AQUATIC RESOURCE DELINEATION REPORT

Warner Street Bridge
Big Chico Creek Erosion Repair Project
Butte County, California

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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

USACE – United States Army Corps of Engineers

USFWS – United States Fish and Wildlife Service

Summary and Project Description

The City of Chico Department of Public Works (City) proposes to address erosion at a bridge crossing over Big Chico Creek, located within the City of Chico, in Butte County, California as part of the Big Chico Creek Erosion Repair Project (Project) (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 creek banks and bridge structures along Big Chico Creek, causing future risk of significant damage to nearby public facilities.

The Project will repair structural deficiencies and bank erosion and scour at the Warner Street Bridge. The Warner Street bridge is situated on the Chico State University campus, between Legion Avenue and West 1st Street. Proposed repairs include the installation of rock slope protection along the creek banks and in the creek itself, as well as the restoration and reinforcement of scoured areas at the Warner Street bridge.

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 July 30th, 2024. 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 at a bridge crossing over Big Chico Creek, located 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, at a bridge crossing over Big Chico Creek, within the Chico United States Geological Survey 7.5-minute topographic quadrangle (Appendix A. Project Location and Features Exhibits). The Warner Street bridge is situated on the Chico State University campus, about 0.14 miles northwest of the intersection of W 1st Street and Ivy Street. Within the BSA, the elevation ranges between approximately 190 to 205 feet above mean 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 BSA totals approximately 1.77 acres and encompasses an approximate 370-foot segment of Big Chico Creek that flows from east to west within the BSA (see Appendix A).

2.1 Directions to Site

Warner Street Bridge

This bridge is located on the Chico State University campus, is located 0.14 miles northwest of the intersection of W 1st Street and Ivy Street (39.7288964812, -121.848448364). To get to Warner Street Bridge from SR-99, follow these directions:

- Start on SR-99 North
- Use the right two lanes to take exit 386 for E 1st Avenue
- Turn left onto E 1st Avenue, then drive southwest for 1.4 miles
- Turn left onto Warner Street
- Drive southeast on Warner Street for 0.5 miles and arrive at Warner Street over Big Chico Creek

Chapter 3. Delineation Methods

The jurisdictional delineation was conducted by Dokken Engineering biologists Jeff Harris and Scott Salembier on July 30th, 2024. 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 2024). 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 2024). 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 2024).

The elevation within the BSA ranges from approximately 190 to 205 feet above mean sea level, with predominantly flat topography throughout. According to the Natural Resource Conservation Service (NRCS), 100% of the soil 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 2024; Appendix D. NRCS Soil Report).

4.2 Land Cover Types

Land cover types within the BSA include riparian forest, road, and urban/developed land. Big Chico Creek is the only jurisdictional feature identified within the BSA. Plant and wildlife species observed within the BSA during the July 30th, 2024, biological survey efforts were used to define habitat types based on composition, abundance, and cover (Appendix C. Plant Species Observed).

Riparian Forest

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 riparian tree species such as southern catalpa (*Catalpa bignonioides)*, Fremont cottonwood (*Populus fremontii)*, California sycamore (*Platanus racemosa),* valley oak (*Quercus lobata*), Northern California black walnut (*Juglans hindsii)* and white alder (*Alnus rhombifolia*).

The understory near the Warner Street Bridge consists of a mix of California wild grape (*Vitis californica*), dallis grass (*Paspalum dilatatum*), black locust (*Robinia pseudoacacia*), prickly lettuce (*Lactuca serriola*), and Himalayan blackberry.

The BSA contains approximately 0.55 acres (~31% of the BSA) of riparian forest.

Road

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 the paved surface of Warner Street.

The BSA contains approximately 0.35 acres (~20% of the BSA) of road.

Urban/Development

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

The BSA contains approximately 0.62 acres (~35% of the BSA) of urban/developed land.

4.3 Jurisdictional Resources

Based on field survey results, the Chico United States Geological Survey 7.5-minute quadrangle topographic map, and the United States Fish and Wildlife Service (USFWS) National Wetland Inventory (USFWS 2024), 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 Warner Street, eventually converging with the Sacramento River about 5 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 2024). Its riverbed is composed of pebbles, cobbles, and small boulders.

