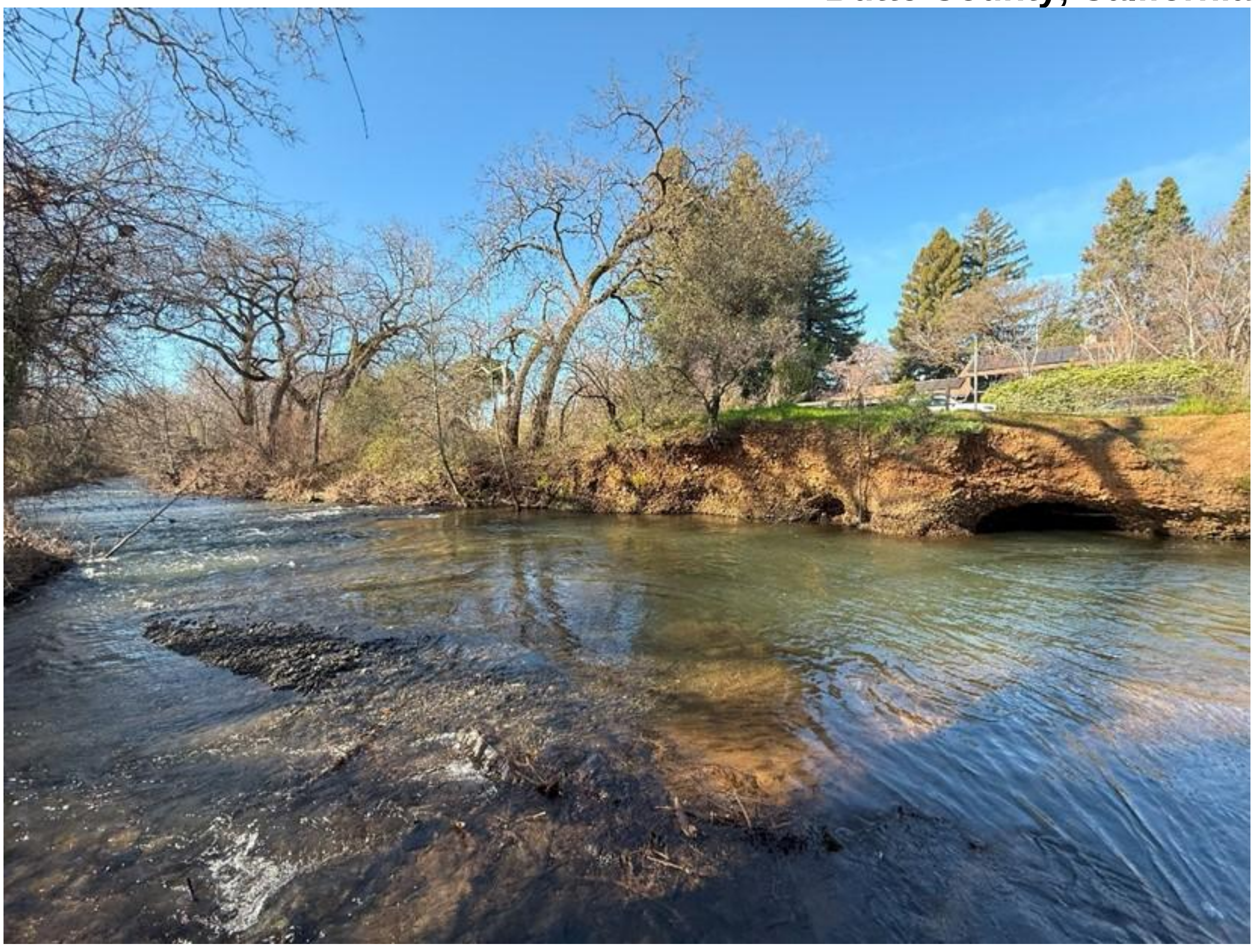
AQUATIC RESOURCE DELINEATION REPORT

Manzanita Avenue and Vallombrosa Avenue
Big Chico Creek Erosion Repair Project
Butte County, California



Prepared By:

Dokken Engineering
110 Blue Ravine Road, Suite 200
Folsom, California 95630
(916) 858-0642

Prepared For:

City of Chico Public Works
411 Main St
Chico, California 95928
(530) 896-7200

Table of Contents

Summary and Project Description 1
Chapter 1. Introduction 2
Chapter 2. Location 3
Chapter 3. Delineation Methods 4
Chapter 4. Existing Conditions 5
4.1 Landscape Setting 5
4.2 Land Cover Types 5
4.3 Jurisdictional Resources 6
Chapter 5. References 9
Appendix A. Project Location and Features Exhibits 10
Appendix B. Ordinary High-Water Mark Datasheets 11
Appendix C. Plant Species Observed 12
Appendix D. NRCS Soil Report 13
Appendix E. Representative Photographs 14

Tables

Table 1. Aquatic Resources within the BSA 7

Figures

Figure A. Aquatic Resources Delineation Map – Summary Potential of Waters of the United States 8

Acronym List

BSA – Biological Study Area

City – City of Chico Department of Public Works

NRCS – National Resource Conservation Service

NWPL – National Wetland Plant List

OHWM – Ordinary High-Water Mark

Project – Big Chico Creek Erosion Repair Project

SR-99 – State Route 99

USACE – United States Army Corps of Engineers

USFWS – United States Fish and Wildlife Service

Contact Information

Applicant:
Tracy Bettencourt
Regulatory and Grants Manager
City of Chico
411 Main Street
Chico, CA 95928
(530) 879-6903
tracy.bettencourt@chicoca.gov

Agent:
Ken Chen
Dokken Engineering
Associate Environmental Planner/Noise and Air
110 Blue Ravine Rd #200
Folsom, CA 95630
(916) 858-0642
kchen@dokkenengineering.com

Summary and Project Description

The City of Chico Department of Public Works (City) proposes to address ongoing bank erosion along the west bank of Big Chico Creek within the City of Chico, in Butte County, California as part of the Big Chico Creek Erosion Repair Project (Project). The Project is located directly east of the intersection of Covell Park Avenue and Vallombrosa Avenue, (Appendix A, see Figure 1, Figure 2, and Figure 3).

Due to heavy creek flows from atmospheric river events in Winter 2023/Spring 2024, erosion damage has significantly deteriorated the west bank of Big Chico Creek, causing future risk of significant damage to nearby public facilities.

The Project will address bank erosion and scour along the west bank of Big Chico Creek by installing rock slope protection (RSP) along the west bank of Big Chico Creek. This treatment will stabilize approximately 187 linear feet of streambank and reinforce a 8-foot-wide section of the eroded area.

On behalf of the City, Dokken Engineering conducted jurisdictional delineations of waters of the United States within the Biolgoical Study Area (BSA). The BSA was defined as the proposed Project area with an approximate 50-foot buffer where the proposed Project activities intersect with natural habitat communities. The delineations were conducted on February 26th, 2025. Delineation procedures followed the technical methods outlined in the Regional Supplement to the United States Army Corps of Engineers (USACE) Wetland Delineation Manual: Arid West Region (USACE 2008), and A Field Guide to the Identification of the Ordinary High-Water Mark (OHWM) in the Arid West Region of the Western United States (Lichvar 2008). The delineation confirmed the presence of one jurisdictional water feature present within the BSA: Big Chico Creek.

As the Project will result in impacts to Big Chico Creek, a jurisdictional water of the U.S. and State, the Project will be required to obtain regulatory permitting from the Central Valley Regional Water Quality Control Board, USACE, and California Department of Fish and Wildlife. The Project will also be required to obtain an encroachment permit from the Central Valley Flood Protection board.

The Project is anticipated to begin construction in spring of 2027 at the earliest.

