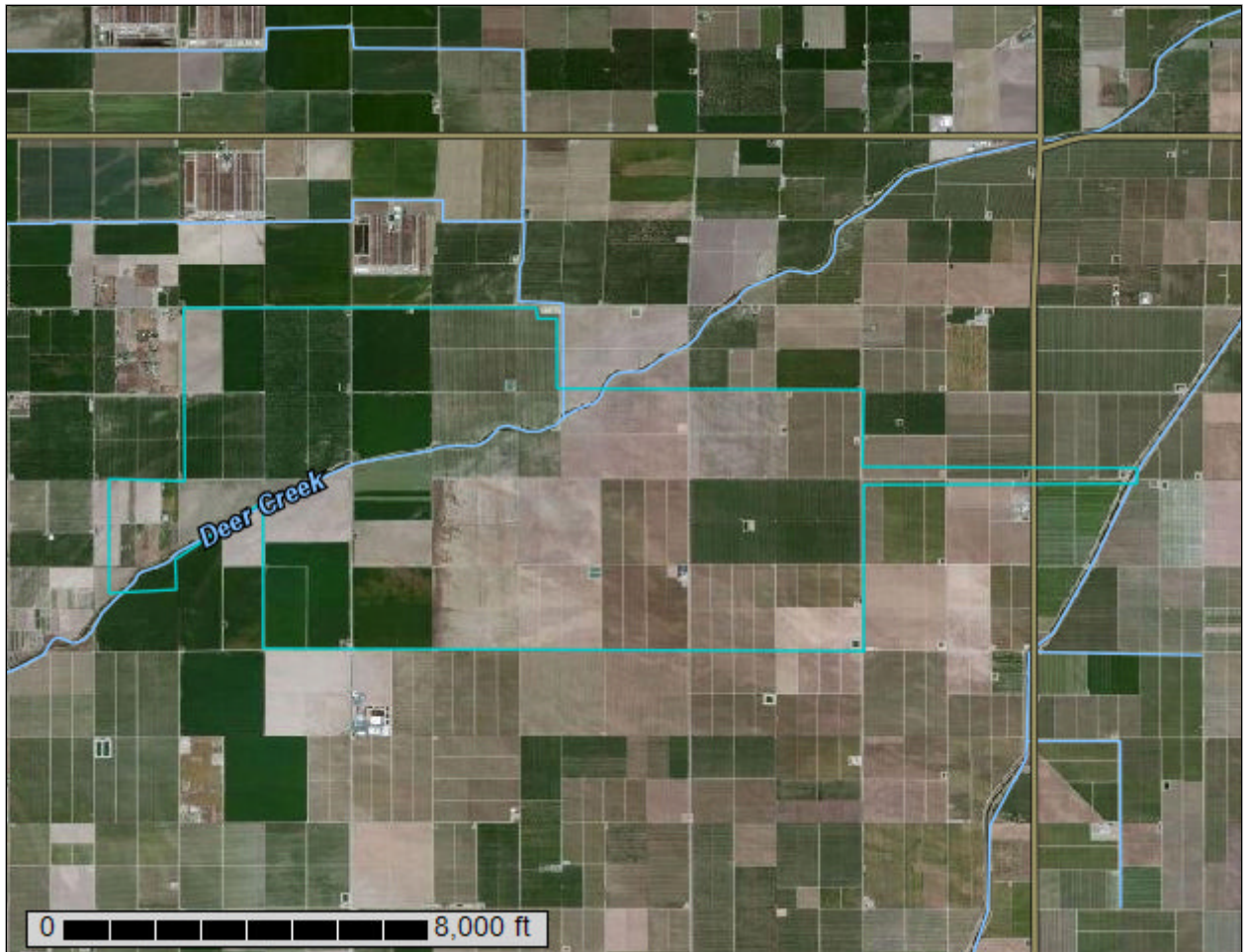


**Appendix F**  
**Custom NRCS Soils Report**



# Custom Soil Resource Report for Tulare County, Western Part, California





# Preface

---

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (<http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/>) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (<http://offices.sc.egov.usda.gov/locator/app?agency=nrcs>) or your NRCS State Soil Scientist ([http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2\\_053951](http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951)).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means

for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

# Contents

---

<b>Preface</b> .....	2
<b>How Soil Surveys Are Made</b> .....	5
<b>Soil Map</b> .....	7
Soil Map.....	8
Legend.....	9
Map Unit Legend.....	10
Map Unit Descriptions.....	10
Tulare County, Western Part, California.....	12
101—Akers-Akers, saline-Sodic, complex, 0 to 2 percent slopes.....	12
104—Biggriz-Biggriz, saline-Sodic, complex, 0 to 2 percent slopes.....	14
105—Calgro-Calgro, saline-Sodic, complex, 0 to 2 percent slopes.....	16
106—Centerville clay, 0 to 2 percent slopes.....	19
108—Colpien loam, 0 to 2 percent slopes.....	20
109—Crosscreek-Kai association, 0 to 2 percent slopes.....	22
114—Exeter loam, 0 to 2 percent slopes.....	24
116—Flamen loam, 0 to 2 percent slopes.....	25
124—Hanford sandy loam, 0 to 2 percent slopes.....	27
134—Riverwash.....	29
145—Water-perennial.....	29
<b>References</b> .....	30

