Appendix F
Waters of the US Delineation Report

RECLAMATION

Managing Water in the West

Waters of the U.S. Delineation

East Sand Slough Restoration Project

Tehama County, California

U.S. Department of the Interior
Bureau of Reclamation

September 2018

Mission Statements

The mission of the Department of the Interior is to protect and provide access to our Nation's natural and cultural heritage and honor our trust responsibilities to Indian Tribes and our commitments to island communities.

The mission of the Bureau of Reclamation is to manage, develop, and protect water and related resources in an environmentally and economically sound manner in the interest of the American public.

Table of Contents

1.0 Request for delineation verification 1
2.0 Project and Study Area Location 1
1.1 Directions to the Site and Access Considerations 1
1.2 Property Owner Information 2
3.0 Project Background 2
3.1 Red Bluff Diversion Dam Fish Passage Improvement Project 2
4.0 Jurisdictional Authorities and Regulated Activities 2
4.1 Rivers and Harbors Act of 1899 3
4.2 Clean Water Act 5
4.3 Regulated Activities 5
5.0 Study Area Description 5
5.1 Topography and Bathymetric Characteristics 5
5.2 Geology and Soils 5
5.3 Aerial Imagery 6
5.4 Vegetation Communities 6
5.5 Local Climate 7
5.6 Hydrology 7
5.7 National Wetlands Inventory 8
6.0 Field Methods 9
7.0 Results 10
7.1 Riverine 16
7.2 Palustrine Seasonal Wetlands 16
7.3 Scrub-Shrub Riparian Wetland 16
7.4 Forested Riparian Wetland 16
7.5 Ephemeral Drainage 16
8.0 Conclusion and Request for a Jurisdictional Determination 16
9.0 References 18

Figures

Name	Description	Page
Figure 1	Vicinity Map	4
Figure 2	Waters of the U.S. Delineation Map	15

Tables

Name	Description	Page
Table 1	Study Area Location	1
Table 2	Property Owner and Applicant Information	2
Table 3	Overview of Waters of the U.S. in the Study Area	11

Attachments

Name	Description
Attachment 1	East Sand Slough Restoration Waters of the U.S. delineation maps
Attachment 2	LiDAR Imagery
Attachment 3	Soil Survey Information
Attachment 4	2005, 2010, 2012, and 2016 NAIP Imagery
Attachment 5	Botanical Survey Report
Attachment 6	National Wetlands Inventory Map
Attachment 7	Data Sheets
Attachment 8	Site Visit Photographs
Attachment 9	Aerial Photography

1.0 Request for delineation verification

The Bureau of Reclamation (Reclamation) requests a preliminary jurisdictional determination (PJD) for the East Sand Slough Restoration Waters of the U.S. delineation maps (Attachment 1). Reclamation understands that all delineated waters in the Study Area will be considered jurisdictional under a PJD, per *Regulatory Guidance Letter 16-01* (USACE, 2016b).

2.0 Project and Study Area Location

The Study Area is located along the east bank of the Sacramento River, east of Interstate 5, in the City of Red Bluff and the surrounding region in Tehama County, California. The site can be seen on the Red Bluff East, California 7.5-Minute U.S. Geological Survey (USGS) Quadrangle. The 372.98-acre Study Area for the delineation of waters of the U.S. includes potential access routes to East Sand Slough from Sale Lane, and potential staging and stockpile areas in the Red Bluff Recreation Area. The primary work areas include the entire East Sand Slough side channel, starting at the upstream confluence with the Sacramento River to approximately 3,400 feet upstream of the old Red Bluff Diversion Dam (RBDD).

Table 1. Study Area Location

Study Area Center Coordinates (NAD 83)	
Latitude	Longitude
40°10’12.06 N	122°13’12.17 W
UTM	
10T 566431m E 4447201m N	
USPLS	
Section 17, Township 27 North, Range 3 West, MDB&M Section 20, Township 27 North, Range 3 West, MDB&M Section 28, Township 27 North, Range 3 West, MDB&M	
USGS 7.5-Min Quadrangle Name: Red Bluff East, California	

1.1 Directions to the Site and Access Considerations

From the Corps of Engineers field offices at 310 Hemsted Drive in Redding, California or 1325 J Street in Sacramento, California, take Interstate 5 to Exit 649, Antelope Boulevard, in Red Bluff. For access to the Study Area north of Antelope Boulevard, take Sale Lane north and park in the northwestern edge of the fast food parking lot at 200 Antelope Boulevard. A foot trail begins from the parking lot at 40°11'1.49"N, 122°13'16.14"W and provides access to the Study Area north of Antelope Boulevard bridge. To access the downstream part of the Study Area, take Sale Lane south from Antelope Boulevard and park in the paved lot west of Sale Lane at 40° 9'47.94"N, 122°12'46.96"W. From the lot, hiking trails provide access to and around the Study Area. Coordinate with Jane Dolan, Sacramento River Forum (see contact information below), at least a few days prior to access to make sure all land owners are informed about anticipated access.

1.2 Property Owner Information

The Study Area is located on property owned and managed by the United States Forest Service. The Bureau of Reclamation, having interest in improving the status of special-status species that influence water delivery and management in the Sacramento Valley, is the applicant.

Table 2. Property Owner and Applicant Information

Property Owners:	Applicant:	Technical Assistance:
U.S. Forest Service Attn: Christine Hill Mendocino National Forest 825 N. Humboldt Ave Willows, CA 95988 (530) 934-3316 Durango RV Park and City of Red Bluff – contact Jane Dolan for access questions at: (530) 528-7435; Jane.dolan@water.ca.gov	John Hannon, Fish Biologist Bureau of Reclamation Bay-Delta Office 801 I Street, Suite 140 Sacramento, CA (916) 414-2413	Luke Davis, Natural Resources Specialist Bureau of Reclamation Bay-Delta Office 801 I Street, Suite 140 Sacramento, CA (916) 414-2429

3.0 Project Background

3.1 Red Bluff Diversion Dam Fish Passage Improvement Project

The slough was historically inundated during summertime irrigation as a result of the operation of the downstream RBDD control gates, but since the operation of these gates ceased in 2012, the area is no longer seasonally inundated on a predicted schedule. East Sand Slough now becomes inundated with Sacramento River flows that are high enough to flow over the upstream end of East Sand Slough.

There is an existing mitigation site on the west bank of the Sacramento River, downstream of the proposed project site and confluence of East Sand Slough with the Sacramento River. This mitigation project excavated a channel to provide year-round flow and additional aquatic habitat, to mitigate for the construction of the Red Bluff Pumping Plant that was installed when the RBDD was decommissioned.

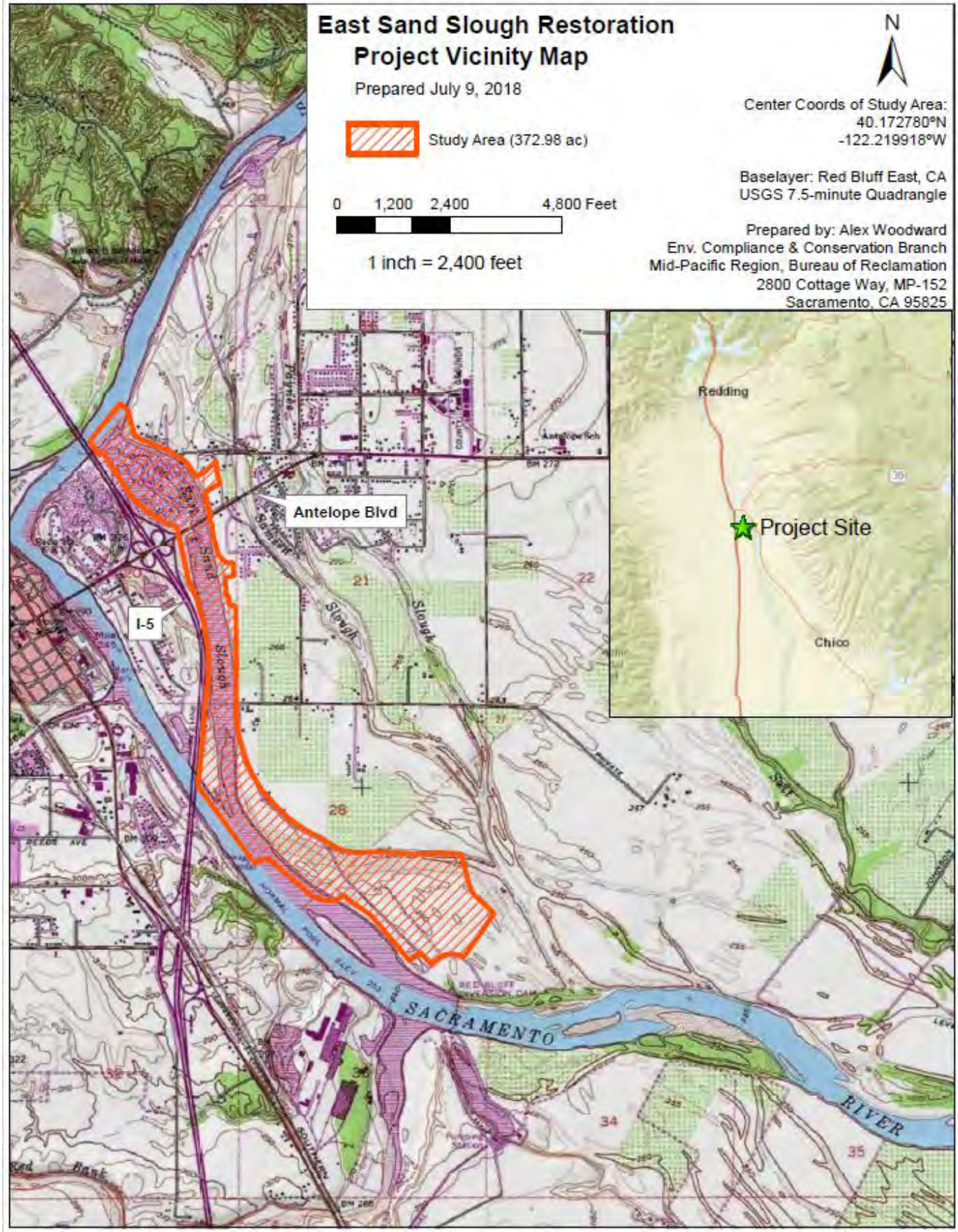
The proposed project for which this delineation report was prepared is the reconnection of East Sand Slough on a permanent basis, so that water flows through the side channel year-round, including during the lowest flow period of late fall and early winter, when this type of habitat is needed most by juvenile winter-run Chinook salmon.