The riverbed beneath the Warner Street bridge 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 370 linear feet of perennial stream channel (Waters of the US and State) with an average width of 30 feet, comprising approximately 0.31 acres (~18% of the BSA) of Big Chico Creek.

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).

Summary of Potential Waters of the United States

Waters					
Label	Type	Cowardin Type	Location (UTMm)	Area (ac)	Length (ft)
SC-2	Perennial Channel	R3UB	10N 3642366 m N 1052855 m E	0.31	370
Total Potential Waters of the United States				**0.31**	**370**

V:\2833 Chico On Call Structural Engineering\Biology\ARDR Warner.mxd

Coordinate System: NAD 1983 UTM Zone 10
Projection: Tranverse Mercator
Datum: North American 1983

1 inch = 50 feet

0 25 50 75 100 125 Feet

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Chico, CA 95928

Delineator: Scott Salembier, Jeff Harris
Delineation Date: July 30th, 2024
Aerial Photography Source: Google Earth, 2024
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.

Aquatic Resources Delineation Map

Warner Street Bridge
Big Chico Creek Erosion Repair Project
City of Chico, California

Aquatic Resources within the BSA

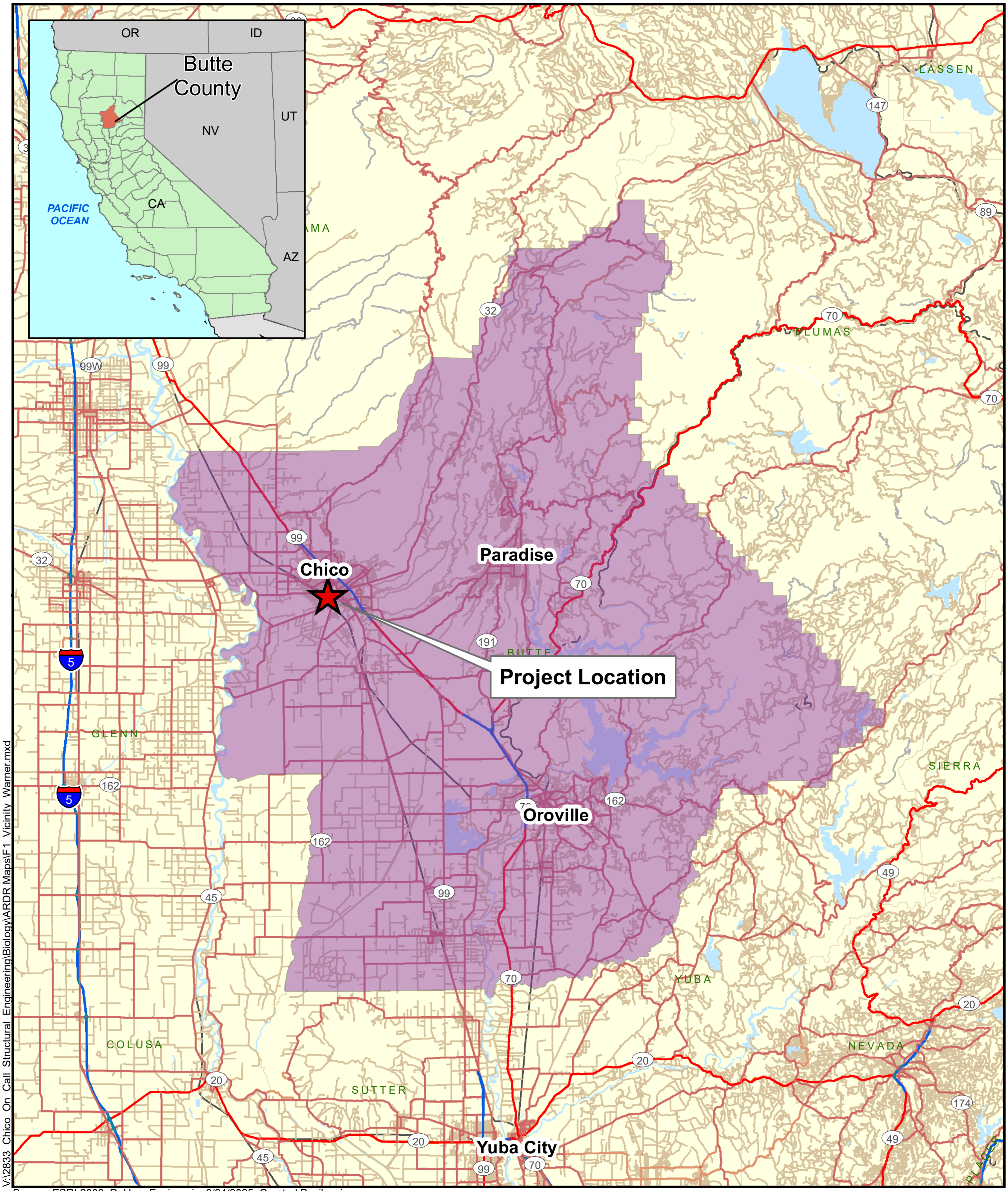
Site Coordinates (decimal degrees)	Aquatic Resource	Classification[2]	Aquatic Resource Size (acre)	Aquatic Resource Size (linear feet)
39.72889 N -121.84844 W	Big Chico Creek (SC-2)	R3UB (Unconsolidated Bottom, Upper Perennial, Riverine)	0.31	370
		Total	**0.31**	**370**