# **How Soil Surveys Are Made**

---

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the



## Custom Soil Resource Report

individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

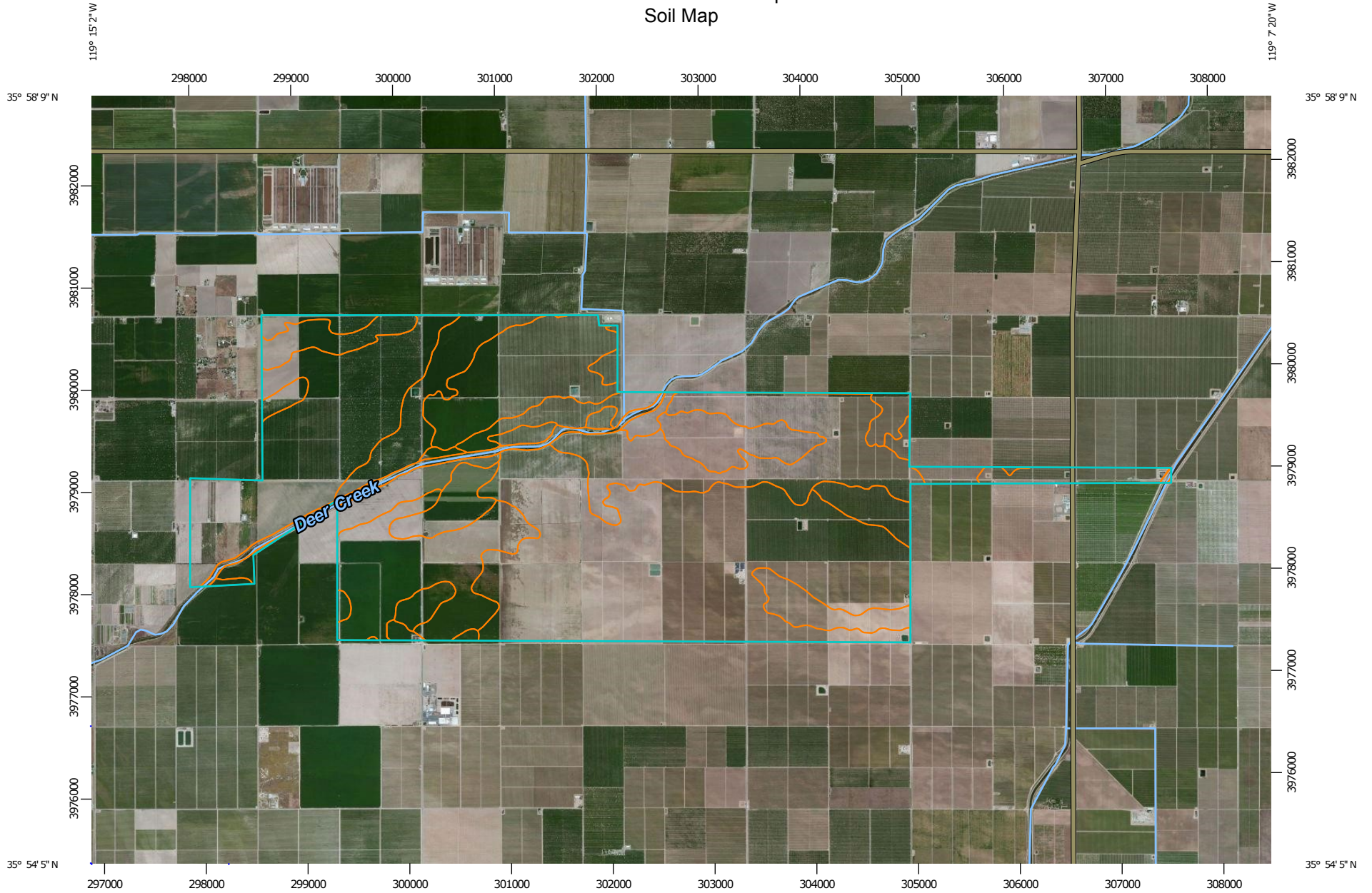
After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

# Soil Map

---

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

# Custom Soil Resource Report Soil Map



Map Scale: 1:53,000 if printed on A landscape (11" x 8.5") sheet.




Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 11N WGS84




### MAP LEGEND

**Area of Interest (AOI)**

 Area of Interest (AOI)




















**Soils**







 Soil Map Unit Polygons

 Soil Map Unit Lines


 Soil Map Unit Points

**Special Point Features**






-  Blowout
-  Borrow Pit
-  Clay Spot
-  Closed Depression
-  Gravel Pit
-  Gravelly Spot
-  Landfill
-  Lava Flow
-  Marsh or swamp
-  Mine or Quarry
-  Miscellaneous Water
-  Perennial Water
-  Rock Outcrop
-  Saline Spot
-  Sandy Spot
-  Severely Eroded Spot
-  Sinkhole
-  Slide or Slip
-  Sodic Spot

-  Spoil Area
-  Stony Spot
-  Very Stony Spot
-  Wet Spot
-  Other
-  Special Line Features


**Water Features**

 Streams and Canals

**Transportation**

-  Rails
-  Interstate Highways
-  US Routes
-  Major Roads
-  Local Roads

**Background**

 Aerial Photography

### MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service  
 Web Soil Survey URL: <http://websoilsurvey.nrcs.usda.gov>  
 Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Tulare County, Western Part, California  
 Survey Area Data: Version 10, Sep 12, 2016

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: May 5, 2010—May 7, 2010

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

## Map Unit Legend

Tulare County, Western Part, California (CA659)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
101	Akers-Akers, saline-Sodic, complex, 0 to 2 percent slopes	443.1	9.7%
104	Biggriz-Biggriz, saline-Sodic, complex, 0 to 2 percent slopes	390.5	8.6%
105	Calgro-Calgro, saline-Sodic, complex, 0 to 2 percent slopes	98.0	2.1%
106	Centerville clay, 0 to 2 percent slopes	182.8	4.0%
108	Colpien loam, 0 to 2 percent slopes	1,528.6	33.5%
109	Crosscreek-Kai association, 0 to 2 percent slopes	370.4	8.1%
114	Exeter loam, 0 to 2 percent slopes	114.3	2.5%
116	Flamen loam, 0 to 2 percent slopes	579.8	12.7%
124	Hanford sandy loam, 0 to 2 percent slopes	781.9	17.1%
134	Riverwash	69.3	1.5%
145	Water-perennial	2.1	0.0%
<b>Totals for Area of Interest</b>		<b>4,560.7</b>	<b>100.0%</b>

## Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a

## Custom Soil Resource Report

particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

## Tulare County, Western Part, California

### 101—Akers-Akers, saline-Sodic, complex, 0 to 2 percent slopes

#### Map Unit Setting

*National map unit symbol:* hp6z

*Elevation:* 230 to 350 feet

*Mean annual precipitation:* 8 to 12 inches

*Mean annual air temperature:* 63 to 64 degrees F

*Frost-free period:* 225 to 300 days

*Farmland classification:* Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season

#### Map Unit Composition

*Akers and similar soils:* 60 percent

*Akers, saline-sodic, and similar soils:* 25 percent

*Minor components:* 15 percent

*Estimates are based on observations, descriptions, and transects of the mapunit.*

#### Description of Akers

##### Setting

*Landform:* Fan remnants

*Landform position (two-dimensional):* Shoulder

*Landform position (three-dimensional):* Side slope

*Down-slope shape:* Linear

*Across-slope shape:* Linear

*Parent material:* Alluvium derived from granitic rock sources

##### Typical profile

*Ap - 0 to 16 inches:* fine sandy loam

*Bk - 16 to 60 inches:* fine sandy loam

##### Properties and qualities

*Slope:* 0 to 2 percent

*Depth to restrictive feature:* More than 80 inches

*Natural drainage class:* Well drained

*Runoff class:* Negligible

*Capacity of the most limiting layer to transmit water (Ksat):* Moderately high to high  
(0.60 to 2.00 in/hr)

*Depth to water table:* More than 80 inches

*Frequency of flooding:* Very rare

*Frequency of ponding:* None

*Calcium carbonate, maximum in profile:* 10 percent

*Gypsum, maximum in profile:* 2 percent

*Salinity, maximum in profile:* Nonsaline to slightly saline (0.0 to 4.0 mmhos/cm)

*Sodium adsorption ratio, maximum in profile:* 12.0

*Available water storage in profile:* High (about 9.7 inches)

##### Interpretive groups

*Land capability classification (irrigated):* 1

*Land capability classification (nonirrigated):* 4c

*Hydrologic Soil Group:* B

*Hydric soil rating:* No

## Description of Akers, Saline-sodic

### Setting

*Landform:* Fan remnants  
*Landform position (two-dimensional):* Shoulder  
*Landform position (three-dimensional):* Side slope  
*Down-slope shape:* Linear  
*Across-slope shape:* Linear  
*Parent material:* Alluvium derived from granitic rock sources

### Typical profile

*Ap - 0 to 15 inches:* fine sandy loam  
*Bk - 15 to 60 inches:* fine sandy loam

### Properties and qualities

*Slope:* 0 to 2 percent  
*Depth to restrictive feature:* More than 80 inches  
*Natural drainage class:* Well drained  
*Runoff class:* Negligible  
*Capacity of the most limiting layer to transmit water (Ksat):* Moderately high (0.20 to 0.60 in/hr)  
*Depth to water table:* More than 80 inches  
*Frequency of flooding:* Very rare  
*Frequency of ponding:* None  
*Calcium carbonate, maximum in profile:* 10 percent  
*Gypsum, maximum in profile:* 2 percent  
*Salinity, maximum in profile:* Slightly saline to moderately saline (4.0 to 8.0 mmhos/cm)  
*Sodium adsorption ratio, maximum in profile:* 30.0  
*Available water storage in profile:* High (about 9.1 inches)

### Interpretive groups

*Land capability classification (irrigated):* 2s  
*Land capability classification (nonirrigated):* 4s  
*Hydrologic Soil Group:* C  
*Hydric soil rating:* No

## Minor Components

### Tujunga

*Percent of map unit:* 3 percent  
*Landform:* Flood plains  
*Hydric soil rating:* No

### Colpien

*Percent of map unit:* 3 percent  
*Landform:* Fan remnants  
*Hydric soil rating:* No

### Yetter

*Percent of map unit:* 2 percent  
*Landform:* Flood plains, alluvial fans  
*Hydric soil rating:* No

### Tagus

*Percent of map unit:* 2 percent  
*Landform:* Fan remnants



## Custom Soil Resource Report

*Hydric soil rating:* No

### **Grangeville**

*Percent of map unit:* 2 percent

*Landform:* Alluvial fans, flood plains

*Hydric soil rating:* No

### **Hanford**

*Percent of map unit:* 2 percent

*Landform:* Alluvial fans, flood plains

*Hydric soil rating:* No

### **Unnamed, ponded**

*Percent of map unit:* 1 percent

*Landform:* Depressions

*Hydric soil rating:* Yes

## **104—Biggriz-Biggriz, saline-Sodic, complex, 0 to 2 percent slopes**

### **Map Unit Setting**

*National map unit symbol:* hp46

*Elevation:* 190 to 270 feet

*Mean annual precipitation:* 6 to 8 inches

*Mean annual air temperature:* 63 to 66 degrees F

*Frost-free period:* 250 to 300 days

*Farmland classification:* Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season

### **Map Unit Composition**

*Biggriz and similar soils:* 55 percent

*Biggriz, saline-sodic, and similar soils:* 30 percent

*Minor components:* 15 percent

*Estimates are based on observations, descriptions, and transects of the mapunit.*