4.0 Jurisdictional Authorities and Regulated Activities

4.1 Rivers and Harbors Act of 1899

The Sacramento River is designated as a Section 10 waterway from its mouth to Keswick Dam, northwest of Redding. East Sand Slough is an overflow side channel on the Sacramento River and is also a navigable waterway under Section 10. The Sacramento River was designated by the U.S. Army Corps of Engineers (USACE) as a navigable river based on the procedure described in 33 CFR Part 329. Section 10 of the Rivers and Harbors Act of 1899 (33 USC 403) prohibits the building of structures, excavation, or fill that modifies the course, location, condition or capacity of a channel of any navigable river in the U.S., unless the work has been recommended by the USACE. Section 10 jurisdiction would occur over the entire bed of the river, extending laterally to the entire water surface and bed of a navigable water body, which includes all the land and waters below the ordinary high water mark (OHWM).

Figure 1. Project Vicinity Map



4.2 Clean Water Act

The Clean Water Act encompasses Section 10 waters, plus their tributaries and adjacent wetlands where the use, degradation or destruction of such waters could affect interstate or foreign commerce. Section 404 of the Clean Water (33 USC 1344) Act would also apply to activities in the Sacramento River and East Sand Slough at this location (33 CFR 328).

4.3 Regulated Activities

The proposed activity would involve the reconnection and restoration of the East Sand Slough side channel to the Sacramento River for the benefit of salmonid rearing and spawning habitat. This would involve excavation, hauling, and depositing gravel, sand and other fine material below the OHWM of East Sand Slough and the Sacramento River, and wetlands above and below the OHWM. These activities will require a permit from the Corps to authorize activities under Section 10 of the Rivers and Harbors Act and Section 404 of the Clean Water Act.

5.0 Study Area Description

The 372.98-acre Study Area includes the full extent of East Sand Slough from its upstream to downstream confluence with the Sacramento River. The southern end of the Study Area also includes a large part of the Red Bluff Recreation Area to the southeast, which can be accessed by public hiking trails. The Study Area does not include the area of the Red Bluff Diversion Dam Fish Passage Improvement Project Mitigation Site further southeast along the Sacramento River. Figure 1 illustrates the Study Area for this report.

5.1 Topography and Bathymetric Characteristics

East Sand Slough is approximately 1.6 miles long and ranges from 400 yards wide at the upstream end, down to 115 yards wide at the downstream end. Elevation ranges from 244 to 278 above mean sea level. Attachment 2 contains a LiDAR imagery from DWR (2010) and NOAA Fisheries (2017) for the site. On the most upstream end of the slough (above the Antelope Street bridge), the topography is variable, with higher areas of riparian forest, and a primary channel that runs along the east bank of the slough, and a secondary channel closer to the west bank. The secondary channel is braided where it flows in from the Sacramento River and the inlet elevation is approximately 5 feet higher than when the secondary channel becomes formed from the braided channels. Downstream of the Antelope Street bridge, the slough transitions to a wide, flat channel with little topographic variation.

5.2 Geology and Soils

There are nine soil units in the Study Area. Those most closely associated with the channel include the Columbia fine sandy loam (CmA), Columbia complex (Cu), riverwash (Rw), and water (W). The portion of the Study Area along the western edge of the Sacramento River includes Columbia silt loam (CsA), Newville gravelly loam (NrE), Red Bluff loam (Rb), Redding gravelly loam (RnB), and Tehama gravelly loam (Tb), all associated with a 0 to 8 percent slope, except for NrE which is associated with 10 to 40 percent slopes. These soil types

all derive from alluvium parent material, and are associated with floodplain, drainageway, fan remnants, or stream terrace landforms. Attachment 3 includes a soil map and the soil unit descriptions.

Of the soil units onsite, Columbia fine sandy loam, Columbia complex, and riverwash have hydric soil ratings and are on the National List of Hydric Soils (NRCS, 2015). The depth to the restrictive feature is greater than 80 inches for all soil types in the Study Area, except for Redding gravelly loam, which features an abrupt textural change at 19 inches depth and duripan at 20-39 inches depth.

Descriptions for soils observed in the wetland features in the field are detailed in Section 7.

5.3 Aerial Imagery

Digital, color aerial imagery is publicly available from the National Agriculture Inventory Project (NAIP) on ArcGIS for years 2005, 2010, 2012, and 2016 (Attachment 4). Metadata from the base map layers through ArcGIS Online indicate that the aerial imagery covering the Study Area was flown on the following dates: June 30, 2005, July 20, 2010, July 3, 2012, and January 1, 2016. The World Imagery base map from ArcGIS Online was also updated with imagery flown on October 26, 2017, which represents fall vegetation after a very wet winter from earlier in the year that ended a six-year drought. The 2005 imagery also represents peak vegetation conditions after a wet spring, but when the RBDD gates were still in operation and caused water to backflow into East Sand Slough.

5.4 Vegetation Communities

Eleven general vegetation communities were mapped in the Study Area (GIC 2016): *Artemisia douglasiana* (California mugwort) – provisional; Barren, Gravel, Sand; California Introduced Annual and Perennial Herbaceous; California Warm Temperate Marsh/Seep; Naturalized Warm-Temperature Riparian/Wetland; *Populus fremontii* (Fremont cottonwood); *Quercus lobata* (Valley oak); *Salix exigua* (Narrowleaf willow); and *Salix gooddingii* (Gooding's black willow).

A botanical report prepared for the project is included in Attachment 5.

The lower elevation low-flow channels are predominantly covered by a barren, gravel, and sand alliance and lack a definitive vegetation layer. The long low-flow channels are exposed and barren when Sacramento River flows are low. Surrounding this layer, much of the Study Area is a California Introduced Annual and Perennial Herbaceous alliance. This alliance also makes up the large majority of vegetation communities in the Red Bluff Recreation Area part of the Study Area. This area was determined to be upland, except for an ephemeral drainage feature, which consists of the same alliance with some willows. A California Warm Temperate Marsh/Seep alliance exists in the northeastern interior, centered around 40°11'04.49 N, 122°13'25.73 W, in a forested wetland. A Naturalized Warm-Temperate Riparian/Wetland alliance exists along the southern edge, and at a portion of the eastern edge, in higher elevation, around 40°10'34.58, N 122°13'09.27 W.

A *Salix exigua* (Narrowleaf willow) alliance is present along the edges of the OHWM and around scrub-shrub or forested wetlands, in parts of the northeastern and eastern, interior, and southern parts of the Study Area. In the northern portion, northwestern edge, and border of the OHWM in the downstream section of the Study Area, large regions of *populus fremontii* (Fremont cottonwood) exist. A small region of *Salix gooddingii* exists in the northeastern edge and a small region of *Artemisia douglasiana* (California mugwort) exists near the southwestern edge of the Study Area, closer to the East Sand Slough's downstream confluence with the Sacramento River.

California Introduced Annual and Perennial Herbaceous alliance habitat occurs within the majority of the terrace, active floodplain, and upland portions of the Study Area. Common species observed in these alliances include Bromus diandrus, *Avena barbata, Brassica nigra, Bromus madritensis* ssp. *rubens, Festuca perennis,* and *Brassica rapa*.

In most reaches of the Study Area, riparian habitat alliances exist as along the Sacramento River and in scattered patches on the lower terrace and banks of the slough. *Populus fremontii, Salix exigua,* California Warm Temperate Marsh/Seep, *Artemisia douglasiana* – provisional, and Naturalized Warm-Temperate Riparian/Wetland alliance habitats occur interspersed with one another, and either below or within close proximity to the OHWM. Common species observed in these alliances include *Populus fremontii, Quercus lobata, Platanus recemosa, Acer negundo, Fraxinus latifolia,* and *Juglans hindsii*. The understory contains *Salix lasiolepis, Salix exigua, Salix laevigata, Sambucus nigra* ssp. *caerulea,* and *Rubus armeniacus*.