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

Chapter 5. References

BCCER 2024	Big Chico Creek Ecological Reserve 2024. The Big Chico Creek Watershed. Available at: <https://www.csuchico.edu/bccer/natural-resources/watershed.shtml> (accessed 12/12/2024)
Cowardin et. al. 1979	Cowardin et.al. 1979. Classification of Wetlands and Deepwater Habitats of the United States.
Jepson 2024	Jepson eFlora. 2024. Geographic subdivisions. Available at: <https://ucjeps.berkeley.edu/eflora/geography.html> (accessed 10/1/2024).
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 2024	Natural Resource Conservation Service. 2024. Custom Soil Resources Report for Butte County, California Western Part. Available at: <https://websoilsurvey.sc.egov.usda.gov/App/> (accessed 10/1/2024).
U.S. Climate Data 2024	United States Climate Data. 2024. Chico Weather Averages. Available at: <https://www.usclimatedata.com> (accessed 10/1/2024).
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 2024	United States Fish and Wildlife Service. 2024. National Wetland Inventory. Available at <https://www.fws.gov/wetlands/data/mapper.html> (accessed 10/1/2024)

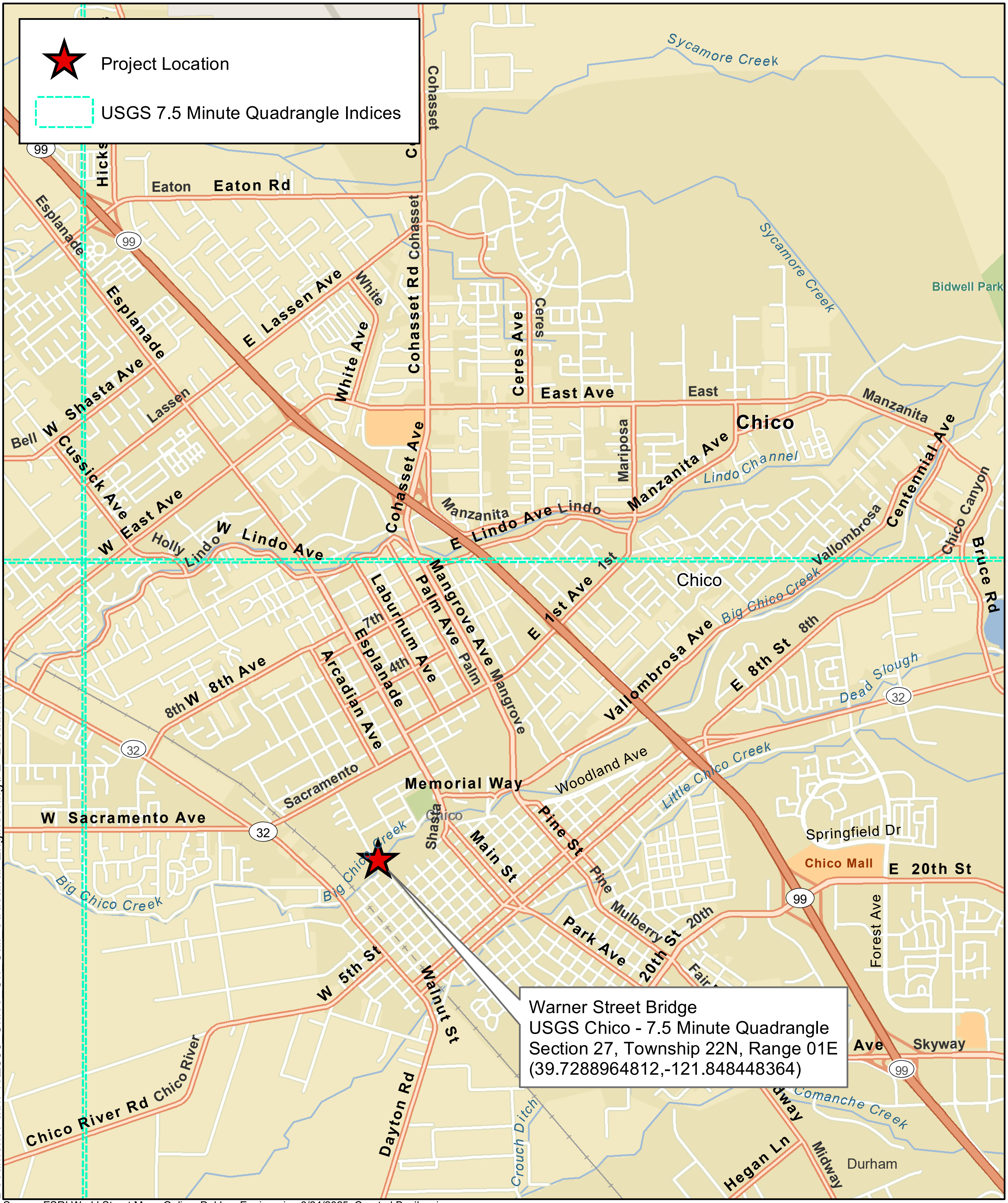
Appendix A. Project Location and Features Exhibits



Source: ESRI 2008; Dokken Engineering6/24/2025; Created By: jharris