### **Description of Biggriz**

#### **Setting**

*Landform:* Fan remnants

*Landform position (two-dimensional):* Shoulder

*Landform position (three-dimensional):* Side slope

*Down-slope shape:* Linear

*Across-slope shape:* Linear

*Parent material:* Alluvium derived from granitic rock sources

#### **Typical profile**

*Ap - 0 to 14 inches:* loam

*Btkg - 14 to 50 inches:* loam

*Btkng - 50 to 65 inches:* sandy loam

#### **Properties and qualities**

*Slope:* 0 to 2 percent

## Custom Soil Resource Report

*Depth to restrictive feature:* More than 80 inches  
*Natural drainage class:* Somewhat poorly drained  
*Runoff class:* Negligible  
*Capacity of the most limiting layer to transmit water (Ksat):* Moderately high (0.20 to 0.60 in/hr)  
*Depth to water table:* More than 80 inches  
*Frequency of flooding:* Rare  
*Frequency of ponding:* None  
*Calcium carbonate, maximum in profile:* 10 percent  
*Gypsum, maximum in profile:* 1 percent  
*Salinity, maximum in profile:* Nonsaline to slightly saline (0.0 to 4.0 mmhos/cm)  
*Sodium adsorption ratio, maximum in profile:* 13.0  
*Available water storage in profile:* High (about 9.3 inches)

### Interpretive groups

*Land capability classification (irrigated):* 2s  
*Land capability classification (nonirrigated):* 6s  
*Hydrologic Soil Group:* C  
*Hydric soil rating:* No

### Description of Biggriz, Saline-sodic

#### Setting

*Landform:* Fan remnants  
*Landform position (two-dimensional):* Shoulder  
*Landform position (three-dimensional):* Side slope  
*Down-slope shape:* Linear  
*Across-slope shape:* Linear  
*Parent material:* Alluvium derived from granitic rock sources

#### Typical profile

*Ap - 0 to 14 inches:* loam  
*Btkg - 14 to 50 inches:* loam  
*Btkng - 50 to 65 inches:* sandy loam

#### Properties and qualities

*Slope:* 0 to 2 percent  
*Depth to restrictive feature:* More than 80 inches  
*Natural drainage class:* Somewhat poorly drained  
*Runoff class:* Negligible  
*Capacity of the most limiting layer to transmit water (Ksat):* Moderately high (0.20 to 0.60 in/hr)  
*Depth to water table:* More than 80 inches  
*Frequency of flooding:* Rare  
*Frequency of ponding:* None  
*Calcium carbonate, maximum in profile:* 10 percent  
*Gypsum, maximum in profile:* 1 percent  
*Salinity, maximum in profile:* Slightly saline to moderately saline (4.0 to 8.0 mmhos/cm)  
*Sodium adsorption ratio, maximum in profile:* 200.0  
*Available water storage in profile:* Moderate (about 7.2 inches)

#### Interpretive groups

*Land capability classification (irrigated):* 3s  
*Land capability classification (nonirrigated):* 7s  
*Hydrologic Soil Group:* C  
*Hydric soil rating:* No

**Minor Components**

**Nord**

*Percent of map unit:* 3 percent  
*Landform:* Alluvial fans, flood plains  
*Hydric soil rating:* No

**Gambogy**

*Percent of map unit:* 3 percent  
*Landform:* Alluvial fans, flood plains  
*Hydric soil rating:* No

**Tujunga**

*Percent of map unit:* 2 percent  
*Landform:* Flood plains  
*Hydric soil rating:* No

**Lethent**

*Percent of map unit:* 2 percent  
*Landform:* Fan remnants  
*Hydric soil rating:* No

**Colpien**

*Percent of map unit:* 2 percent  
*Landform:* Fan remnants  
*Hydric soil rating:* No

**Garces**

*Percent of map unit:* 2 percent  
*Landform:* Fan remnants  
*Hydric soil rating:* No

**Unnamed, ponded**

*Percent of map unit:* 1 percent  
*Landform:* Depressions  
*Hydric soil rating:* Yes

**105—Calgro-Calgro, saline-Sodic, complex, 0 to 2 percent slopes**

**Map Unit Setting**

*National map unit symbol:* hp47  
*Elevation:* 250 to 480 feet  
*Mean annual precipitation:* 8 to 12 inches  
*Mean annual air temperature:* 62 to 65 degrees F  
*Frost-free period:* 250 to 300 days  
*Farmland classification:* Farmland of statewide importance

**Map Unit Composition**

*Calgro and similar soils:* 60 percent  
*Calgro, saline-sodic, and similar soils:* 25 percent

## Custom Soil Resource Report

*Minor components: 15 percent*

*Estimates are based on observations, descriptions, and transects of the mapunit.*

### Description of Calgro

#### Setting

*Landform: Fan remnants*

*Landform position (two-dimensional): Shoulder*

*Landform position (three-dimensional): Side slope*

*Down-slope shape: Linear*

*Across-slope shape: Linear*

*Parent material: Alluvium derived from granite*

#### Typical profile

*Ap - 0 to 7 inches: sandy loam*

*Bw - 7 to 25 inches: sandy loam*

*2Bkqm - 25 to 33 inches: cemented*

*2Bkq - 33 to 53 inches: gravelly loamy sand*

*3Bkqm - 53 to 60 inches: cemented*

#### Properties and qualities

*Slope: 0 to 2 percent*

*Depth to restrictive feature: 20 to 40 inches to duripan*

*Natural drainage class: Moderately well drained*

*Runoff class: Low*

*Capacity of the most limiting layer to transmit water (Ksat): Low to moderately high  
(0.01 to 0.20 in/hr)*

*Depth to water table: More than 80 inches*

*Frequency of flooding: Very rare*

*Frequency of ponding: None*

*Calcium carbonate, maximum in profile: 2 percent*

*Salinity, maximum in profile: Nonsaline to slightly saline (0.0 to 4.0 mmhos/cm)*