5.5 Local Climate

The Study Area is in a Mediterranean climate with extreme lows not going below 17 degrees Fahrenheit and extreme highs not going above 121 degrees Fahrenheit, based on temperature records between 1933 and 2010 (WRCC, 2018). Red Bluff, California, has a frost-free period between May and October, with an average of 21 days between November and April where temperatures freeze overnight. Precipitation in the area averages 22 to 24 inches per year in a normal year. The most recent storm event and resulting high Sacramento River flows as measured at the USGS 11377100 gage (Sac River AB Bend Bridge near Red Bluff, CA) occurred on April 7, 2018, reaching 52,200 cubic-feet per second (cfs). This gage is located approximately 11 river miles upstream of the Study Area, so flows were likely slightly higher at the Study Area. Low-flow conditions existed on the Sacramento River during the field survey from April 30, 2018 to May 3, 2018, lows as measured at the USGS 11377100 gage, reaching 8,400 cfs. There were no active flows through East Sand Slough during the survey, but water remained in isolated pools in low points of the channel as remnant water from the high flow event earlier that month.

5.6 Hydrology

The Sacramento River is a perennial waterway that drains the northern part of the Central Valley and its watershed covers 27,210 square miles. Its headwaters are at the junction of the Middle Fork Sacramento River and South Fork Sacramento River about 5.5 miles west-southwest of the town of Mount Shasta. The Sacramento River flows through or borders eleven counties,

including Siskiyou, Shasta, Tehama, Butte, Glenn, Colusa, Sutter, Yolo, Sacramento, Solano, and Contra Costa. The river flows southward, joining the San Joaquin River northeast of Pittsburg to form Suisun Bay. Suisun Bay empties into the San Francisco Bay. Flows in the Sacramento River near Redding are controlled through flow releases from Shasta Dam and Keswick Dam.

Sacramento River flows enter the northeastern-most low-flow channel at the upstream end of East Sand Slough at around 18,000 cfs. Reclamation reviewed the gage data from the USGS gage at Bend Bridge (site no. 11377100), upstream of Red Bluff, and analyzed data along with video available on YouTube taken above the Market Street bridge at the water intake facility during a release that Reclamation reported at 35,000 cubic foot per second (cfs) from Shasta Dam. Peak flow during the release occurred on March 20, 2011, with flows ranging from 53,500 cfs to 97,300 cfs.

Flow rates were also obtained for the dates corresponding to the NAIP imagery covering the Study Area, are as follows:

- June 30, 2005: 14,400 cfs – 14,500 cfs
- July 2, 2009: 12,800 cfs – 13,500 cfs
- July 20, 2010: 12,900 cfs – 13,200 cfs
- July 3, 2012: 14,600 cfs – 15,300 cfs

These flow rates are indicative of low-flow conditions, thus the NAIP imagery depict low-flow channel conditions.

5.7 National Wetlands Inventory

The riverine streambed mapped in the National Wetlands Inventory (NWI) generally coincide with the delineated area for this report. However, the riverine and palustrine habitat mapped in the NWI appear to be from before 2012 when the RBDD gates were decommissioned, which changed the hydrology in East Sand Slough. When the RBDD gates were in operation at different intervals from 1966 to 2012, Sacramento River water backed up into East Sand Slough, most recently from May 15 to September 15 from 1994 to 2008, and June 15 to August 31 from 2009 to 2012. The frequent and consistent inundation of East Sand Slough created a complex riparian wetland system. The water regime in East Sand Slough is now driven purely by Sacramento River flows, starting around 17,000 cfs when flows are high enough to enter the channel upstream. This means the channel now experiences less frequent inundation and for shorter periods once flows recede, which the riparian features had to adapt to. The NWI map of the area (see Attachment 6) shows riverine, freshwater emergent, and freshwater forested/shrub habitat in the Study Area. Freshwater emergent wetlands as indicated on the NWI map either are no longer present or converted to a forested/shrub wetland habitat after changing from seasonally flooded to seasonally saturated or temporarily flooded systems. A similar case occurred for some areas indicated on the NWI map as forested wetlands but are either absent or are now shrub habitat due to the hydrology shift and 2013 fire in the slough.

6.0 Field Methods

A delineation of waters of the U.S. was conducted within the Study Area on April 30, 2018 through May 3, 2018, by Alexandra Woodward, Jamie LeFevre, Luke Davis, Sarah Perrin, and Spencer Marshall, Natural Resources Specialists, with Reclamation. The weather was clear with no recent precipitation. The most recent precipitation occurred April 7, 2018 (0.75 inch of rain) and April 11, 2018 (0.24 inch of rain) (Weather Underground 2018). Data collection in the field was conducted in accordance with the *A Field Guide to the Identification of the Ordinary High Water Mark (OHWM) in the Arid West Region of the Western United States* (USACE, 2008a) (OHWM manual), the 1987 Corps of Engineers Wetland Delineation Manual (USACE, 1987) (1987 manual), and the *Regional Supplement to the Corps of Engineers Wetland Delineaiton Manual: Arid West Region* (Version 2.0) (USACE, 2008b) (regional manual). The OHWM data for the Sacramento River and East Sand Slough were collected on the *Updated Datasheet for the Identification of the Ordinary High Water Mark (OHWM) in the Arid West Region of the Western United States* (USACE, 2010). Suspected wetland areas were evaluated using data collected on Wetland Determination Forms found in the back of the regional manual.

The study area was evaluated by foot. Eight data points were completed in the Study Area to determine the presence of the three wetland parameters (vegetation, soils, and hydrology). The datasheets for each point are included in Attachment 7, and site visit photos are included in Attachment 8.. The wetland indicator status of plant species was based on the *Arid West 2016 Regional Wetland Plant List* (Lichvar et al. 2016). Soil colors were determined using the *Munsell Soil Color Charts* (Munsell Color 2000).

The boundaries of channelized features, such as the Sacramento River, East Sand Slough, and other waters of the U.S. were delineated based on the OHWM indicators observed in the field, using the methods outlined in *Regulatory Guidance Letter No. 05-05*. The high water year events and floods on the Sacramento River in winter and spring of 2017 resulted in conditions that complicated locating the OHWM with just field indicators. Field indicators observed for the OHWM include wrack or debris on shrubs and branches in taller trees indicating height of high flow events, erosion and bank cutting, change in average sediment texture from cobble-gravel low points to sand and fines as move up-slope, and change in plant density and species composition from water-tolerant species to upland species. LiDAR, aerial imagery, and hydraulic modelling shape files were analyzed and used in addition to observed field indicators to determine the location of the OHWM. A total of eight transects (transects 1a, 1b, 2a, 2b, 2c, 2d, 2e, 3a) were taken on OHWM data sheets throughout the Study Area. The first transect (Transect 1a) started at the upstream confluence with the Sacramento River, including the river island on the east bank of the river. Transect 2a walked from river-left to river-right crossed a scrub-shrub wetland within a low-flow channel, to an upland island containing a mixture of *Populus fremontii*, *Quercus lobata*, and California Introduced Annual and Perennial Herbaceous alliance habitats, to a cobble-gravel low-flow channel, a small upland island, and a third more narrow cobble-gravel low-flow channel. Transect 2b was similar to and approximately 1,000 feet downstream of the previous one, but with a narrower island between the outermost OHWM boundaries. Transect 2c walked immediately downstream of the Antelope Boulevard bridge, from the OHWM at river-right to river-left, crossing areas of cobble-gravel and vegetated (*Avena fatua*, *Rorippa curvisiliqua*, *Cyperus* sp., *Brassica rapa*, *Vicia villosa*, *Rumex crispus*, *Leontodon*

saxatilis, *Lupinus bicolor*, *Bromus diandrus*, *Avena barbata*, *Festuca perennis*) intermittent streambed, and a scrub-shrub wetland of mostly willows. Transect 2d walked a 15-foot wide side channel on river-right, approximately 215 feet downstream of Transect 2c. This side channel starts out sandy, then becomes densely vegetated with annual and perennial herbaceous species, with forested riparian wetlands developed along the edges of the OHWM as move downstream towards its reconnection with the main channel. Transect 3a walked a 50-foot wide forested riparian wetland above the OHWM, that runs parallel to Interstate-5, and appears to be fed by storm water runoff from a culvert off the highway. Transect 2e walked from the OHWM at river-right to river-left, approximately 1,250 feet downstream from Transect 2e, covering vegetated intermittent streambed along the edges of the active floodplain, and cobble-gravel intermittent streambed in the low-flow channel. Transect 1b started at the OHWM river-left and walked across a combination of cobble-gravel, sandy, and vegetated intermittent streambed until reaching the active low-flow channel of the Sacramento River. This transect was extended to the other side of the Sacramento River bank to complete the extent of the OHWM.