Chapter 1. Introduction

The City proposes to address erosion along the west bank of Big Chico Creek, in the City of Chico, in Butte County, California as part of the Project. The purpose of this report is to identify and describe aquatic resources within the Project's BSA.

This report facilitates efforts to:

1. Avoid or minimize impacts to aquatic resources during the Project design process.
2. Document aquatic resource boundary determinations for review by regulatory authorities.
3. Provide background information regarding aquatic resources in the BSA.

Chapter 2. Location

The proposed erosion repair work is located in the City of Chico, California, along Big Chico Creek, (Appendix A. Project Location and Features Exhibits) and is directly adjacent to the intersection of Covell Park Avenue and Vallombrosa Avenue. The BSA is within Section 18, Township 22 North, and Range 2 East of the Richardson Springs USGS 7.5-minute quadrangle. The BSA ranges between 265 to 275 feet above sea level.

The Project area includes all the temporary impacts associated with the Project, including proposed right of way, temporary construction easements, access roads, and potential staging areas. The BSA was defined as the proposed Project area with an approximate 50-foot buffer where the proposed Project activities intersect with natural habitat communities. The combined BSA totals approximately 1.86 acres and encompasses an approximate 425-foot segment of Big Chico Creek that flows from north to south within the BSA (see Appendix A).

2.1 Directions to Site

The BSA (39.75784, -121.796627) is directly east of the intersection of Covell Park Avenue and Vallombrosa Avenue. To get to the intersection of Covell Park Avenue and Vallombrosa Avenue from State Route 99 (SR-99), follow these directions:

- **Exit SR99:** Take Exit 385 CA-32 toward Chester/Orland
- **Turn right onto CA-32 E:** After exiting, turn right onto CA-32 E and head east, continue for 1.5 miles.
- **Turn left onto Bruce Road:** After turning onto Bruce Road, continue for 0.7 miles until Bruce Road merges into Chico Canyon Road.
- **Continue on Chico Canyon Road:** Continue on Chico Canyon Road for 0.3 miles until it merges into Manzanita Avenue.
- **Continue on Manzanita Avenue:** Continue on Manzanita until you hit the roundabout.
- **Take the 2nd exit on the roundabout:** At the roundabout, take the second exit onto Vallombrosa Avenue.
- **Continue south on Vallombrosa Avenue:** Continue south on Vallombrosa Avenue for 443 feet.
- **Reach your destination:** 443 feet south of the roundabout is the intersection of Vallombrosa Avenue and Covell Park Lane. The intersection is located within the BSA.

Chapter 3. Delineation Methods

The jurisdictional delineation was conducted by Dokken Engineering biologists Jeff Harris and Lea Braen on February 26th, 2025. The purpose of the survey was to identify habitat communities, assess potential for special-status species, and delineate aquatic resources present within the proposed BSA. The field investigation was conducted in accordance with technical methods outlined in the Corps of Engineers Wetlands Delineation Manual (USACE 1987), Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region (USACE 2008), and A Field Guide to the Identification of the OHWM in the Arid West Region of the Western United States (Lichvar 2008).The limits of the OHWM were mapped in the field with an EOS Arrow 100 Receiver and ArcGIS software, and Arid West Ephemeral and Intermittent Streams OWHM Datasheets were completed (Appendix B. Ordinary High-Water Mark Datasheets). OHWM data points were taken where primary indicators of the OWHM were delineated in accordance with the technical methods listed above.

Scientific nomenclature for plants cited in this report in Appendix C. Plant Species Observed is in accordance with The Jepson Manual (Jepson 2025). The indicator status of plants in this report is in accordance with the National Wetland Plant List (NWPL).

Chapter 4. Existing Conditions

4.1 Landscape Setting

The BSA is within Butte County, California, within the Sacramento Valley Province (Jepson 2025). The average annual high temperature is approximately 75 degrees Fahrenheit, the average annual lows reach approximately 47°F, with up to 27 inches of precipitation annually (U.S. Climate Data 2025).

The elevation within the BSA ranges from approximately 260 to 275 feet above mean sea level, with predominantly flat topography throughout, with the exception of Big Chico Creek, which sits about 10 feet below the surface of Vallombrosa Avenue. According to the NRCS (Appendix D), soil composition within the BSA consists of Redsluff gravelly loam (~10.3% of the Project Area), Vina fine sandy loam (70.0% of the Project Area) and Charger fine sandy loam (18.8% of Project Area) (NRCS 2025; Appendix D. NRCS Soil Report).

4.2 Land Cover Types

Land cover types within the BSA include roadway, urban/developed, and riparian forest. Big Chico Creek is the only jurisdictional aquatic resource identified within the BSA. Plant and wildlife species observed within the BSA during the February 26th, 2025, biological survey efforts were used to define habitat types based on composition, abundance, and cover (Appendix C. Plant Species Observed).

<u>*Riparian Forest*</u>

A riparian corridor refers to the strip of land along the banks of a river, stream, or other water bodies. It is characterized by its unique ecological and environmental features, including the vegetation, wildlife, and aquatic ecosystems that thrive in and around these waterways.

The riparian forest habitat within the BSA occurs along the slopes and banks of Big Chico Creek. This habitat is characterized by an overstory of large riparian tree species such as California sycamore (*Platanus racemosa),* valley oak (*Quercus lobata*), Northern California black walnut (*Juglans hindsii)* and white alder (*Alnus rhombifolia*).

The understory composition of the riparian forest along Big Chico Creek within the BSA varies depending on canopy cover density and proximity to urban development. Along the west bank, the understory is relatively undeveloped, with the exception of sporadic, dense patches of poison oak (*Toxicodendron diversilobum*). The understory of the riparian corridor along the east bank is highly developed and features dense stands of California wild grape (*Vitis californica*) intertwined with blue elderberry (*Sambucus mexicana*).

The BSA contains approximately 0.62 acres (~33% of the BSA) of riparian forest.

<u>*Road*</u>

Roadways are characterized by impervious surfaces like asphalt and concrete, which are devoid of vegetation and provide limited shelter and food sources for wildlife. Roadways within the BSA consist of paved roads including the intersection of Covell Park Avenue and Vallombrosa Avenue, Manzanita Avenue, and Centennial Avenue.

The BSA contains approximately 0.30 acres (~16% of the BSA) of road.

Urban/Development

Urban and developed areas within the BSA consist of both paved and unpaved paths and residential development within the staging area. This land cover type features little to no natural vegetation, except for landscaped and ornamental plantings associated with residential developments.

The BSA contains approximately 0.50 acres (~27% of the BSA) of urban/developed land.

4.3 Jurisdictional Resources

Based on field survey results, the Richardson Springs United States Geological Survey 7.5-minute quadrangle topographic map, and the United States Fish and Wildlife Service (USFWS) National Wetland Inventory (USFWS 2025), Big Chico Creek is the only jurisdictional water feature within the BSA. (Appendix E. Representative Photographs).

Big Chico Creek

Big Chico Creek is a perennial freshwater creek that flows from east to west through the City of Chico. Its flow is primarily governed by natural hydrological processes, with some human intervention for purposes such as recreation, habitat protection, and local water use. A federal flood control project diverts winter flows into a bypass channel system upstream of the Project area which limits the maximum winter flows to 1,500 cfs.

Big Chico Creek flows below Manzanita Avenue, eventually converging with the Sacramento River about 10 miles downstream of the furthest western extent of the BSA. The creek originates in the Sierra Nevada at an elevation of about 6,000 feet northeast of the City of Chico and has a 240 square mile watershed. As it flows through the foothills and over the creek's out wash delta to the valley floor, the creek experiences infiltration and often no flows reach the Sacramento River (BCCER 2025). Its riverbed is composed of pebbles, cobbles, underlain by medium to fine grained sand.

