well-drained soils are typically free from mottling, moderately permeable, and commonly of medium texture.

Moderately well drained soils commonly have a slowly permeable layer in or immediately beneath the lower subsoil. They have uniform color in the surface soil and in the upper subsoil and have mottling in the lower subsoil and in the substratum.

Imperfectly or somewhat poorly drained soils are wet for significant periods but not all the time, and many soils commonly have mottlings below 6 to 16 inches in the lower surface soil and in the upper subsoil.

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.

Fallow. Cropland left idle in order to restore productivity, mainly through accumulation of water, nutrients, or both. The soil ordinarily is tilled but not planted for at least one growing season, to control weeds and to aid in the decomposition of plant residues.

Fertility, soil. The quality that enables a soil to provide compounds, in adequate amounts and in proper balance, for the growth of specified plants, when other growth factors, such as moisture, light, temperature, and the physical condition (or tilth) of the soil, are favorable.

Flood plain. Nearly level land, next to a stream, that consists of sediment and is subject to flooding unless protected artificially.

Furrow irrigation. A method of using furrows to apply irrigation water to tree crops and row crops.

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.

Igneous rock. A rock produced by the cooling of melted mineral material. Examples: Granite, andesite, diorite, and basalt.

Leaching. The removal of soluble materials from soils or other material by percolating water.

Leveling (of land). The reshaping, or modification of the soil surface, to a planned grade to provide a more suitable surface for applying irrigation water and for proper drainage of the surface.

Lime. Chemically, lime is calcium oxide (CaO), but as the term is commonly used, it is also calcium carbonate ($CaCO_3$) and calcium hydroxide ($Ca(OH)_2$). Agricultural lime refers to ground limestone, hydrated lime, or burned lime, with or without magnesium minerals. Basic slag, oystershells, and marl also contain calcium.

Metamorphic rocks. Rocks of any origin that have been completely changed physically by pressure, heat, and movement. Such rocks are nearly always crystalline. Examples: Mica schist and serpentine.

Microrelief. Minor surface irregularities of the land, such as low mounds or shallow pits. Some of these are termed hogwallow microrelief.

Mottled. Irregularly marked with spots of different colors that vary in number and size.

Nutrient, plant. Any element taken in by a plant, essential to its growth and used by it in the elaboration of its food and tissue. Among the elements obtained from the soil are nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, zinc, and molybdenum. Plant nutrients obtained largely from the air and water are carbon, hydrogen, and oxygen.

Parent material. The horizon of weathered rock or partly weathered soil material from which soil has formed.

Percent slope. The gradient of any particular slope expressed as the difference in elevation in feet between two points 100 feet apart horizontally.

Permeability. The quality of a soil horizon that enables it to transmit water or air. Terms used to describe permeability are *very slow, slow, moderately slow, moderate, moderately rapid, rapid,* and *very rapid.*

pH. A numerical means for designating relatively weak acidity and alkalinity, as in soils and other biological systems. A pH value of 7.0 indicates precise neutrality; a higher value, alkalinity; and a lower value, acidity. See Reaction, soil.

Profile, soil. A vertical section of the soil through all its horizons and extending into the parent material. See Horizon, soil.

Reaction, soil. The degree of acidity or alkalinity of a soil expressed either in pH values or in words, as follows:

	pH		*pH*
Extremely acid	Below 4.5	Mildly alkaline	7.4 to 7.8
Very strongly acid	4.5 to 5.0	Moderately alkaline	7.9 to 8.4
Strongly acid	5.1 to 5.5	Strongly alkaline	8.5 to 9.0
Medium acid	5.6 to 6.0	Very strongly alkaline	9.1 and higher
Slightly acid	6.1 to 6.5		
Neutral	6.6 to 7.3		

Runoff. The rate at which water flows over the surface of the soil. Relative terms are *very rapid, rapid, medium, slow, very slow,* and *ponded.*

Sand. Individual fragments of rocks or minerals that have diameters ranging from 0.05 (0.002 inch) to 2.0 (0.079 inch) millimeters. Most sand grains consist of quartz, but they may be of any mineral composition. The term sand also is applied to a soil that contains 85 percent or more sand and not more than 10 percent clay.

Sedimentary rock. A rock composed of particles deposited from suspension or solution in water.

Silt. Mineral particles in a soil that range in diameter from 0.002 (0.000079 inch) to 0.05 (0.002 inch) millimeter. The term silt is also applied to a soil that contains 80 percent or more silt and less than 12 percent clay.

Slickensides. Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the base of a slip surface on a relatively steep slope; and in swelling clays, where there is marked change in moisture content.

Solum. The upper part of the soil profile, above the parent material, in which the processes of soil formation are active. The solum of mature soil includes the A and B horizons.

Sprinkler irrigation. Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Structure, soil. The arrangement of the primary soil particles into lumps, granules, or other aggregates. Structure is described by grade—*weak, moderate,* or *strong;* that is, the distinctness and durability of the aggregates. It is also described by the size of the aggregates—*very fine, fine, medium, coarse,* or *very coarse;* and by their shape—*platy, prismatic, columnar, blocky, granular,* or *crumb.* A soil is described as structureless if there are no observable aggregates. Structureless soils may be massive (coherent) or single grain (noncoherent).

Blocky, angular. Aggregates are shaped like blocks; they may have flat or rounded surfaces that join at sharp angles.

Blocky, subangular. Aggregates have some rounded and some flat surfaces; the upper sides are rounded.

Columnar. Aggregates are prismatic and are rounded at the top.

Crumb. Aggregates are generally soft, small, porous, and irregular, but tend toward a spherical shape.

Granular. Aggregates are roughly spherical and small. They may be either hard or soft but are generally more firm and less porous than crumb and are without the distinct faces of blocky structure.

Platy. Aggregates are flaky or platelike.

Prismatic. Aggregates have flat, vertical surfaces, and their height is greater than their width or depth.

Subsoil. Technically, the B horizon; roughly, the part of the soil profile commonly below plow depth and above the substratum.

Substratum. Any layer below the solum, either conforming (C or R) or unconforming.

Summer fallow. The tillage of uncropped land during the summer to control weeds and allow storage of moisture in the soil and the release of nutrients, particularly nitrate by microbial action. The practice is used primarily in semiarid regions, where the annual rainfall is not enough to produce a crop every year.

Surface soil. The upper part of the soil that is ordinarily moved in tillage, or its equivalent in uncultivated soil, about 5 to 8 inches. The plowed layer.

Terrace (geological). A level or gently undulating old alluvial plain bordering a stream valley, river, lake, or the sea. Elevation is intermediate between the flood plain and the upland.

Texture. The relative amounts of the various size classes of soil particles, such as sand, silt, and clay.

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.

Water table, perched. The upper surface of a body of free ground water that is separated from an underlying body of ground water by unsaturated material.

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program information (e.g., Braille, large print, audiotape, etc.), please contact USDA's TARGET Center at (202) 720-2600 (voice and TDD).

Supplemental Nutrition Assistance Program

For additional information dealing with Supplemental Nutrition Assistance Program (SNAP) issues, call either the USDA SNAP Hotline Number at (800) 221-5689, which is also in Spanish, or the State Information/Hotline Numbers (http://directives.sc.egov.usda.gov/33085.wba).

All Other Inquiries

For information not pertaining to civil rights, please refer to the listing of the USDA Agencies and Offices (http://directives.sc.egov.usda.gov/33086.wba).