Suspected wetlands and drainages on aerial imagery (Attachment 9) were evaluated prior to the site visit during a preliminary desk review and targeted for evaluation in the field. Due to the size of the Study Area, the plan was to rely heavily on the NWI map to help focus on areas to confirm wetland presence and determine which areas to evaluate further and add. As mentioned above, once in the field, Reclamation saw some different conditions and determined the NWI map is likely from before 2012 when the slough saw more frequent and prolonged inundation from lowered RBDD gates on the Sacramento River. The existing conditions that have normalized over the past six years lack certain fresh emergent wetlands where the NWI map indicates they are present, have more scrub-shrub riparian instead of indicated forested riparian wetland features due to less water and the fire in 2013, and have a more intermittent riverine streambed below the OHWM instead of the indicated lower perennial riverine unconsolidated bottom. Areas in topographic depressions in topographic swales not indicated on the NWI map as a wetland were also evaluated by taking wetland delineation data points. Soils pits were dug in suspected wetland areas to refusal. Vegetation was surveyed in one square meter plots unless otherwise noted on the data sheets.

Data points and transect features were drawn onto paper maps by hand and collected using a Trimble GPS unit and later processed for the delineation map using ESRI ArcMap 10.5.1, a geographic information system (GIS) software.

7.0 Results

There are 15.81 acres of the Sacramento River, 86.10 acres of East Sand Slough, 10.57 acres of wetlands and 0.07 acres of ephemeral drainage below the OHWM, and 22.86 acres of wetlands and 0.77 acre of ephemeral drainages above the OHWM identified within the 372.98-acre Study Area. See Table 3 for each water of the U.S. feature identified. The wetlands and waters of the U.S. features are further discussed below, and labelled on the delineation map (Figure 2) as the following:

- Riverine – Lower Perennial, Unconsolidated Bottom, Cobble Gravel (RUB)
- Riverine – Lower Perennial, Unconsolidated Shore, Cobble Gravle (RUS)

- Riverine – Intermittent Streambed, Cobble-Gravel (RIScg)
- Riverine – Intermittent Streambed, Sand (RISs)
- Riverine – Intermittent Streambed, Vegetated (RISv)
- Ephemeral Drainage (ED)
- Palustrine Seasonal Wetland (PSW)
- Scrub-Shrub Riparian Wetland (SSW)
- Forested Riparian Wetland (FW)

Zoomed-in versions of this map are in Attachment 1.

Table 3. Overview of Waters of the U.S. in the Study Area

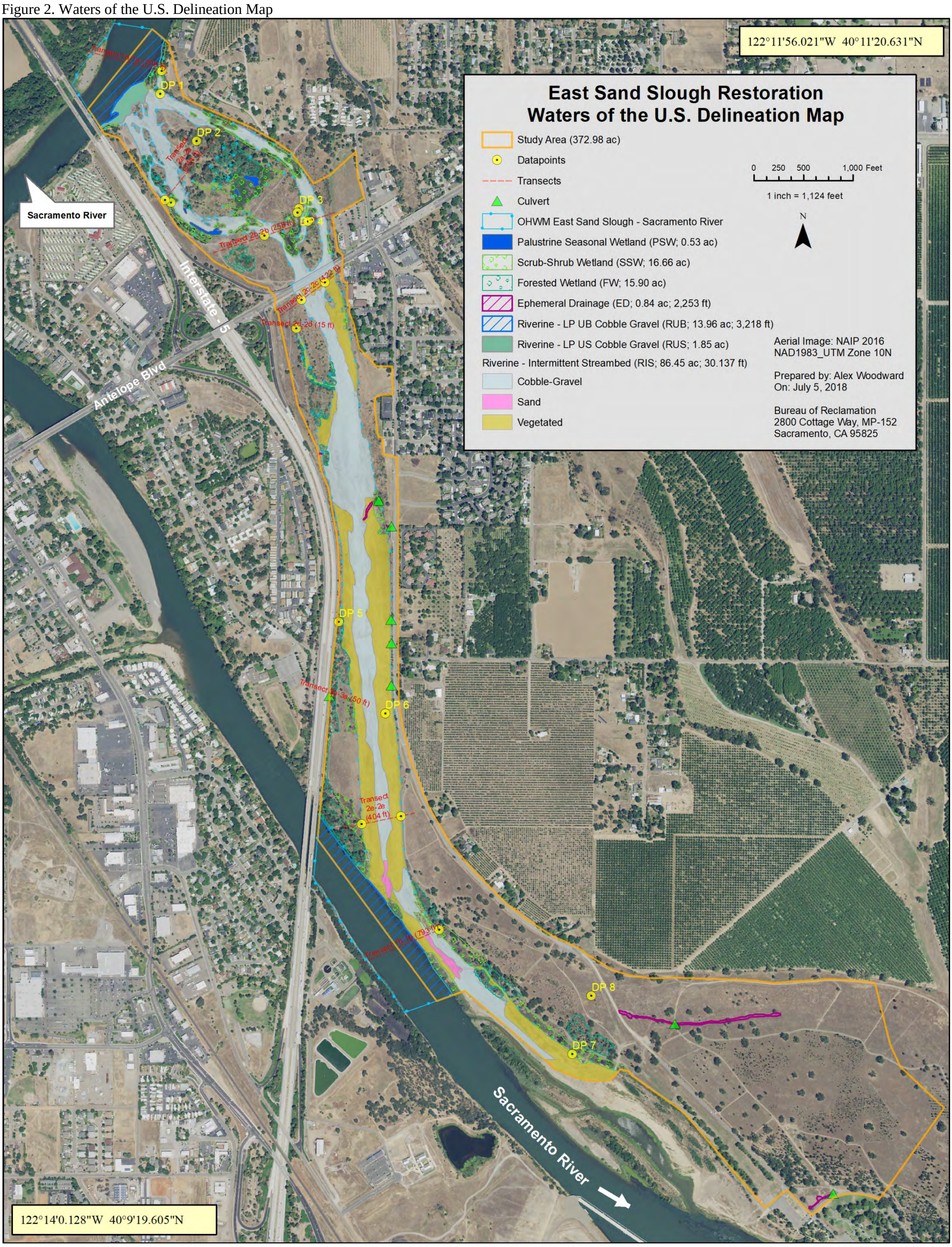
Feature	Cowardin Code	Above/Below OHWM	Area (acres)	Linear Feet (streams or drainages)
Riverine, Lower Perennial – Sacramento River				
Riverine, Lower Perennial, Unconsolidated Bottom, Permanently Flooded (R2UBH)				
RUB-1	R2UBH	below	5.43	1,062
RUB-2	R2UBH	below	8.52	2,156
		R2UBH Subtotal =	**13.95**	**3,218**
Riverine, Lower Perennial, Unconsolidated Shore, Cobble-Gravel (R2US1)				
RUS-1	R2US1	below	1.85	167
		R2US1 Subtotal =	**1.85**	**167**
Riverine, Intermittent Streambed – East Sand Slough				
Cobble-Gravel (R4SB3)				
RIScg-1	R4SB3	below	8.48	3,347
RIScg-2	R4SB3	below	1.01	625
RIScg-3	R4SB3	below	6.13	2,932
RIScg-4	R4SB3	below	25.23	5,919
RIScg-5	R4SB3	below	6.30	2,489
		RIScg Subtotal =	**47.51**	**15,312**
Sand (R4SB4)				
RISs-1	R4SB4	below	0.09	257
RISs-2	R4SB4	below	0.43	384
RISs-3	R4SB4	below	0.69	528
		RISs Subtotal =	**1.21**	**1,169**
Vegetated (R4SB7)				
RISv-1	R4SB7	below	0.33	95
RISv-2	R4SB7	below	0.09	82
RISv-3	R4SB7	below	2.88	1,251

Feature	Cowardin Code	Above/Below OHWM	Area (acres)	Linear Feet (streams or drainages)
RISv-4	R4SB7	below	0.42	704
RISv-5	R4SB7	below	1.05	561
RISv-6	R4SB7	below	15.42	3,950
RISv-7	R4SB7	below	10.66	4,134
RISv-8	R4SB7	below	1.74	1,131
RISv-9	R4SB7	below	5.14	1,928
		RISv Subtotal =	**37.73**	**13,836**
Ephemeral Drainage				
Culvert-fed, Intermittent, Streambed, Vegetated (R4SB7)				
ED-1	R4SB7	above	0.005	47
ED-2	R4SB7	below	0.07	208
ED-3	R4SB7	above	0.007	54
ED-4	R4SB7	above	0.68	1,660
ED-5	R4SB7	above	0.08	284
		ED Subtotal =	**0.84**	**2,253**
Palustrine Seasonal Wetland				
Aquatic Bed, Floating vascular, Seasonally Flooded (PAB4C)				
PSW-1	PAB4C	below	0.24	-
PSW-2	PAB4C	below	0.03	-
PSW-3	PAB4C	below	0.21	-
PSW-4	PAB4C	below	0.05	-
		PSW Subtotal =	**0.53**	-
Scrub-Shrub Riparian Wetland				
Palustrine, Broad-Leaved Deciduous; various water regimes (PSS1_)				
SSW-1	PSS1E	below	0.28	-
SSW-2	PSS1E	below	0.06	-
SSW-3	PSS1E	below	0.23	-
SSW-4	PSS1G	below	0.02	-
SSW-5	PSS1H	below	0.97	-
SSW-6	PSS1G	below	0.65	-
SSW-7	PSS1H	below	0.99	-
SSW-8	PSS1F	below	0.19	-
SSW-9	PSS1F	below	0.24	-
SSW-10	PSS1A	below	2.66	-