The riverbed within the BSA is predominantly shaded by the surrounding riparian forest, with incised channel banks shaped by erosion resulting from urban development and heavy creek flows from atmospheric river events in Winter 2023/Spring 2024.

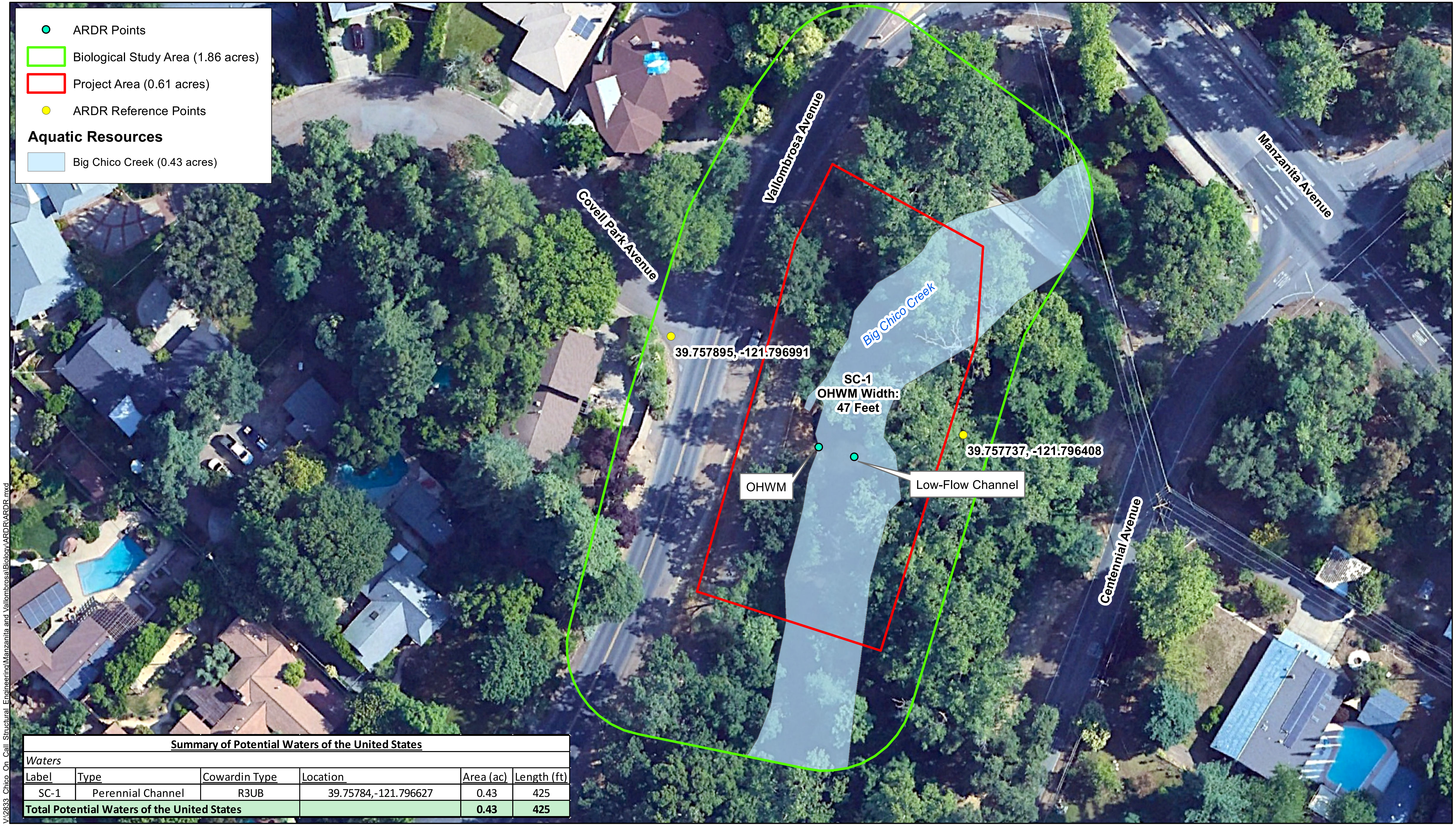
In total, the BSA includes approximately 425 linear feet of perennial stream channel (Waters of the US and State) with an average width of 47 feet, comprising approximately 0.43 acres (~23% of the BSA) of Big Chico Creek (Table 1. Aquatic Resources within the BSA).

The Aquatic Resources Delineation Map illustrates the boundaries of the jurisdictional features within the BSA (Figure A. Aquatic Resources Delineation Map – Summary Potential of Waters of the United States).

Table 1. Aquatic Resources within the BSA

Site Coordinates	Aquatic Resource	OHWM Indicators	Classification[2]	Aquatic Resource Size (acre)	Aquatic Resource Size (linear feet)
39.72698 N -121.86336 W	Big Chico Creek (SC-1)[1]	**At OHWM:** • Change in Average Sediment Texture • Change in vegetation cover • Break in Bank Slope • Exposed Root Hairs Below Intact Soil Layer **Below OHWM:** • Ripples • Drift and Debris • Presence of Bed and Bank • Benches • Gravel Bars	R3UB (Unconsolidated Bottom, Upper Perennial, Riverine)	0.43	425
			Total	**0.43**	**425**

[1]Stream Channel -1 (SC-1)
[2]Cowardin et.al. 1979



Summary of Potential Waters of the United States

Waters					
Label	Type	Cowardin Type	Location	Area (ac)	Length (ft)
SC-1	Perennial Channel	R3UB	39.75784,-121.796627	0.43	425
Total Potential Waters of the United States				**0.43**	**425**

V:\2833 Chico On Call Structural Engineering\Manzanita and Vallombrosa\Biology\ARDR\ARDR.mxd

Coordinate System: NAD 1983
Projection: Tranverse Mercator
Datum: North American 1983

1 inch = 50 feet

0 25 50 75 100 125 Feet

Prepared by: DOKKEN ENGINEERING

110 Blue Ravine Road, Suite 200
Folsom, CA 95630 Phone (916) 858-0642
Fax (916) 858-0643 *www.dokkenengineering.com*

Prepared for:

The City of Chico
411 Main Street
Chico, CA 95928

Delineator: Lea Braen, Jeff Harris
Delineation Date: February 26, 2025
Aerial Photography Source: ESRI Maps Online, 2016
This delineation of waters of the United States is subject to verification by the U.S. Army Corps of Engineers (Corps). Dokken Engineering advises all parties that the delineation is preliminary until the Corps provides a written verification.