0 5 10 15 Miles

FIGURE 1
Project Vicinity
Warner Street Bridge
Big Chico Creek Erosion Repair Project
City of Chico, Butte County, California



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

0 0.5 1 1.5 2 Miles

FIGURE 2
Project Location
Warner Street Bridge
Big Chico Creek Erosion Repair Project
City of Chico, Butte County, California

V:\2833_Chico_On_Call_Structural_Engineering\Biology\F3_Project Features Warner.mxd

Source: ESRI Maps Online; Dokken Engineering 2/5/2025; Created By: jharris

1 inch = 50 feet

0 40 80 120 160 200 Feet

Figure 3
Project Features

Warner Street Bridge
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 : SC-2
Investigator(s): Jeff Harris, Scott Salembier

Date: 7/30/2024
Town: Chico
Photo begin file#: N/A

Time: 11:15 AM
State: CA
Photo end file#: N/A

Y [x] / N [ ] Do normal circumstances exist on the site?

Y [ ] / N [x] Is the site significantly disturbed?

Location Details: Intersection of Warner Street & Big Chico Creek

Projection: Transverse Mercator **Datum:** NA 1983
Coordinates: 39.72889, -121.84844

Potential anthropogenic influences on the channel system:
Urban Development / Chico state university. Removal of native vegetation to accomodate landscaped/ornamental vegetation for the university resulted in increased bank erosion/channel incision.