Feature	Cowardin Code	Above/Below OHWM	Area (acres)	Linear Feet (streams or drainages)
SSW-11	PSS1E	below	0.09	-
SSW-12	PSS1B	above	0.61	-
SSW-13	PSS1A	below	0.19	-
SSW-14	PSS1A	below	0.11	-
SSW-15	PSS1J	below	0.08	-
SSW-16	PSS1C	below	0.08	-
SSW-17	PSS1B	below	0.07	-
SSW-18	PSS1A	below	0.10	-
SSW-19	PSS1C	below	0.04	-
SSW-20	PSS1A	below	0.11	-
SSW-21	PSS1C	below	0.05	-
SSW-22	PSS1A	below	0.17	-
SSW-23	PSS1A	below	0.69	-
SSW-24	PSS1C	below	0.42	-
SSW-25	PSS1B	above	1.09	-
SSW-26	PSS1C	below	0.35	-
SSW-27	PSS1C	below	0.97	-
SSW-28	PSS1C	below	0.25	-
SSW-29	PSS1B	above	1.57	-
SSW-30	PSS1B	above	2.16	-
SSW-31	PSS1B	below	0.11	-
SSW-32	PSS1C	below	0.36	-
SSW-33	PSS1A	below	0.24	-
SSW-34	PSS1A	below	0.11	-
SSW-35	PSS1B	above	0.53	-
SSW-36	PSS1C	below	0.04	
		SSW Subtotal =	**16.66**	-
Forested Riparian Wetland				
Palustrine, Broad-leaved Deciduous; various water regimes (PFO1_)				
FW-1	PFO1A	below	1.90	-
FW-2	PFO1A	below	0.17	-
FW-3	PFO1A	below	0.08	-
FW-4	PFO1J	below	0.06	-

Feature	Cowardin Code	Above/Below OHWM	Area (acres)	Linear Feet (streams or drainages)
FW-5	PFO1J	below	0.12	-
FW-6	PFO1A	below	0.25	-
FW-7	PFO1B	above	1.09	-
FW-8	PFO1A	below	0.09	-
FW-9	PFO1A	below	0.26	-
FW-10	PFO1A	below	0.27	-
FW-11	PFO1A	below	0.08	-
FW-12	PFO1A	below	0.08	-
FW-13	PFO1A	below	0.08	-
FW-14	PFO1A	below	0.18	-
FW-15	PFO1B	above	3.23	-
FW-16	PFO1B	above	3.38	-
FW-17	PFO1C	below	0.38	-
FW-18	PFO1B	below	0.87	-
FW-19	PFO1B	below	0.60	-
FW-20	PFO1B	below	1.90	-
FW-21	PFO1B	below	0.83	-
		FW Subtotal =	**15.90**	-
		Other Waters of the U.S. Total =	***102.75***	***35,955***
		Wetlands Total =	***33.43***	-

Figure 2. Waters of the U.S. Delineation Map



7.1 Riverine

Based on LiDAR shape files of the Study Area, the elevation of the OHWM of the slough starts at the north end of the Study Area at approximately 260 feet above sea level and drops to approximately 253 feet above sea level at the south end of the Study Area.

Based on the Cowardin *et al.* (1979) NWI classification system, the NWI map shows the majority of East Sand Slough to be riverine, lower perennial, unconsolidated bottom, permanently flooded (R2UBH). However, since the 2012 decommissioning of the RBDD gates downstream in the Sacramento River, East Sand Slough now has flowing water only part of the year, during high flows from large storm events, instead of some flow all year based on an operation schedule. The substrate below the OHWM is either cobble-gravel in the low-flow channels, vegetated with upland species that have moved in along the edges of the OHWM and low-flow channels, or patches of sand deposition throughout. The vegetated streambed (RISv) features have a variety of herbaceous species such as *Scleranthus annuus, Polanisia dodecandra ssp. trachysperma, Avena fatua, Rorippa curvisiliqua, Cyperus* sp., Leontodon saxatillis, Xanthium strumarium, Plagiobothrys stipitatus ssp. micranthus, *Brassica rapa*, *Rumex crispus, Bromus diandrus, Avena barbata,* and *Festuca perennis.*

7.2 Palustrine Seasonal Wetlands

All the observed palustrine seasonal wetlands occurred below the OHWM, north of the Antelope Boulevard bridge, and contained floating, non-emergent vascular plants including *Potamogeton crispus* and *Ludwigia peploides*. Soils were typically cobbles and riverwash and were frequently under ponded water.

7.3 Scrub-Shrub Riparian Wetland

Scrub-shrub riparian wetlands largely matched up with what the NWI map indicates, but also were observed in the field where the 2013 fire burned previously forested land. They were also observed along the OHWM margins and areas that no longer receive as much water as pre-2012 that one would expect to have developed into forested riparian wetland by now. The dominant shrub species in these areas is typically *Salix exigua*. The herbaceous stratum varies and includes *Equisetum hyemale, Festuca perennis, Brassica* spp., and *Hordeum marinum* ssp. *gussoneanum*. Soils varied from loams to sand and silt loams.

7.4 Forested Riparian Wetland

The majority of forested riparian wetlands occured along the OHWM margins in seasonal overflow channels, within the low-flow channels, and in depressions in upland areas. The tree canopy was typically composed of *Populus fremontii, Platanus racemosa, Acer negundo, Salix goodingii* and *Salix exigua*. The understory was typically composed of *Rubus armeniacus*. Soils tended to be drier and were composed of sandy loams.

7.5 Ephemeral Drainage

Several of these drainages were fed by culverts from roads, most of which occurred above the East Sand Slough OHWM. The largest drainage (feature ED-4) drains an historic swale and drains through a culvert under Sale Lane. The soils and plants in these drainages varied considerably, though the herbaceous cover was typically grasses such as *Festuca perennis* and *Bromus* spp. Feature ED-2 was colonized by *Lepidium latifolium* and annual grasses.

8.0 Conclusion and Request for a Jurisdictional Determination

Subject to Corps verification, within the 14.71-acre Study Area, there are approximately 33.43 acres of wetlands, regulated under Section 404 of the Clean Water Act, and 101.98 acres and 35,910 linear feet of

other waters of the U.S. (Sacramento River, East Sand Slough, and ephemeral drainages), regulated under Section 10 of the Rivers and Harbors Act and Section 404 of the Clean Water Act. Reclamation requests a preliminary jurisdictional determination of the extent of waters shown in Figure 2, and Attachment 1, for the East Sand Slough Restoration Project.

9.0 References

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Attachment 1

East Sand Slough Restoration Waters of the U.S. delineation maps

122°13'54.426"W 40°11'25.925"N

Sacramento River

Antelope Blvd

Interstate - 5

Transect 1a-1a (729 ft)

DP 1

DP 2

Transect 1a-2a (944 ft)

DP 3

DP 4

Transect 2b-2b (598 ft)

Transect 2c-2c (423 ft)

Transect 2c-2d (15 ft)

DP 5

Transect 2e-3a (50 ft)

DP 6

Transect 2e-2e (404 ft)

Transect 1b-1b (793 ft)

DP 8

DP 7

Sacramento River

122°11'51.055"W 40°9'10.756"N

East Sand Slough Restoration
Waters of the U.S. Delineation Map

- Study Area (372.98 ac)
- Datapoints
- Transects
- Culvert
- OHWM East Sand Slough - Sacramento River
- Palustrine Seasonal Wetland (PSW; 0.53 ac)
- Scrub-Shrub Wetland (SSW; 16.66 ac)
- Forested Wetland (FW; 15.90 ac)
- Ephemeral Drainage (ED; 0.84 ac; 2,253 ft)
- Riverine - LP UB Cobble Gravel (RUB; 13.96 ac; 3,218 ft)
- Riverine - LP US Cobble Gravel (RUS; 1.85 ac)
- Riverine - Intermittent Streambed (RIS; 86.45 ac; 30.137 ft)
  - Cobble-Gravel
  - Sand
  - Vegetated

0 250 500 1,000 Feet

1 inch = 500 feet

N

Aerial Image: NAIP 2016
NAD1983_UTM Zone 10N

Prepared by: Alex Woodward
On: July 5, 2018

Bureau of Reclamation
2800 Cottage Way, MP-152
Sacramento, CA 95825

East Sand Slough Restoration
Waters of the U.S. Delineation Map - Zoom 1/5

- Study Area (372.98 ac)
- Datapoints
- Transects
- Culvert
- OHWM East Sand Slough - Sacramento River
- Palustrine Seasonal Wetland (PSW; 0.53 ac)
- Scrub-Shrub Wetland (SSW; 16.66 ac)
- Forested Wetland (FW; 15.90 ac)
- Ephemeral Drainage (ED; 0.84 ac; 2,253 ft)
- Riverine - LP UB Cobble Gravel (RUB; 13.96 ac; 3,218 ft)
- Riverine - LP US Cobble Gravel (RUS; 1.85 ac)