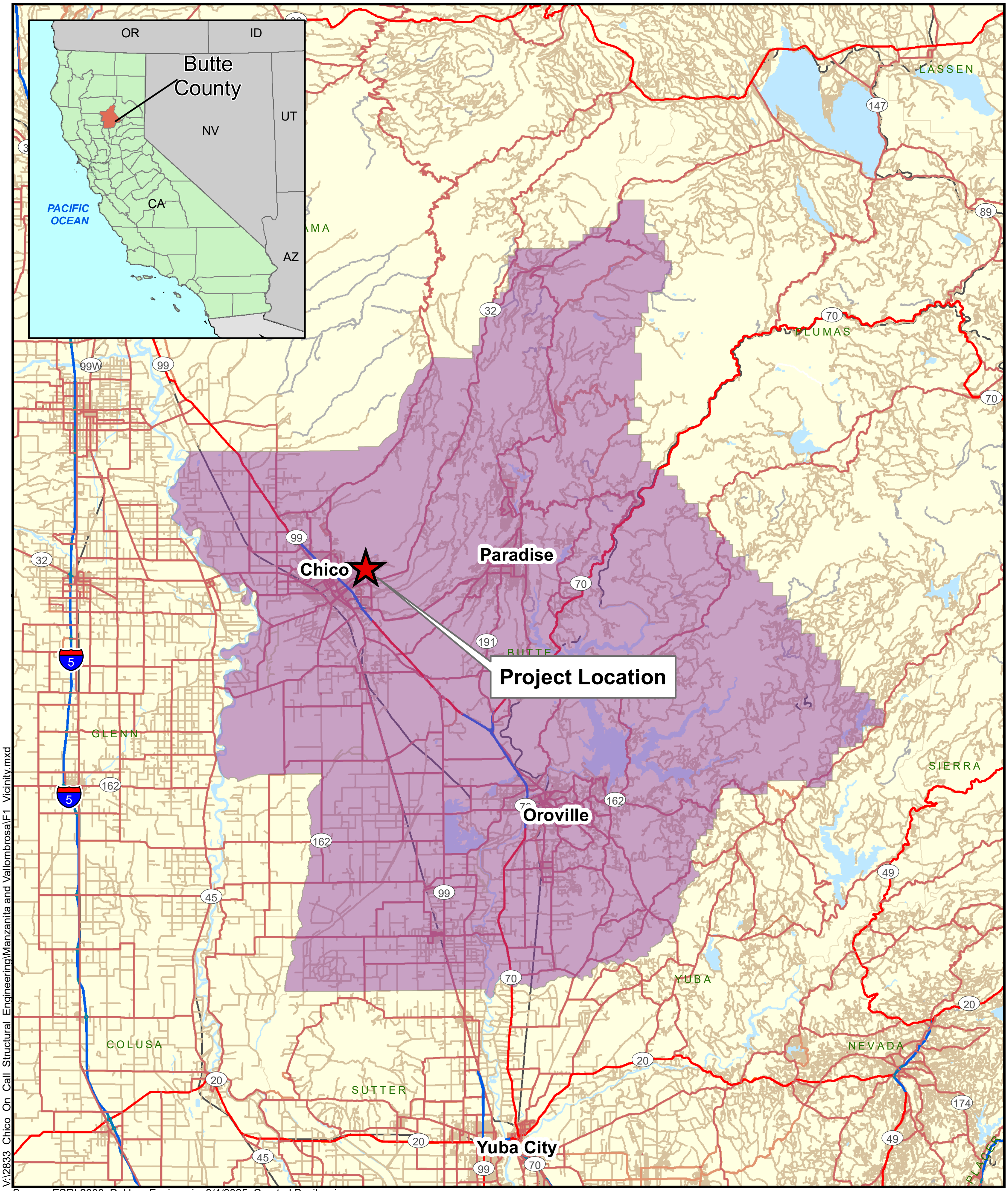
Potential Waters of the US
Aquatic Resources Delineation Map

Manzanita Avenue and Vallombrosa Avenue
Big Chico Creek Erosion Repair Project
City of Chico, California

Chapter 5. References

BCCER 2025	Big Chico Creek Ecological Reserve 2025. The Big Chico Creek Watershed. Available at: <https://www.csuchico.edu/bccer/natural-resources/watershed.shtml> (accessed 4/4/2025)
Cowardin et. al. 1979	Cowardin et.al. 1979. Classification of Wetlands and Deepwater Habitats of the United States.
Jepson 2025	Jepson eFlora. 2025. Geographic subdivisions. Available at: <https://ucjeps.berkeley.edu/eflora/geography.html> (accessed 4/4/2025).
Lichvar 2008	Lichvar, R.W. & McColley, S.M. 2008. A Field Guide to the Identification of the Ordinary High Water Mark (OHWM) in the Arid West Region of the Western United States. United States Army Engineer Research and Development Center, Hanover, New Hampshire.
NRCS 2025	Natural Resource Conservation Service. 2025. Custom Soil Resources Report for Butte County, California Western Part. Available at: <https://websoilsurvey.sc.egov.usda.gov/App/> (accessed 4/4/2025).
U.S. Climate Data 2025	United States Climate Data. 2025. Chico Weather Averages. Available at: <https://www.usclimatedata.com> (accessed 4/4/2025).
USACE 1987	U.S. Army Corps of Engineers. 1987. Corps of Engineers Wetlands Delineation Manual. Technical Report Y-87-1. U.S. Army Engineer Waterways Experiment Station.
USACE 2008	United States Army Corps of Engineers. 2008. Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region (Version 2.0). United States Army Engineer Research and Development Center, Vicksburg, Mississippi.
USFWS 2025	United States Fish and Wildlife Service. 2025. National Wetland Inventory. Available at <https://www.fws.gov/wetlands/data/mapper.html> (accessed 4/4/2025)

Appendix A. Project Location and Features Exhibits

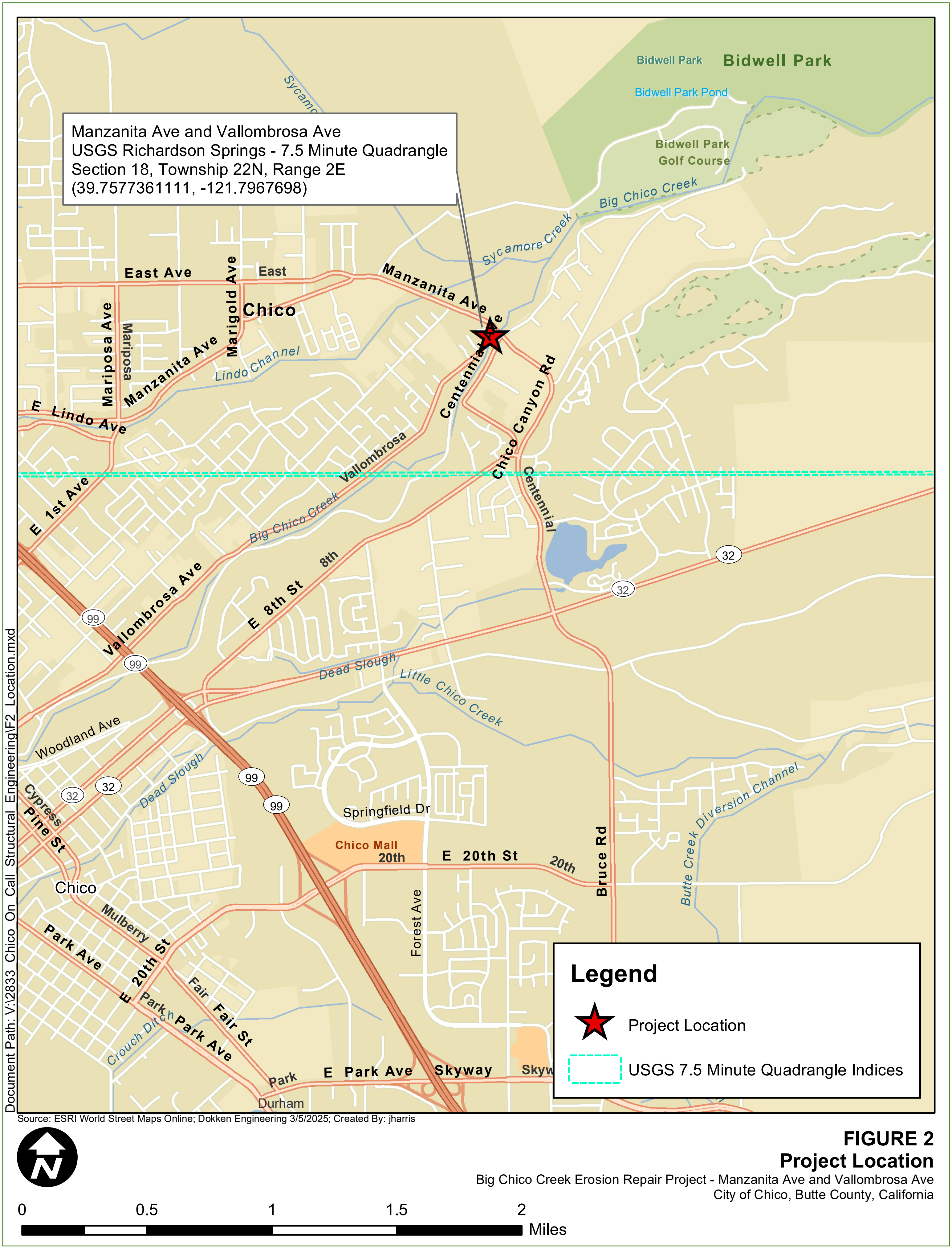


V:\2833 Chico On Call Structural Engineering\Manzanita and Vallombrosa\F1 Vicinity.mxd