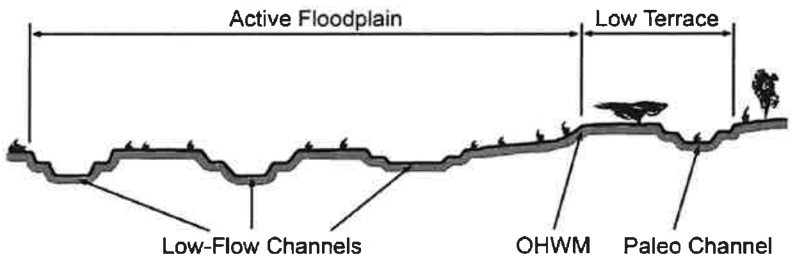
Brief site description: Perrenial creek, flows east to west under the Warner Street Bridge. Light flow during time of survey. Northeastern bank eroding. Large terrace under the southern half of the bridge

Checklist of resources (if available):

- [x] Aerial photography
  Dates:
- [x] Topographic maps
- [ ] Geologic maps
- [ ] Vegetation maps
- [x] Soils maps
- [ ] Rainfall/precipitation maps
- [ ] Existing delineation(s) for site
- [x] 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

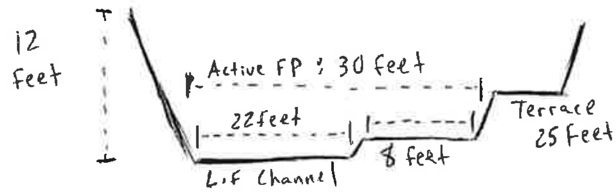


Procedure for identifying and characterizing the floodplain units to assist in identifying the OHWM:

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
   - [x] GPS
   - [ ] Other:

Project ID: 2833 **Cross section ID:** 1 **Date:** 7/30/2024 **Time:** 11:15 AM

Cross section drawing:



OHWM

GPS point: 39.72892, -121.84831

Indicators:

- ☐ Change in average sediment texture
- ☐ Change in vegetation species
- ☐ Change in vegetation cover
- ☐ Break in bank slope
- ☑ Other: Active floodplain
- ☑ Other: Change in particle size distribution

Exposed root hairs below intact soil layer.

Comments:

Northern bank showing erosion east of bridge. West of bridge the northern bank is reinforced with Rock slope protection. Large terrace from the southern abutment to central pier.

Floodplain unit: ☑ Low-Flow Channel ☐ Active Floodplain ☐ Low Terrace

GPS point: 39.72890, -121.84829

Characteristics of the floodplain unit:

Average sediment texture: Pebble / Cobble

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

Community successional stage:

- ☑ NA
- ☐ Early (herbaceous & seedlings)
- ☐ Mid (herbaceous, shrubs, saplings)
- ☐ Late (herbaceous, shrubs, mature trees)

Indicators:

- ☐ Mudcracks
- ☐ Ripples
- ☑ Drift and/or debris
- ☑ Presence of bed and bank
- ☐ Benches
- ☐ Soil development
- ☐ Surface relief
- ☑ Other: Scour holes downstream of obstructions
- ☐ Other: ____________
- ☐ Other: ____________

Comments:

Project ID: 2833 **Cross section ID:** 1 **Date:** 7/30/2024 **Time:** 11:15 AM

Floodplain unit: ☐ Low-Flow Channel ☑ Active Floodplain ☐ Low Terrace

GPS point: 39.72886, -121.84825

Characteristics of the floodplain unit:

Average sediment texture: Pebble/Cobble

Total veg cover: 60 % Tree: 25 % Shrub: 25 % Herb: ____ %

Community successional stage:

- ☐ NA
- ☐ Early (herbaceous & seedlings)
- ☑ Mid (herbaceous, shrubs, saplings)
- ☐ Late (herbaceous, shrubs, mature trees)

Indicators:

- ☐ Mudcracks
- ☐ Ripples
- ☑ Drift and/or debris
- ☑ Presence of bed and bank
- ☐ Benches
- ☐ Soil development
- ☐ Surface relief
- ☑ Other: Gravel Sheets
- ☐ Other: ____
- ☐ Other: ____

Comments:

Floodplain unit: ☐ Low-Flow Channel ☐ Active Floodplain ☑ Low Terrace

GPS point: 39.72882, -121.84819

Characteristics of the floodplain unit:

Average sediment texture: Pebble/Granule

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

Community successional stage:

- ☑ NA
- ☐ Early (herbaceous & seedlings)
- ☐ Mid (herbaceous, shrubs, saplings)
- ☐ Late (herbaceous, shrubs, mature trees)

Indicators:

- ☐ Mudcracks
- ☐ Ripples
- ☑ Drift and/or debris
- ☐ Presence of bed and bank
- ☐ Benches
- ☐ Soil development
- ☐ Surface relief
- ☑ Other: Depositional topography
- ☐ Other: ____
- ☐ Other: ____

Comments:

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			
Arroyo willow	*Salix exigua*	FACW	N
Black locust	*Robinia pseudoacacia*	FACU	X [Limited]
Common nightshade	*Solanum americanmun*	FACU	N
Boxelder	*Acer negundo*	FACW	N
Bur chevril	*Anthriscus caucalis*	NL	X
Buttonbush	*Cephalanthus occidentalis*	OBL	N
California mugwort	*Artemisia douglasiana*	FAC	N
California pipevine	*Aristolochia californica*	NL	N
California wild grape	*Vitis californica*	FACU	N
California wild rose	*Rosa californica*	FAC	N
Canada horseweed	*Erirgeron canadensis*	FACU	N
Coast redwood	*Sequoia sempervirens*	NL	N
Common fig	*Ficus carica*	FACU	X [Moderate]
Curly dock	*Rumex crispus*	FAC	N
Dallis grass	*Paspalum dilatatum*	FAC	X
Devil’s beggartick	*Bidens frondosa*	FACW	N
Dogtail grass	*Cynosurus echinatus*	FACU	X [Moderate]
Elderberry shrub	*Sambucus mexicana*	FACU	N
English Ivy	*Hedera helix*	FAC	X [High]
Fremont cottonwood	*Populus fremontii*	FAC	N
Common mullein	*Verbascum thapsus*	FACU	X [Limited]
Himalayan blackberry	*Rubus armeniacus*	FAC	X [High]
Sweetgum	*Liquidambar styraciflua*	FAC	X
Loquat	*Eriobotrya japonica*	UPL	X
White mulberry	*Morus alba*	FACU	X
Mulefat	*Baccharis salicifolia*	FAC	N
Narrow leaf milkweed	*Asclepias fascicularis*	FAC	N
Northern California black walnut	*Juglans hindsii*	UPL	N
Oleander	*Nerium oleander*	NL	X
Persian silk tree	*Albizia julibrissin*	NL	X
American pokeweed	*Phytolacca americana*	FAC	X
Prickly lettuce	*Lactuca serriola*	FACU	X
Raspberry	*Rubus idaeus*	FACU	N
Southern catalpa	*Catalpa bignonioides*	UPL	X
Stinging nettle	*Urtica dioica*	FAC	N
Straw-colored flatsedge	*Cyperus strigosus*	FACW	N
California sycamore	*Platanus racemosa*	FAC	N
Tall flatsedge	*Cyperus exaltatus*	FACW	N
Tree-of-heaven	*Ailanthus altissima*	FACU	X [Moderate]

Tree privet	*Ligustrum lucidum*	NL	X [Limited]
Valley oak	*Quercus lobata*	FACU	N
White alder	*Alnus rhombifolia*	FACW	N
White sweetclover	*Melilotus albus*	NL	X
Wild oat	*Avena fatua*	UPL	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