Riverine - Intermittent Streambed (RIS; 86.45 ac; 30.137 ft)

- Cobble-Gravel
- Sand
- Vegetated

0 105 210 420 Feet

1 inch = 250 feet

N

Aerial Image: NAIP 2016
NAD1983_UTM Zone 10N

Prepared by: Alex Woodward
On: July 5, 2018

Bureau of Reclamation
2800 Cottage Way, MP-152
Sacramento, CA 95825

Sacramento River

Interstate - 5

Antelope Blvd

SSW-3
Transect 1a-1a (709 ft)
RUB-1
SSW-1
SSW-2
DP 1
SSW-4
RUS-1
SSW-36
SSW-11
SSW-6
DP 2
RIScg-2
RIScg-1
FW-4
FW-5
Transect 2a-2a (344 ft)
FW-1
SSW-7
FW-2
PSW-3
FW-3
FW-6
PSW-4
SSW-10
SSW-14
FW-8
PSW-2
DP 3
DP 4
SSW-15
SSW-16
SSW-19
SSW-17
SSW-9
SSW-18
RIScg-3
Transect 2b-2b (258 ft)
SSW-12
PSW-1
SSW-8
SSW-13
SSW-5
SSW-20
FW-7
SSW-21
Transect 2c-2c (422 ft)
RISv-1
RISv-3
RISv-2
RIScg-4
RISv-3
SSW-22

East Sand Slough Restoration
Waters of the U.S. Delineation Map - Zoom 2/5

- Study Area (372.98 ac)
- Datapoints
- Transects
- Culvert
- OHWM East Sand Slough - Sacramento River
- Palustrine Seasonal Wetland (PSW; 0.53 ac)
- Scrub-Shrub Wetland (SSW; 16.66 ac)
- Forested Wetland (FW; 15.90 ac)
- Ephemeral Drainage (ED; 0.84 ac; 2,253 ft)
- Riverine - LP UB Cobble Gravel (RUB; 13.96 ac; 3,218 ft)
- Riverine - LP US Cobble Gravel (RUS; 1.85 ac)

Riverine - Intermittent Streambed (RIS; 86.45 ac; 30.137 ft)

- Cobble-Gravel
- Sand
- Vegetated

0 85 170 340 Feet

1 inch = 201 feet

N

Aerial Image: NAIP 2016
NAD1983_UTM Zone 10N

Prepared by: Alex Woodward
On: July 5, 2018

Bureau of Reclamation
2800 Cottage Way, MP-152
Sacramento, CA 95825

East Sand Slough Restoration
Waters of the U.S. Delineation Map - Zoom 3/5

- Study Area (372.98 ac)
- Datapoints
- Transects
- Culvert
- OHWM East Sand Slough - Sacramento River
- Palustrine Seasonal Wetland (PSW; 0.53 ac)
- Scrub-Shrub Wetland (SSW; 16.66 ac)
- Forested Wetland (FW; 15.90 ac)
- Ephemeral Drainage (ED; 0.84 ac; 2,253 ft)
- Riverine - LP UB Cobble Gravel (RUB; 13.96 ac; 3,218 ft)
- Riverine - LP US Cobble Gravel (RUS; 1.85 ac)

Riverine - Intermittent Streambed (RIS; 86.45 ac; 30.137 ft)

- Cobble-Gravel
- Sand
- Vegetated

0 55 110 220 Feet

1 inch = 170 feet

N

Aerial Image: NAIP 2016
NAD1983_UTM Zone 10N

Prepared by: Alex Woodward
On: July 5, 2018

Bureau of Reclamation
2800 Cottage Way, MP-152
Sacramento, CA 95825

DP 5
FW-15
Transect 3a-3a (50 ft)
RISv-6
RIScg-4
DP 6
SSW-35
SSW-34
RISv-7
Sacramento River
Interstate - 5
SSW-25
FW-16
Transect 2e-2e (404 ft)
FW-17
RUB-2
SSW-24

East Sand Slough Restoration
Waters of the U.S. Delineation Map - Zoom 4/5

- Study Area (372.98 ac)
- Datapoints
- Transects
- Culvert
- OHWM East Sand Slough - Sacramento River
- Palustrine Seasonal Wetland (PSW; 0.53 ac)
- Scrub-Shrub Wetland (SSW; 16.66 ac)
- Forested Wetland (FW; 15.90 ac)
- Ephemeral Drainage (ED; 0.84 ac; 2,253 ft)
- Riverine - LP UB Cobble Gravel (RUB; 13.96 ac; 3,218 ft)
- Riverine - LP US Cobble Gravel (RUS; 1.85 ac)

Riverine - Intermittent Streambed (RIS; 86.45 ac; 30.137 ft)

- Cobble-Gravel
- Sand
- Vegetated

0 55 110 220 Feet

1 inch = 175 feet

N

Aerial Image: NAIP 2016
NAD1983_UTM Zone 10N

Prepared by: Alex Woodward
On: July 5, 2018

Bureau of Reclamation
2800 Cottage Way, MP-152
Sacramento, CA 95825

FW-16
FW-17
SSW-24
RISv-7
RISv-6
RIScg-4
RISs-2
SSW-32
FW-18
SSW-26
SSW-28
RISv-8
RUB-2
Transect 1b-1b (793 ft)
SSW-27
RISs-3
RIScg-5
FW-19
FW-21
SSW-29
DP 8
FW-20
SSW-30
RISv-9
DP 7
SSW-33

East Sand Slough Restoration
Waters of the U.S. Delineation Map - Zoom 5/5

- Study Area (372.98 ac)
- Datapoints
- Transects
- Culvert
- OHWM East Sand Slough - Sacramento River
- Palustrine Seasonal Wetland (PSW; 0.53 ac)
- Scrub-Shrub Wetland (SSW; 16.66 ac)
- Forested Wetland (FW; 15.90 ac)
- Ephemeral Drainage (ED; 0.84 ac; 2,253 ft)
- Riverine - LP UB Cobble Gravel (RUB; 13.96 ac; 3,218 ft)
- Riverine - LP US Cobble Gravel (RUS; 1.85 ac)

Riverine - Intermittent Streambed (RIS; 86.45 ac; 30.137 ft)

- Cobble-Gravel
- Sand
- Vegetated

0 87.5 175 350 Feet

1 inch = 268 feet

N

Aerial Image: NAIP 2016
NAD1983_UTM Zone 10N

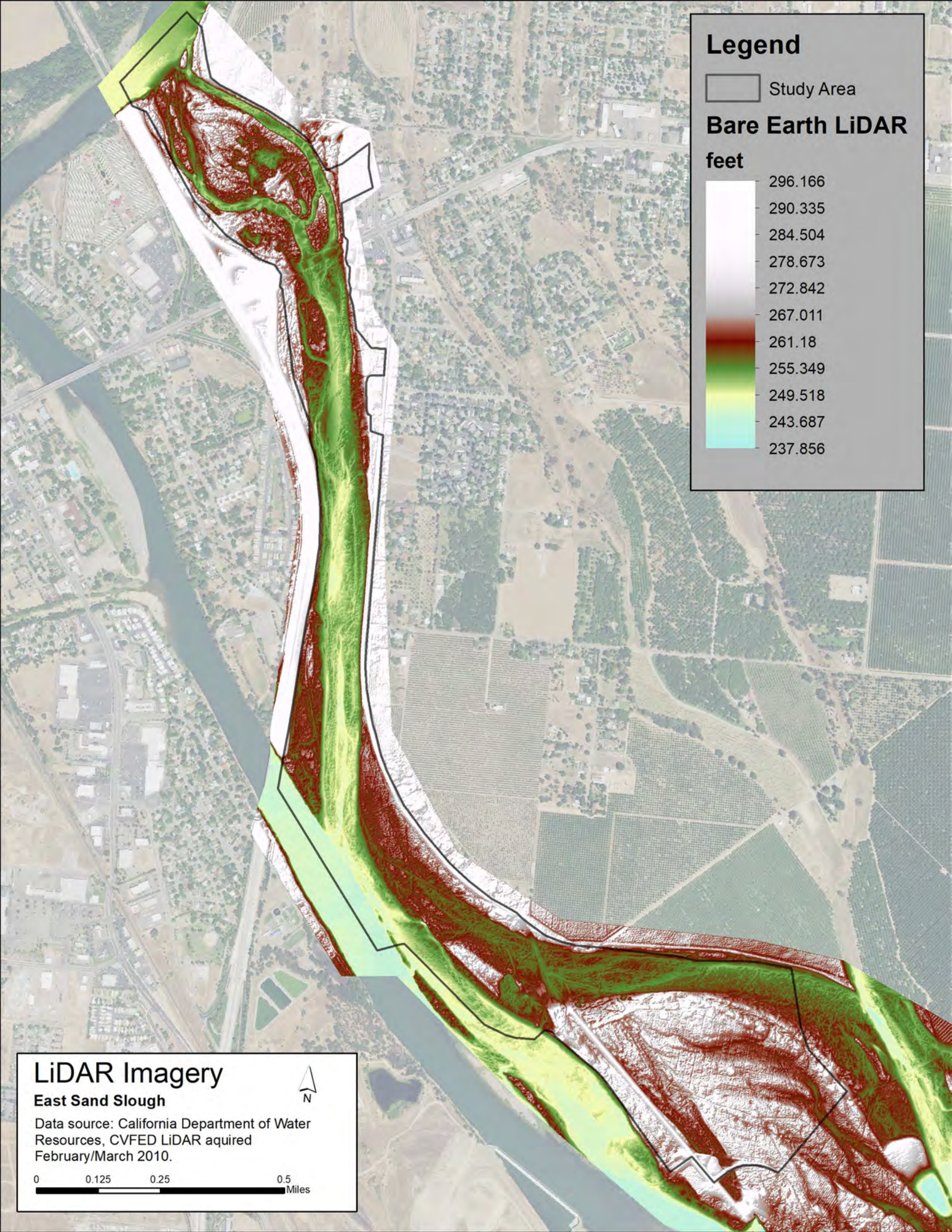
Prepared by: Alex Woodward
On: July 5, 2018