Source: ESRI 2008; Dokken Engineering3/4/2025; Created By: jharris

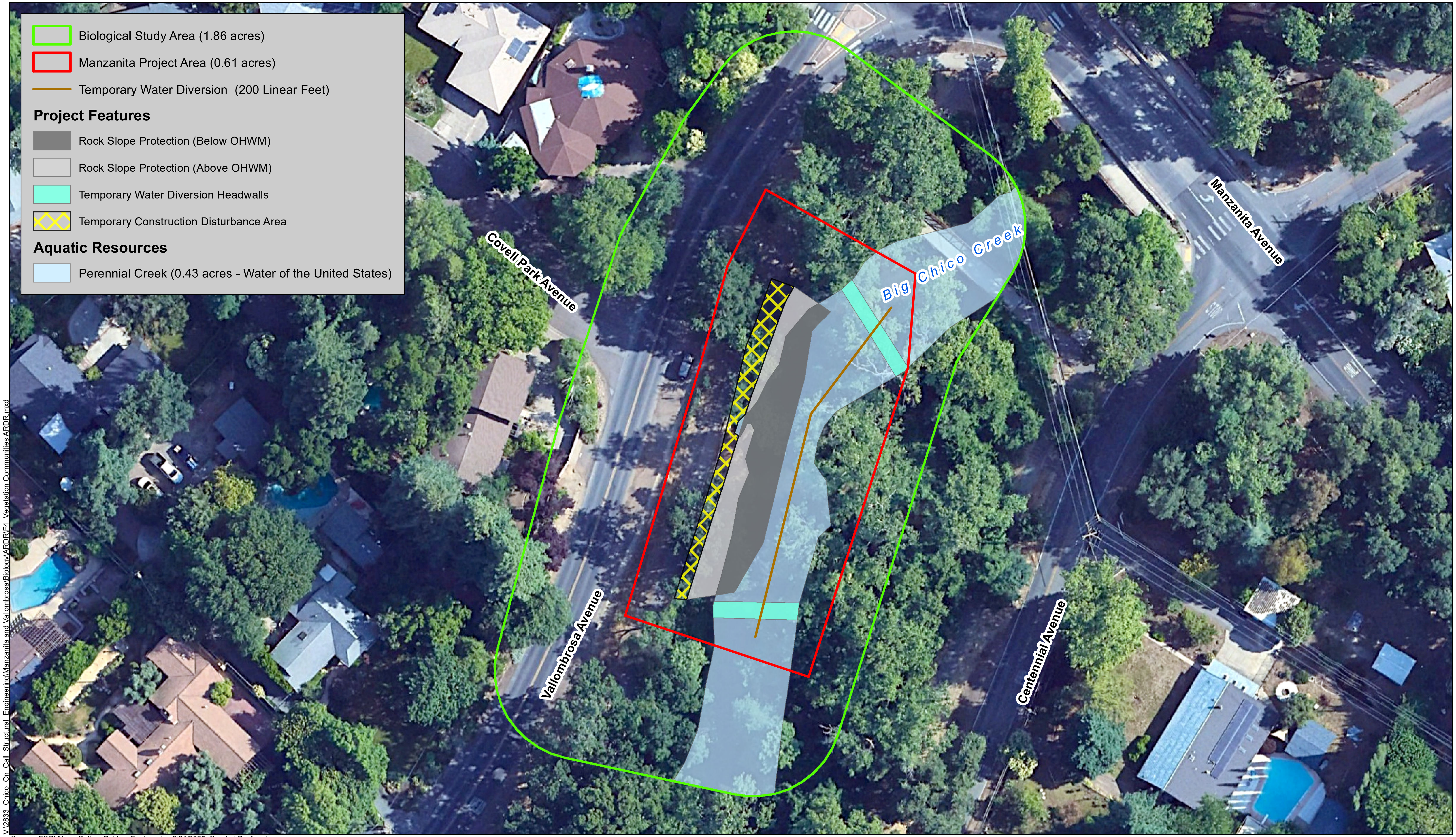
FIGURE 1
Project Vicinity
Big Chico Creek Erosion Repair Project - Manzanita Ave and Vallombrosa Ave
City of Chico, Butte County, California

0 5 10 15 Miles



Source: ESRI World Street Maps Online; Dokken Engineering 3/5/2025; Created By: jharris

FIGURE 2
Project Location
Big Chico Creek Erosion Repair Project - Manzanita Ave and Vallombrosa Ave
City of Chico, Butte County, California



V:\2833_Chico_On_Call_Structural_Engineering\Manzanita and Vallombrosa\Biology\ARDR\F4_Vegetation Communities ARDR.mxd

Source: ESRI Maps Online; Dokken Engineering 6/24/2025; Created By: jharris

N

1 inch = 50 feet

0 40 80 120 160 200 Feet

Figure 3
Project Features
Manzanita Avenue and Vallombrosa Avenue
Big Chico Creek Erosion Repair Project
City of Chico, Butte County, California

Appendix B. Ordinary High-Water Mark Datasheets

Arid West Ephemeral and Intermittent Streams OHWM Datasheet

Project: Big Chico Creek Erosion Repair Project
Project Number: 2833
Stream: BIG CHICO CREEK
Investigator(s): JEFF HARIS, LEA BRAEN

Date: 2/26/2025
Town: CHICO
Photo begin file#:

Time: 9:40 am
State: CA
Photo end file#:

Y ☑ / N ☐ Do normal circumstances exist on the site?

Y ☐ / N ☑ Is the site significantly disturbed?

Location Details: Manzanita Ave. + Valembrossa Ave

Projection: Transverse Mercator **Datum:** NAD 83
Coordinates: 39.75784, -121.796627

Potential anthropogenic influences on the channel system:
Big Chico creek is bordered by Bidwell Park biking/walking trails as well as Vallombrosa Ave and Centennial Ave. In this location. The west bank is eroded close to the park trail. Foot traffic throughout the Riparian corridor may have aided in some erosion of the east bank

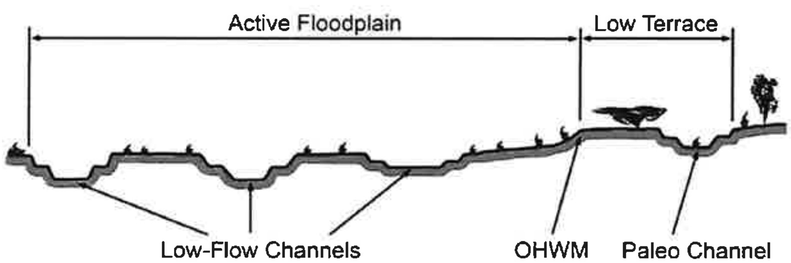
Brief site description: Site contains the low-flow channel of Big Chico Creek bordered by Bidwell park biking + walking trails as well as Vallombrosa Ave + Centennial Ave, further surrounded by developed/residential areas, including Manzanita Ave. bridge over the creek. The creek is bordered by Valley Oak/Western Sycamore dominated Riparian Corridor with an understory dominated by California grape and California wild rose on the east bank and poison oak on the west bank. West bank is steep and eroded.