*Sodium adsorption ratio, maximum in profile: 12.0*

*Available water storage in profile: Low (about 3.6 inches)*

#### Interpretive groups

*Land capability classification (irrigated): 3s*

*Land capability classification (nonirrigated): 6s*

*Hydrologic Soil Group: C*

*Hydric soil rating: No*

### Description of Calgro, Saline-sodic

#### Setting

*Landform: Fan remnants*

*Landform position (two-dimensional): Shoulder*

*Landform position (three-dimensional): Side slope*

*Down-slope shape: Linear*

*Across-slope shape: Linear*

*Parent material: Alluvium derived from granite*

#### Typical profile

*Ap - 0 to 8 inches: sandy loam*

*Bw - 8 to 24 inches: sandy loam*

*2Bkqm - 24 to 33 inches: cemented*

*2Bkq - 33 to 52 inches: gravelly loamy sand*

*3Bkqm - 52 to 60 inches: cemented*

## Custom Soil Resource Report

### Properties and qualities

*Slope:* 0 to 2 percent

*Depth to restrictive feature:* 20 to 40 inches to duripan

*Natural drainage class:* Moderately well drained

*Runoff class:* Low

*Capacity of the most limiting layer to transmit water (Ksat):* Low to moderately high  
(0.01 to 0.20 in/hr)

*Depth to water table:* More than 80 inches

*Frequency of flooding:* Very rare

*Frequency of ponding:* None

*Calcium carbonate, maximum in profile:* 4 percent

*Salinity, maximum in profile:* Slightly saline to strongly saline (4.0 to 16.0 mmhos/cm)

*Sodium adsorption ratio, maximum in profile:* 100.0

*Available water storage in profile:* Very low (about 3.0 inches)

### Interpretive groups

*Land capability classification (irrigated):* 4s

*Land capability classification (nonirrigated):* 7s

*Hydrologic Soil Group:* C

*Hydric soil rating:* No

### Minor Components

#### Colpien

*Percent of map unit:* 5 percent

*Landform:* Fan remnants

*Hydric soil rating:* No

#### Grangeville

*Percent of map unit:* 4 percent

*Landform:* Flood plains, alluvial fans

*Hydric soil rating:* No

#### Tujung

*Percent of map unit:* 3 percent

*Landform:* Flood plains

*Hydric soil rating:* No

#### Exeter

*Percent of map unit:* 2 percent

*Landform:* Fan remnants

*Hydric soil rating:* No

#### Unnamed, ponded

*Percent of map unit:* 1 percent

*Landform:* Depressions

*Hydric soil rating:* Yes

## 106—Centerville clay, 0 to 2 percent slopes

### Map Unit Setting

*National map unit symbol:* hp48

*Elevation:* 300 to 600 feet

*Mean annual precipitation:* 9 to 12 inches

*Mean annual air temperature:* 63 to 64 degrees F

*Frost-free period:* 250 to 300 days

*Farmland classification:* Farmland of statewide importance

### Map Unit Composition

*Centerville, 0-2% slopes, and similar soils:* 90 percent

*Minor components:* 10 percent

*Estimates are based on observations, descriptions, and transects of the mapunit.*

### Description of Centerville, 0-2% Slopes

#### Setting

*Landform:* Fan remnants

*Landform position (two-dimensional):* Shoulder

*Landform position (three-dimensional):* Side slope

*Down-slope shape:* Linear

*Across-slope shape:* Linear

*Parent material:* Alluvium derived from granitic rock sources

#### Typical profile

*A - 0 to 7 inches:* clay

*Bss - 7 to 48 inches:* sandy clay

*Bdtkss - 48 to 60 inches:* stratified gravelly sandy clay loam to gravelly clay

#### Properties and qualities

*Slope:* 0 to 2 percent

*Depth to restrictive feature:* 48 to 60 inches to densic material

*Natural drainage class:* Well drained

*Runoff class:* Negligible

*Capacity of the most limiting layer to transmit water (Ksat):* Moderately low to moderately high (0.06 to 0.20 in/hr)

*Depth to water table:* More than 80 inches

*Frequency of flooding:* Very rare

*Frequency of ponding:* None

*Calcium carbonate, maximum in profile:* 5 percent

*Salinity, maximum in profile:* Nonsaline to moderately saline (0.0 to 8.0 mmhos/cm)

*Sodium adsorption ratio, maximum in profile:* 40.0

*Available water storage in profile:* Moderate (about 6.7 inches)

#### Interpretive groups

*Land capability classification (irrigated):* 3s

*Land capability classification (nonirrigated):* 4s

*Hydrologic Soil Group:* C

*Hydric soil rating: No*

**Minor Components**

**Exeter**

*Percent of map unit: 7 percent*

*Landform: Fan remnants*

*Hydric soil rating: No*

**San joaquin**

*Percent of map unit: 2 percent*

*Landform: Fan remnants*

*Hydric soil rating: No*

**Unnamed, ponded**

*Percent of map unit: 1 percent*

*Landform: Depressions*

*Hydric soil rating: Yes*

**108—Colpien loam, 0 to 2 percent slopes**

**Map Unit Setting**

*National map unit symbol: hp4b*

*Elevation: 220 to 550 feet*

*Mean annual precipitation: 8 to 12 inches*

*Mean annual air temperature: 63 to 64 degrees F*

*Frost-free period: 250 to 300 days*

*Farmland classification: Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season*

**Map Unit Composition**

*Colpien and similar soils: 85 percent*

*Minor components: 15 percent*

*Estimates are based on observations, descriptions, and transects of the mapunit.*