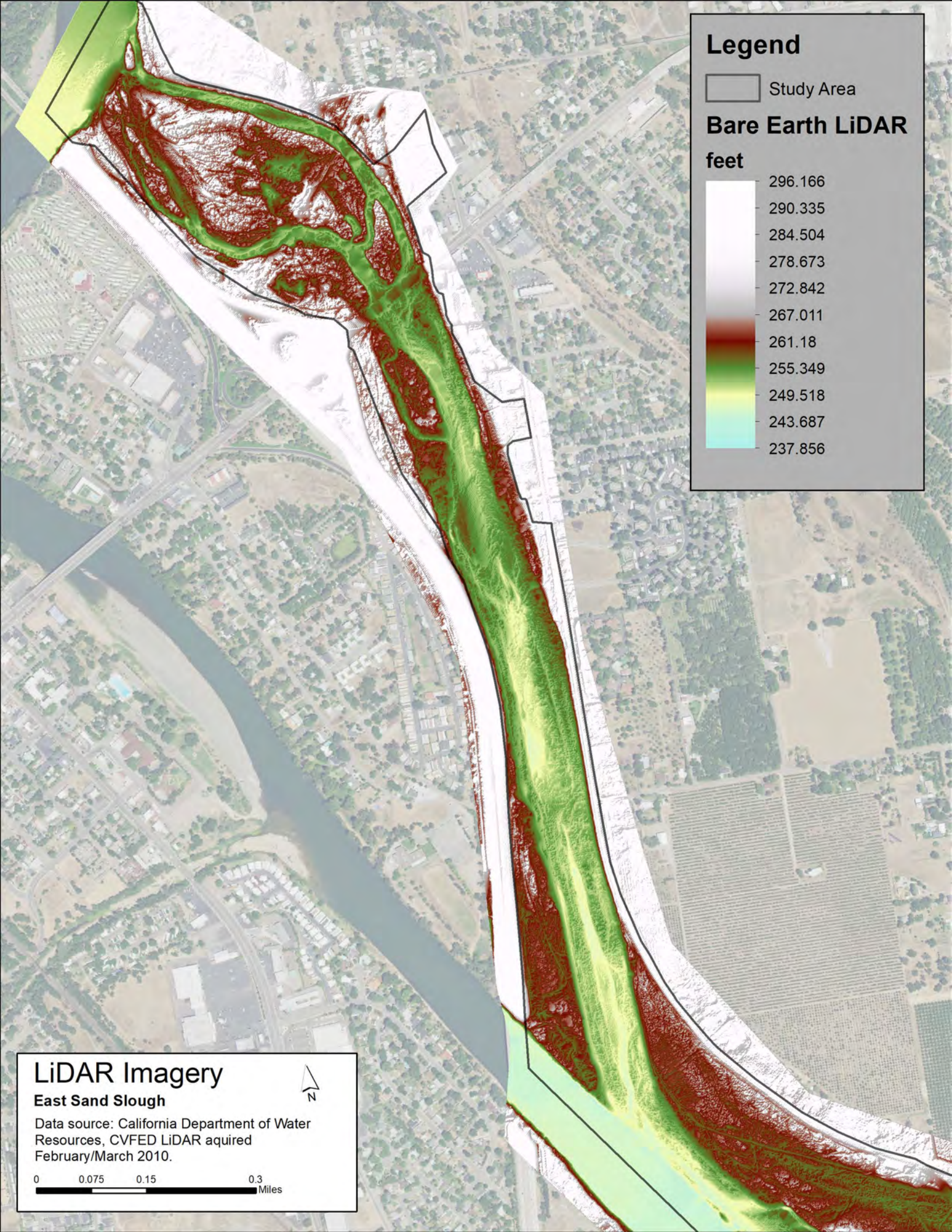
Bureau of Reclamation
2800 Cottage Way, MP-152
Sacramento, CA 95825

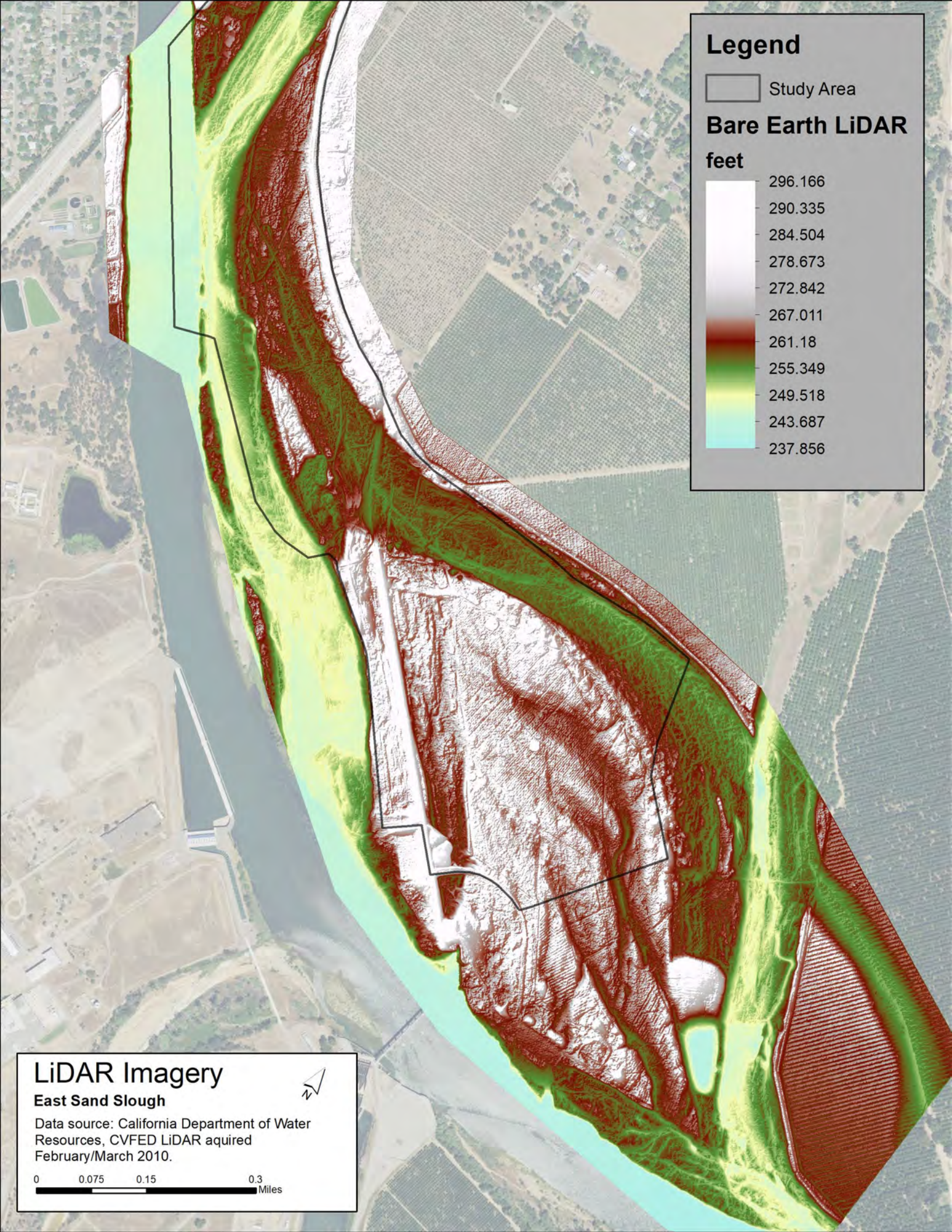
DP 8
DP 7
ED-4
ED-5
FW-21
FW-20
SSW-30
SSW-33
SSW-31
RIScg-5
RISv-9
Sale Lane
Sacramento River