Checklist of resources (if available):

- ☑ Aerial photography
  Dates:
- ☑ Topographic maps
- ☐ Geologic maps
- ☑ Vegetation maps
- ☑ Soils maps
- ☐ Rainfall/precipitation maps
- ☐ Existing delineation(s) for site
- ☑ Global positioning system (GPS)
- ☐ Other studies

- ☐ Stream gage data
  Gage number:
  Period of record:
  - ☐ History of recent effective discharges
  - ☐ Results of flood frequency analysis
  - ☐ Most recent shift-adjusted rating
  - ☐ Gage heights for 2-, 5-, 10-, and 25-year events and the most recent event exceeding a 5-year event

Hydrogeomorphic Floodplain Units

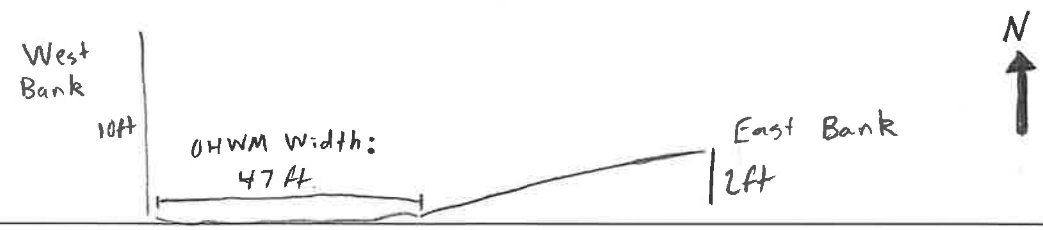


Procedure for identifying and characterizing the floodplain units to assist in identifying the OHWM:

1. Walk the channel and floodplain within the study area to get an impression of the geomorphology and vegetation present at the site.
2. Select a representative cross section across the channel. Draw the cross section and label the floodplain units.
3. Determine a point on the cross section that is characteristic of one of the hydrogeomorphic floodplain units.
   a) Record the floodplain unit and GPS position.
   b) Describe the sediment texture (using the Wentworth class size) and the vegetation characteristics of the floodplain unit.
   c) Identify any indicators present at the location.
4. Repeat for other points in different hydrogeomorphic floodplain units across the cross section.
5. Identify the OHWM and record the indicators. Record the OHWM position via:
   - ☐ Mapping on aerial photograph
   - ☐ Digitized on computer
   - ☑ GPS
   - ☐ Other:

Project ID: 2833 **Cross section ID:** 1 **Date:** 2/26/25 **Time:** 9:40 AM

Cross section drawing:



OHWM

GPS point: 39.757723, -121.796702

Indicators:

- [x] Change in average sediment texture
- [ ] Change in vegetation species
- [x] Change in vegetation cover
- [x] Break in bank slope
- [x] Other: Exposed root hairs
- [ ] Other: ______

Comments:
Heavy flows from the winter 2022-2023 storms have caused significant erosion & undercutting along the west bank, resulting in a nearly vertical bank.

Floodplain unit: [x] Low-Flow Channel [ ] Active Floodplain [ ] Low Terrace

GPS point: 39.757705, -121.798625

Characteristics of the floodplain unit:

Average sediment texture: pebbles + cobbles underlain by medium-fine sand

Total veg cover: 3 % Tree: 0 % Shrub: 0 % Herb: 3 %

Community successional stage:

- [ ] NA
- [x] Early (herbaceous & seedlings)
- [ ] Mid (herbaceous, shrubs, saplings)
- [ ] Late (herbaceous, shrubs, mature trees)

Indicators:

- [ ] Mudcracks
- [x] Ripples
- [x] Drift and/or debris
- [x] Presence of bed and bank
- [x] Benches
- [ ] Soil development
- [ ] Surface relief
- [x] Other: Gravel bar
- [ ] Other: ______
- [ ] Other: ______

Comments:
Heavy flow at time of survey, Iris sp. along east bank.

Appendix C. Plant Species Observed

The table below includes a list of plant species observed within the BSAs during biological field surveys. No special-status plant species were observed.

Common Name	Scientific Name	Indicator[1]	Native (N)/ Non-Native (X)[2]
Plant Species			
Bay laurel	*Umbellularia californica*	FAC	N
Bur chevril	*Anthriscus caucalis*	NL	X
California man-root	*Marah fabacea*	NL	N
California pipevine	*Aristolochia californica*	NL	N
California sycamore	*Platanus racemosa*	FAC	N
California wild grape	*Vitis californica*	FACU	N
California wild rose	*Rosa californica*	FAC	N
Callery pear	*Pyrus calleryana*	NL	X
Common bedstraw	*Galium aparine*	FACU	N
Common vetch	*Vicia sativa ssp. nigra*	NL	X
Coyote brush	*Baccharis pilularis*	NL	N
Curly dock	*Rumex crispus*	FAC	X [Limited]
Elderberry shrub	*Sambucus mexicana*	NL	N
English ivy	*Hedera helix*	FACU	X [High]
Fremont cottonwood	*Populus fremontii*	NL	N
Himalayan blackberry	*Rubus armeniacus*	FAC	X [High]
Interior live oak	*Quercus wislizeni*	NL	N
Italian lords and ladies	*Arum italicum*	NL	X
Miner's lettuce	*Claytonia perfoliata*	FAC	N
Northern California black walnut	*Juglans hindsii*	FAC	N
Oregon ash	*Fraxinus latifolia*	FACW	N
Poison oak	*Toxicodendron diversilobum*	FACU	N
Shepherd's purse	*Capsella bursa-pastoris*	FACU	X
Silver bush lupine	*Lupinus albifrons*	NL	N
Sitka brome	*Bromus sitchensis*	NL	N
Spanish brome	*Bromus madritensis*	UPL	X
Valley oak	*Quercus lobata*	FACU	N
White alder	*Alnus rhombifolia*	FACW	N
White-stemmed filaree	*Erodium moschatum*	NL	X
Wild oat	*Avena fatua*	NL	X [Moderate]

[1] Species not listed (NL) on the NWPL are considered UPL indicator species
[2] California Invasive Plant Council