**Description of Colpien**

**Setting**

*Landform: Fan remnants*

*Landform position (two-dimensional): Shoulder*

*Landform position (three-dimensional): Side slope*

*Down-slope shape: Linear*

*Across-slope shape: Linear*

*Parent material: Alluvium derived from granitic rock sources*

**Typical profile**

*Ap - 0 to 6 inches: loam*

*Bt - 6 to 24 inches: loam*

*Btk - 24 to 60 inches: loam*

*C - 60 to 65 inches: sandy loam*

## Custom Soil Resource Report

### Properties and qualities

*Slope:* 0 to 2 percent  
*Depth to restrictive feature:* More than 80 inches  
*Natural drainage class:* Moderately well drained  
*Runoff class:* Low  
*Capacity of the most limiting layer to transmit water (Ksat):* Moderately high (0.20 to 0.60 in/hr)  
*Depth to water table:* More than 80 inches  
*Frequency of flooding:* Rare  
*Frequency of ponding:* None  
*Calcium carbonate, maximum in profile:* 5 percent  
*Salinity, maximum in profile:* Nonsaline to slightly saline (0.5 to 4.0 mmhos/cm)  
*Sodium adsorption ratio, maximum in profile:* 12.0  
*Available water storage in profile:* High (about 10.7 inches)

### Interpretive groups

*Land capability classification (irrigated):* 1  
*Land capability classification (nonirrigated):* 4c  
*Hydrologic Soil Group:* C  
*Hydric soil rating:* No

### Minor Components

#### Hanford

*Percent of map unit:* 3 percent  
*Landform:* Flood plains, alluvial fans  
*Hydric soil rating:* No

#### Biggriz

*Percent of map unit:* 3 percent  
*Landform:* Fan remnants  
*Hydric soil rating:* No

#### Gambogy

*Percent of map unit:* 3 percent  
*Landform:* Alluvial fans, flood plains  
*Hydric soil rating:* No

#### Tujung

*Percent of map unit:* 2 percent  
*Landform:* Flood plains  
*Hydric soil rating:* No

#### Nord

*Percent of map unit:* 2 percent  
*Landform:* Alluvial fans, flood plains  
*Hydric soil rating:* No

#### Akers, saline-sodic

*Percent of map unit:* 2 percent  
*Landform:* Fan remnants  
*Hydric soil rating:* No



## 109—Crosscreek-Kai association, 0 to 2 percent slopes

### Map Unit Setting

*National map unit symbol:* hp4c

*Elevation:* 230 to 400 feet

*Mean annual precipitation:* 8 to 12 inches

*Mean annual air temperature:* 63 to 64 degrees F

*Frost-free period:* 250 to 300 days

*Farmland classification:* Farmland of statewide importance

### Map Unit Composition

*Crosscreek and similar soils:* 70 percent

*Kai and similar soils:* 15 percent

*Minor components:* 15 percent

*Estimates are based on observations, descriptions, and transects of the mapunit.*

### Description of Crosscreek

#### Setting

*Landform:* Fan remnants

*Landform position (two-dimensional):* Shoulder

*Landform position (three-dimensional):* Side slope

*Down-slope shape:* Linear

*Across-slope shape:* Linear

*Parent material:* Formed by the chemical and mechanical alteration of the kai series which originally formed in alluvium derived from granitic rock

#### Typical profile

*Ap1 - 0 to 11 inches:* loam

*Ap2 - 11 to 17 inches:* gravelly loam

*Ap3 - 17 to 55 inches:* sandy loam

*2Bkqmb - 55 to 60 inches:* cemented

#### Properties and qualities

*Slope:* 0 to 2 percent

*Depth to restrictive feature:* 40 to 60 inches to duripan

*Natural drainage class:* Well drained

*Runoff class:* Medium

*Capacity of the most limiting layer to transmit water (Ksat):* Low to moderately low  
(0.01 to 0.06 in/hr)

*Depth to water table:* More than 80 inches

*Frequency of flooding:* Very rare

*Frequency of ponding:* None

*Calcium carbonate, maximum in profile:* 10 percent

*Gypsum, maximum in profile:* 5 percent

*Salinity, maximum in profile:* Nonsaline to moderately saline (1.0 to 12.0 mmhos/cm)

*Sodium adsorption ratio, maximum in profile:* 13.0

*Available water storage in profile:* Moderate (about 7.8 inches)

## Custom Soil Resource Report

### Interpretive groups

*Land capability classification (irrigated): 2s*  
*Land capability classification (nonirrigated): 6s*  
*Hydrologic Soil Group: C*  
*Hydric soil rating: No*

### Description of Kai

#### Setting

*Landform: Fan remnants*  
*Landform position (two-dimensional): Shoulder*  
*Landform position (three-dimensional): Side slope*  
*Down-slope shape: Linear*  
*Across-slope shape: Linear*  
*Parent material: Alluvium derived from granitic rock sources*

#### Typical profile

*A - 0 to 6 inches: loam*  
*Btkn - 6 to 39 inches: loam*  
*Bkqm - 39 to 46 inches: cemented*  
*Btq - 46 to 65 inches: stratified sandy loam to silt loam*

#### Properties and qualities

*Slope: 0 to 2 percent*  
*Depth to restrictive feature: 4 to 12 inches to natric; 20 to 40 inches to duripan*  
*Natural drainage class: Moderately well drained*  
*Runoff class: Medium*  
*Capacity of the most limiting layer to transmit water (Ksat): Low to moderately low (0.01 to 0.06 in/hr)*  
*Depth to water table: More than 80 inches*  
*Frequency of flooding: Very rare*  
*Frequency of ponding: None*  
*Calcium carbonate, maximum in profile: 10 percent*  
*Salinity, maximum in profile: Nonsaline to strongly saline (1.0 to 16.0 mmhos/cm)*  
*Sodium adsorption ratio, maximum in profile: 80.0*  
*Available water storage in profile: Very low (about 0.9 inches)*

### Interpretive groups

*Land capability classification (irrigated): 3s*  
*Land capability classification (nonirrigated): 7s*  
*Hydrologic Soil Group: C*  
*Hydric soil rating: No*

### Minor Components

#### Quonal

*Percent of map unit: 5 percent*  
*Landform: Fan remnants*  
*Hydric soil rating: No*

#### Exeter

*Percent of map unit: 4 percent*  
*Landform: Fan remnants*  
*Hydric soil rating: No*