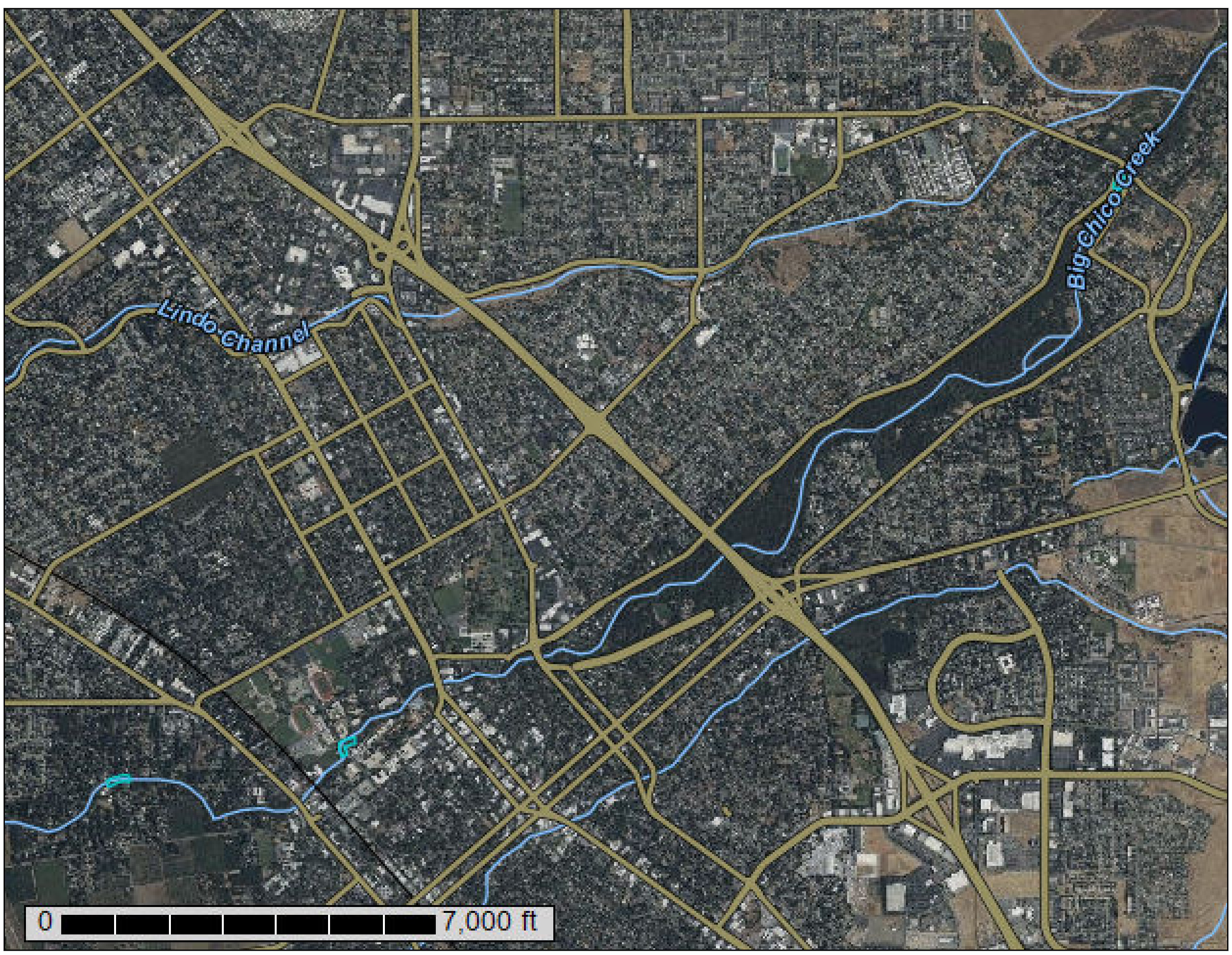
United States Department of Agriculture

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.

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Contents

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.

Soil Map


121° 52' 15" W
121° 47' 22" W
39° 45' 46" N
39° 43' 19" N
597100
597800
598500
599200
599900
600600
601300
602000
602700
603400
4401900
4401200
4400500
4399800
4399100
4398400
4397700
Lindo Channel
Big Chico Creek
300
425
425
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

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Appendix E. Representative Photographs

Photo 1. Represenative photo of Big Chico Creek at the Warner Street Bridge (SC-2) location, taken facing east, looking upstream. Photo taken July 2024.

Photo 2. Represenative photo of Big Chico Creek at the Warner Street Bridge (SC-2) location , taken facing west, looking downstream. Photo taken July 2024.