Appendix D. NRCS Soil Report

United States Department of Agriculture

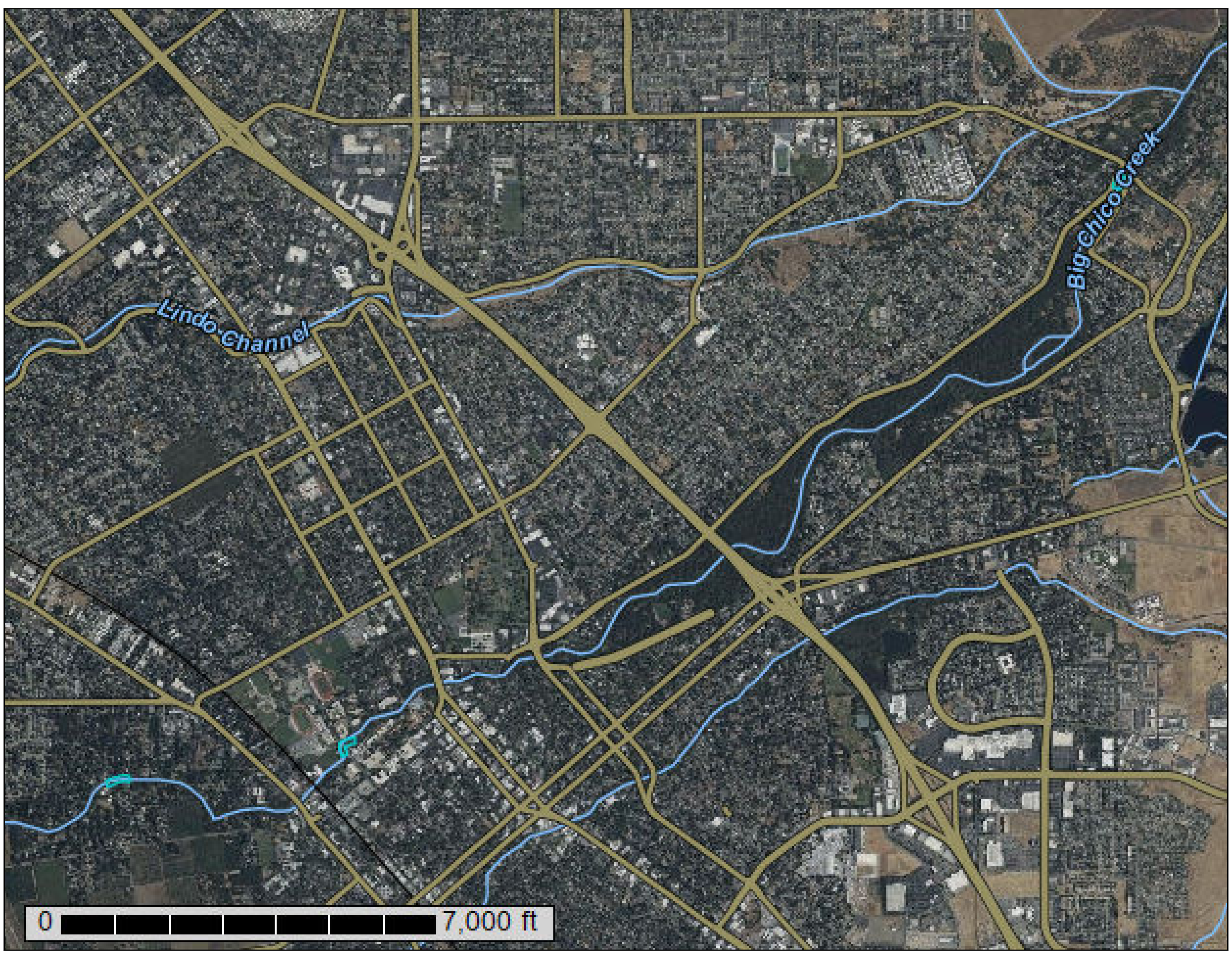
NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for

Butte Area, California, Parts of Butte and Plumas Counties



June 9, 2025

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 (https://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).

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

Preface.....2
How Soil Surveys Are Made.....5
Soil Map.....8
Soil Map.....9
Legend.....10
Map Unit Legend.....11
Map Unit Descriptions.....11
Butte Area, California, Parts of Butte and Plumas Counties.....13
300—Redsluff gravelly loam, 0 to 2 percent slopes.....13
425—Vina fine sandy loam, sandy substratum, 0 to 2 percent slopes, MLRA 17.....15
447—Charger fine sandy loam, 0 to 1 percent slopes.....17
References.....20

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 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.

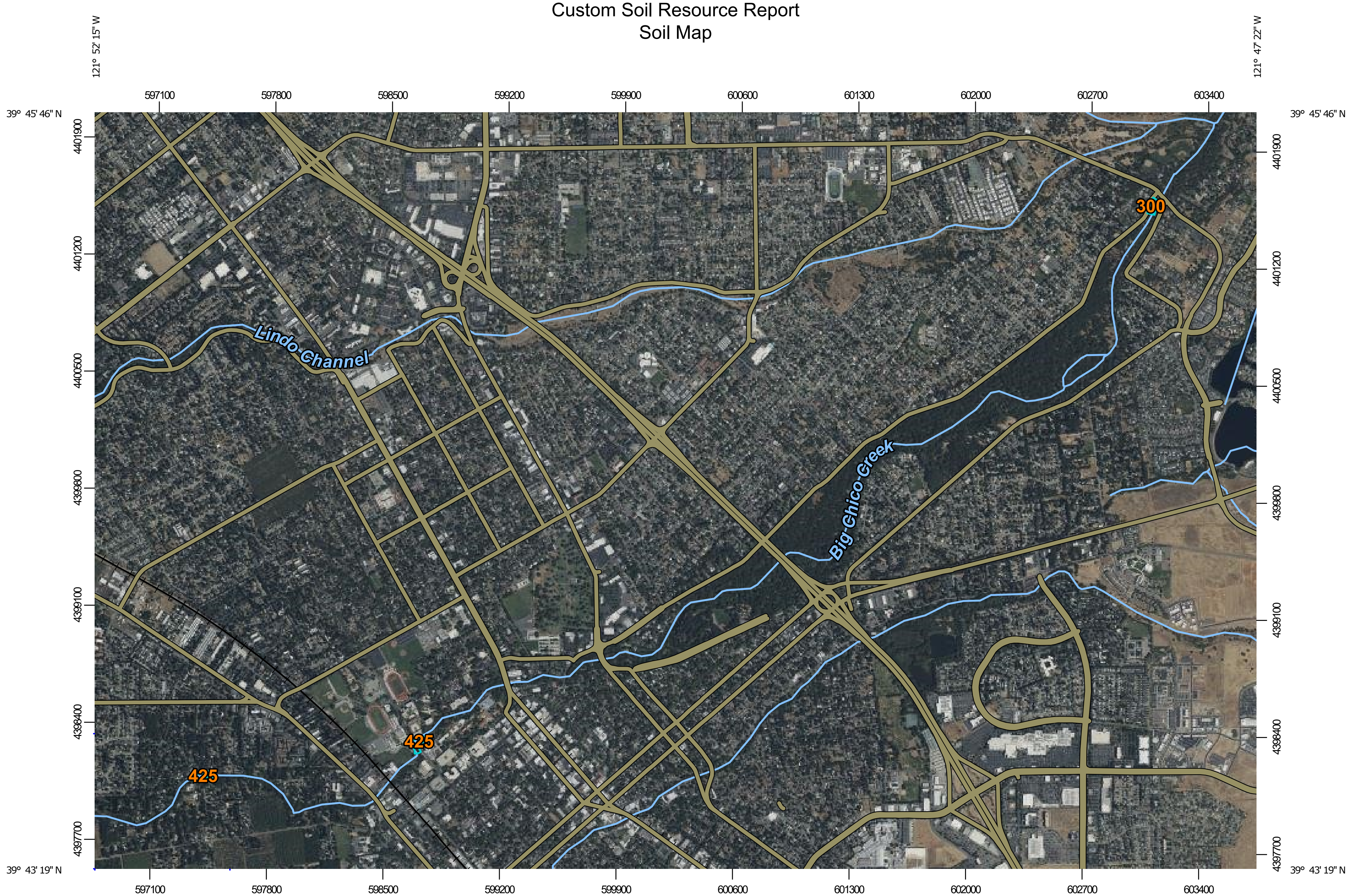
Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree 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: 1:31,900 if printed on A landscape (11" x 8.5") sheet.