#### Calgro, saline-sodic

*Percent of map unit: 3 percent*

## Custom Soil Resource Report

*Landform:* Fan remnants  
*Hydric soil rating:* No

### **Hanford**

*Percent of map unit:* 2 percent  
*Landform:* Alluvial fans, flood plains  
*Hydric soil rating:* No

### **Unnamed, ponded**

*Percent of map unit:* 1 percent  
*Landform:* Depressions  
*Hydric soil rating:* Yes

## **114—Exeter loam, 0 to 2 percent slopes**

### **Map Unit Setting**

*National map unit symbol:* hp4j  
*Elevation:* 250 to 570 feet  
*Mean annual precipitation:* 8 to 12 inches  
*Mean annual air temperature:* 63 to 64 degrees F  
*Frost-free period:* 250 to 300 days  
*Farmland classification:* Farmland of statewide importance

### **Map Unit Composition**

*Exeter, 0-2% slopes, and similar soils:* 85 percent  
*Minor components:* 15 percent  
*Estimates are based on observations, descriptions, and transects of the mapunit.*

### **Description of Exeter, 0-2% Slopes**

#### **Setting**

*Landform:* Fan remnants  
*Landform position (two-dimensional):* Shoulder  
*Landform position (three-dimensional):* Side slope  
*Down-slope shape:* Linear  
*Across-slope shape:* Linear  
*Parent material:* Alluvium derived from granitic rock sources

#### **Typical profile**

*Ap - 0 to 9 inches:* loam  
*Bt1 - 9 to 26 inches:* sandy clay loam  
*Bt2 - 26 to 28 inches:* clay loam  
*Btqm - 28 to 46 inches:* indurated  
*2Bt - 46 to 72 inches:* stratified very gravelly loamy coarse sand to gravelly loam

#### **Properties and qualities**

*Slope:* 0 to 2 percent  
*Depth to restrictive feature:* 20 to 40 inches to duripan  
*Natural drainage class:* Moderately well drained  
*Runoff class:* Medium

## Custom Soil Resource Report

*Capacity of the most limiting layer to transmit water (Ksat):* Low to moderately low  
(0.01 to 0.06 in/hr)

*Depth to water table:* More than 80 inches

*Frequency of flooding:* Very rare

*Frequency of ponding:* None

*Calcium carbonate, maximum in profile:* 5 percent

*Salinity, maximum in profile:* Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)

*Available water storage in profile:* Low (about 4.4 inches)

### Interpretive groups

*Land capability classification (irrigated):* 3s

*Land capability classification (nonirrigated):* 4s

*Hydrologic Soil Group:* C

*Hydric soil rating:* No

### Minor Components

#### Hanford

*Percent of map unit:* 4 percent

*Landform:* Alluvial fans, flood plains

*Hydric soil rating:* No

#### Colpien

*Percent of map unit:* 3 percent

*Landform:* Fan remnants

*Hydric soil rating:* No

#### San joaquin

*Percent of map unit:* 3 percent

*Landform:* Fan remnants

*Hydric soil rating:* No

#### Quonal

*Percent of map unit:* 2 percent

*Landform:* Fan remnants

*Hydric soil rating:* No

#### Calgro

*Percent of map unit:* 2 percent

*Landform:* Fan remnants

*Hydric soil rating:* No

#### Unnamed, ponded

*Percent of map unit:* 1 percent

*Landform:* Depressions

*Hydric soil rating:* Yes

## 116—Flamen loam, 0 to 2 percent slopes

### Map Unit Setting

*National map unit symbol:* hp4l

*Elevation:* 260 to 550 feet

## Custom Soil Resource Report

*Mean annual precipitation:* 8 to 12 inches

*Mean annual air temperature:* 63 to 64 degrees F

*Frost-free period:* 250 to 300 days

*Farmland classification:* Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season

### Map Unit Composition

*Flamen and similar soils:* 85 percent

*Minor components:* 15 percent

*Estimates are based on observations, descriptions, and transects of the mapunit.*

### Description of Flamen

#### Setting

*Landform:* Fan remnants

*Landform position (two-dimensional):* Shoulder

*Landform position (three-dimensional):* Side slope

*Down-slope shape:* Linear

*Across-slope shape:* Linear

*Parent material:* Alluvium derived from granitic rock sources

#### Typical profile

*Ap1 - 0 to 17 inches:* loam

*Ap2 - 17 to 28 inches:* loam

*Btk - 28 to 43 inches:* loam

*2Btkqm - 43 to 72 inches:* cemented

#### Properties and qualities

*Slope:* 0 to 2 percent

*Depth to restrictive feature:* 40 to 60 inches to duripan

*Natural drainage class:* Moderately well drained

*Runoff class:* Low

*Capacity of the most limiting layer to transmit water (Ksat):* Moderately low to moderately high (0.06 to 0.20 in/hr)

*Depth to water table:* More than 80 inches

*Frequency of flooding:* Very rare

*Frequency of ponding:* None

*Calcium carbonate, maximum in profile:* 2 percent

*Salinity, maximum in profile:* Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)

*Sodium adsorption ratio, maximum in profile:* 12.0

*Available water storage in profile:* Moderate (about 6.6 inches)

#### Interpretive groups

*Land capability classification (irrigated):* 2s

*Land capability classification (nonirrigated):* 4e

*Hydrologic Soil Group:* B

*Hydric soil rating:* No

### Minor Components

#### Exeter

*Percent of map unit:* 3 percent

*Landform:* Fan remnants

*Hydric soil rating:* No

#### San joaquin

*Percent of map unit:* 3 percent

## Custom Soil Resource Report

*Landform:* Fan remnants  
*Hydric soil rating:* No

### **Hanford**

*Percent of map unit:* 2 percent  
*Landform:* Flood plains, alluvial fans  
*Hydric soil rating:* No

### **Calgro**

*Percent of map unit:* 2 percent  
*Landform:* Fan remnants  
*Hydric soil rating:* No

### **Colpien**

*Percent of map unit:* 2 percent  
*Landform:* Fan remnants  
*Hydric soil rating:* No

### **Centerville**

*Percent of map unit:* 2 percent  
*Landform:* Fan remnants  
*Hydric soil rating:* No

### **Unnamed, ponded**

*Percent of map unit:* 1 percent  
*Landform:* Depressions  
*Hydric soil rating:* Yes

## **124—Hanford sandy loam, 0 to 2 percent slopes**

### **Map Unit Setting**

*National map unit symbol:* hp4v  
*Elevation:* 220 to 490 feet  
*Mean annual precipitation:* 9 to 12 inches  
*Mean annual air temperature:* 63 to 64 degrees F  
*Frost-free period:* 250 to 280 days  
*Farmland classification:* Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season

### **Map Unit Composition**

*Hanford and similar soils:* 85 percent  
*Minor components:* 15 percent  
*Estimates are based on observations, descriptions, and transects of the mapunit.*

### **Description of Hanford**

#### **Setting**

*Landform:* Alluvial fans, flood plains  
*Landform position (two-dimensional):* Footslope, toeslope  
*Landform position (three-dimensional):* Base slope  
*Down-slope shape:* Linear  
*Across-slope shape:* Linear

## Custom Soil Resource Report

*Parent material:* Alluvium derived from granitic rock sources

### Typical profile

*Ap - 0 to 6 inches:* sandy loam  
*C1 - 6 to 30 inches:* fine sandy loam  
*C2 - 30 to 60 inches:* sandy loam

### Properties and qualities

*Slope:* 0 to 2 percent  
*Depth to restrictive feature:* More than 80 inches  
*Natural drainage class:* Well drained  
*Runoff class:* Negligible  
*Capacity of the most limiting layer to transmit water (Ksat):* High (2.00 to 6.00 in/hr)  
*Depth to water table:* More than 80 inches  
*Frequency of flooding:* Very rare  
*Frequency of ponding:* None  
*Calcium carbonate, maximum in profile:* 2 percent  
*Salinity, maximum in profile:* Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)  
*Sodium adsorption ratio, maximum in profile:* 7.0  
*Available water storage in profile:* Moderate (about 6.6 inches)

### Interpretive groups

*Land capability classification (irrigated):* 1  
*Land capability classification (nonirrigated):* 3c  
*Hydrologic Soil Group:* A  
*Hydric soil rating:* No

### Minor Components

#### Exeter

*Percent of map unit:* 5 percent  
*Landform:* Fan remnants  
*Hydric soil rating:* No

#### Tujung

*Percent of map unit:* 5 percent  
*Landform:* Flood plains  
*Hydric soil rating:* No

#### Calgro

*Percent of map unit:* 3 percent  
*Landform:* Fan remnants  
*Hydric soil rating:* No

#### Yettem

*Percent of map unit:* 2 percent  
*Landform:* Alluvial fans, flood plains  
*Hydric soil rating:* No

## 134—Riverwash

### Map Unit Composition

*Riverwash:* 100 percent

*Estimates are based on observations, descriptions, and transects of the mapunit.*

### Description of Riverwash

#### Setting

*Landform:* Flood plains

*Down-slope shape:* Linear

*Across-slope shape:* Linear

*Parent material:* Alluvium derived from granite

#### Properties and qualities

*Slope:* 0 to 2 percent

*Frequency of flooding:* Frequent

#### Interpretive groups

*Land capability classification (irrigated):* 8

*Land capability classification (nonirrigated):* 8

*Hydric soil rating:* Yes

## 145—Water-perennial

### Map Unit Composition

*Water:* 100 percent

*Estimates are based on observations, descriptions, and transects of the mapunit.*

### Description of Water

#### Interpretive groups

*Land capability classification (irrigated):* None specified

*Land capability classification (nonirrigated):* 8



# References

---

American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.

American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487-00.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deep-water habitats of the United States. U.S. Fish and Wildlife Service FWS/OBS-79/31.

Federal Register. July 13, 1994. Changes in hydric soils of the United States.

Federal Register. September 18, 2002. Hydric soils of the United States.

Hurt, G.W., and L.M. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.

National Research Council. 1995. Wetlands: Characteristics and boundaries.

Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18. [http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2\\_054262](http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_054262)

Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service, U.S. Department of Agriculture Handbook 436. [http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2\\_053577](http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053577)

Soil Survey Staff. 2010. Keys to soil taxonomy. 11th edition. U.S. Department of Agriculture, Natural Resources Conservation Service. [http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2\\_053580](http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053580)

Tiner, R.W., Jr. 1985. Wetlands of Delaware. U.S. Fish and Wildlife Service and Delaware Department of Natural Resources and Environmental Control, Wetlands Section.

United States Army Corps of Engineers, Environmental Laboratory. 1987. Corps of Engineers wetlands delineation manual. Waterways Experiment Station Technical Report Y-87-1.

United States Department of Agriculture, Natural Resources Conservation Service. National forestry manual. [http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/home/?cid=nrcs142p2\\_053374](http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/home/?cid=nrcs142p2_053374)

United States Department of Agriculture, Natural Resources Conservation Service. National range and pasture handbook. <http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/landuse/rangepasture/?cid=stelprdb1043084>

## Custom Soil Resource Report

United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. [http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/scientists/?cid=nrcs142p2\\_054242](http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/scientists/?cid=nrcs142p2_054242)

United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296. [http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2\\_053624](http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053624)

United States Department of Agriculture, Soil Conservation Service. 1961. Land capability classification. U.S. Department of Agriculture Handbook 210. [http://www.nrcs.usda.gov/Internet/FSE\\_DOCUMENTS/nrcs142p2\\_052290.pdf](http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_052290.pdf)