Meters: 0, 450, 900, 1800, 2700

Feet: 0, 1500, 3000, 6000, 9000

N

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 10N 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:
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: Butte Area, California, Parts of Butte and Plumas Counties
Survey Area Data: Version 22, Sep 4, 2024

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

Date(s) aerial images were photographed: Jun 3, 2023—Sep 8, 2023

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

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
300	Redsluff gravelly loam, 0 to 2 percent slopes	0.3	10.3%
425	Vina fine sandy loam, sandy substratum, 0 to 2 percent slopes, MLRA 17	2.4	70.9%
447	Charger fine sandy loam, 0 to 1 percent slopes	0.6	18.8%
Totals for Area of Interest		**3.4**	**100.0%**

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 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.

Butte Area, California, Parts of Butte and Plumas Counties

300—Redsluff gravelly loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: hh0t
Elevation: 180 to 400 feet
Mean annual precipitation: 24 to 29 inches
Mean annual air temperature: 61 to 63 degrees F
Frost-free period: 250 to 255 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Redsluff, gravelly loam, and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Redsluff, Gravelly Loam

Setting

Landform: Fan remnants
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Fine-loamy alluvium derived from igneous, metamorphic and sedimentary rock over gravelly alluvium derived from volcanic rock

Typical profile

Ap - 0 to 2 inches: gravelly loam
Bt1 - 2 to 5 inches: gravelly loam
Bt2 - 5 to 12 inches: gravelly clay loam
Bt3 - 12 to 21 inches: gravelly loam
Bt4 - 21 to 29 inches: gravelly loam
Bt5 - 29 to 37 inches: gravelly loam
Bt6 - 37 to 42 inches: extremely gravelly sandy loam
Cq - 42 to 80 inches: extremely gravelly loamy sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.28 to 0.99 in/hr)
Depth to water table: About 35 to 80 inches
Frequency of flooding: Rare
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 0.5 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 5.5 inches)

Interpretive groups

Land capability classification (irrigated): 2s
Land capability classification (nonirrigated): 3s
Hydrologic Soil Group: C

Ecological site: R017XY904CA - Subirrigated Deep Alluvial Fans
Hydric soil rating: No

Minor Components

Unnamed, weak cementation below 40 inches

Percent of map unit: 4 percent
Landform: Fan remnants
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Fernandez, sandy loam

Percent of map unit: 4 percent
Landform: Fan remnants
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Typic haploxeralfs, very deep

Percent of map unit: 3 percent
Landform: Fan remnants
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Anita, gravelly duripan

Percent of map unit: 3 percent
Landform: Fan remnants
Landform position (two-dimensional): Summit, toeslope
Landform position (three-dimensional): Tread
Microfeatures of landform position: Swales
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: Yes

Redtough

Percent of map unit: 2 percent
Landform: Fan remnants
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Pachic argixerolls

Percent of map unit: 2 percent
Landform: Fan remnants
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Linear

Across-slope shape: Linear
Hydric soil rating: No

Munjar

Percent of map unit: 2 percent
Landform: Fan remnants
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

425—Vina fine sandy loam, sandy substratum, 0 to 2 percent slopes, MLRA 17

Map Unit Setting

National map unit symbol: 2w8b6
Elevation: 140 to 240 feet
Mean annual precipitation: 23 to 28 inches
Mean annual air temperature: 61 to 63 degrees F
Frost-free period: 245 to 255 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Vina, fine sandy loam, sandy substratum, and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Vina, Fine Sandy Loam, Sandy Substratum

Setting

Landform: Alluvial fans
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Coarse-loamy alluvium derived from igneous, metamorphic and sedimentary rock

Typical profile

Ap1 - 0 to 3 inches: fine sandy loam
Ap2 - 3 to 11 inches: fine sandy loam
A1 - 11 to 23 inches: sandy loam
A2 - 23 to 37 inches: sandy loam
C1 - 37 to 50 inches: sandy loam
C2 - 50 to 54 inches: loamy coarse sand
C3 - 54 to 80 inches: coarse sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches

Drainage class: Well drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (1.13 to 3.68 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Rare
Frequency of ponding: None
Calcium carbonate, maximum content: 2 percent
Maximum salinity: Nonsaline (0.2 to 1.0 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 6.4 inches)

Interpretive groups

Land capability classification (irrigated): 2s
Land capability classification (nonirrigated): 3c
Hydrologic Soil Group: A
Ecological site: R017XY904CA - Subirrigated Deep Alluvial Fans
Hydric soil rating: No

Minor Components

Almendra

Percent of map unit: 5 percent
Landform: Alluvial fans
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R017XY904CA - Subirrigated Deep Alluvial Fans
Hydric soil rating: No

Charger

Percent of map unit: 5 percent
Landform: Alluvial fans
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R017XY904CA - Subirrigated Deep Alluvial Fans
Hydric soil rating: No

Redsluff

Percent of map unit: 2 percent
Landform: Fan remnants
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Linear
Ecological site: R017XY904CA - Subirrigated Deep Alluvial Fans
Hydric soil rating: No

Unnamed, water table 40 to 80 inches

Percent of map unit: 2 percent
Landform: Alluvial fans
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear

Hydric soil rating: No

Xerofluvents

Percent of map unit: 1 percent
Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

447—Charger fine sandy loam, 0 to 1 percent slopes

Map Unit Setting

National map unit symbol: hgzf
Elevation: 180 to 600 feet
Mean annual precipitation: 24 to 28 inches
Mean annual air temperature: 61 to 63 degrees F
Frost-free period: 250 to 255 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Charger, fine sandy loam, and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Charger, Fine Sandy Loam

Setting

Landform: Alluvial fans
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Coarse-loamy alluvium derived from igneous, metamorphic and sedimentary rock over gravelly alluvium derived from volcanic and metamorphic rock

Typical profile

Ap - 0 to 3 inches: fine sandy loam
A1 - 3 to 7 inches: fine sandy loam
A2 - 7 to 15 inches: fine sandy loam
Bw1 - 15 to 32 inches: sandy loam
Bw2 - 32 to 42 inches: sandy loam
Bw3 - 42 to 53 inches: sandy loam
Bw4 - 53 to 63 inches: sandy loam
C - 63 to 80 inches: extremely gravelly loamy coarse sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained

Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High (2.27 to 4.25 in/hr)
Depth to water table: About 40 to 80 inches
Frequency of flooding: Rare
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 0.5 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 7.3 inches)

Interpretive groups

Land capability classification (irrigated): 2s
Land capability classification (nonirrigated): 3s
Hydrologic Soil Group: A
Ecological site: R017XY904CA - Subirrigated Deep Alluvial Fans
Hydric soil rating: No

Minor Components

Vina, fine sandy loam

Percent of map unit: 8 percent
Landform: Alluvial fans
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Redsluff

Percent of map unit: 5 percent
Landform: Fan remnants
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Unnamed, sandy-skeletal

Percent of map unit: 2 percent
Landform: Alluvial fans
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Unnamed, loamy-skeletal

Percent of map unit: 2 percent
Landform: Alluvial fans
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Almendra

Percent of map unit: 2 percent
Landform: Alluvial fans

Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Wafap

Percent of map unit: 1 percent
Landform: Stream terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

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

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

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

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

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

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

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

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

Appendix E. Representative Photographs

Photo 1. Representative photo of Big Chico Creek and its riparian forest, taken facing west from the pedestrian path on the Manzanita Pedestrian Bridge—approximately 100 feet south of the Manzanita Avenue and Vallombrosa Avenue intersection—looking downstream.
Photo taken February 2025.

Photo 2. Represenative photo of the erosion feature along the west bank of Big Chico Creek , taken facing west from the east bank. Photo taken February 2025.

Photo 3. Represenative photo of Big Chico Creek, showing conditions downstream of the erosion feature. Photo taken February 2025, facing southgwest.

Photo 4. Represenative photo of the erosion feature along the west bank of Big Chico Creek, taken facing east. Photo taken February 2025.