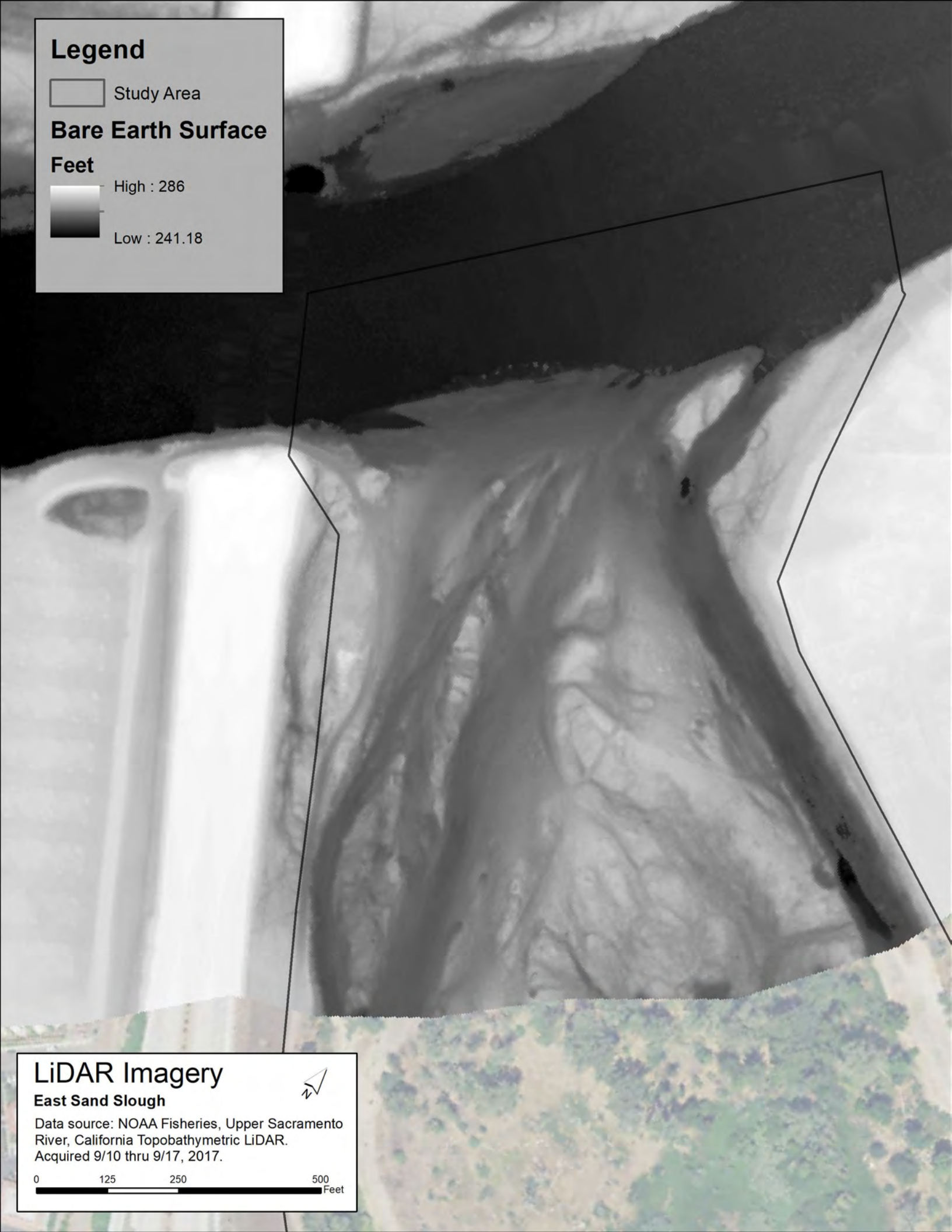
Attachment 2

LiDAR Imagery


Legend
Study Area
Bare Earth LiDAR
feet
296.166
290.335
284.504
278.673
272.842
267.011
261.18
255.349
249.518
243.687
237.856
LiDAR Imagery
East Sand Slough
N
Data source: California Department of Water Resources, CVFED LiDAR aquired February/March 2010.
0
0.125
0.25
0.5
Miles


Legend
Study Area
Bare Earth LiDAR
feet
296.166
290.335
284.504
278.673
272.842
267.011
261.18
255.349
249.518
243.687
237.856
LiDAR Imagery
East Sand Slough
Data source: California Department of Water Resources, CVFED LiDAR aquired February/March 2010.
0
0.075
0.15
0.3
Miles
N


Legend
Study Area
Bare Earth LiDAR
feet
296.166
290.335
284.504
278.673
272.842
267.011
261.18
255.349
249.518
243.687
237.856
LiDAR Imagery
East Sand Slough
Data source: California Department of Water Resources, CVFED LiDAR aquired February/March 2010.
0
0.075
0.15
0.3
Miles


Legend
Study Area
Bare Earth Surface
Feet
High : 286
Low : 241.18
LiDAR Imagery
East Sand Slough
Data source: NOAA Fisheries, Upper Sacramento River, California Topobathymetric LiDAR. Acquired 9/10 thru 9/17, 2017.
0
125
250
500
Feet


Legend
Study Area
Bare Earth Surface
Feet
High : 309.84
Low : 244.7
LiDAR Imagery
East Sand Slough
N
Data source: NOAA Fisheries, Upper Sacramento River, California Topobathymetric LiDAR. Acquired 9/10 thru 9/17, 2017.
0
215
430
860
Feet

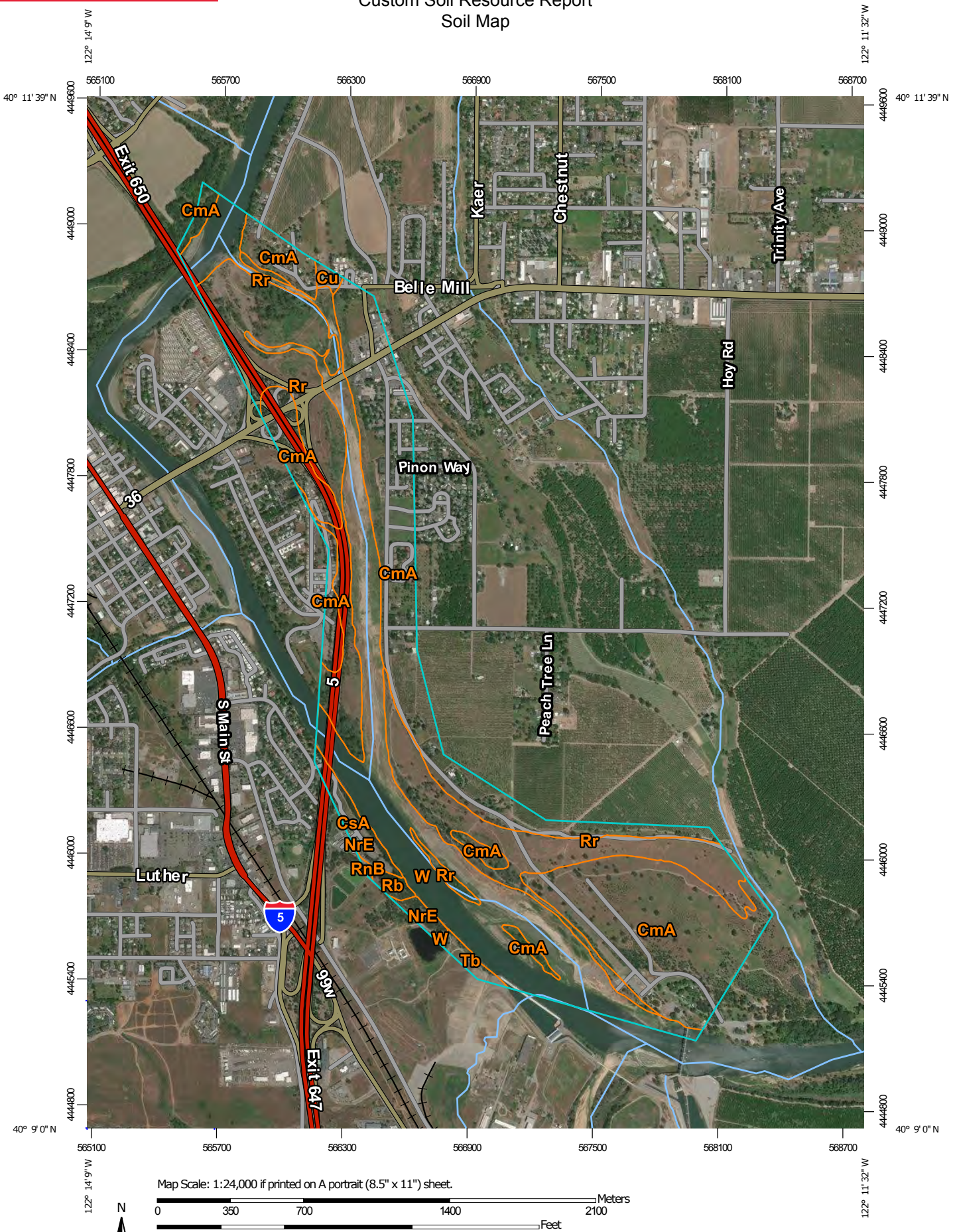

Legend
Study Area
Bare Earth Surface
Feet
High : 322.34
Low : 241.50
LiDAR Imagery
East Sand Slough
Data source: NOAA Fisheries, Upper Sacramento River, California Topobathymetric LiDAR. Acquired 9/10 thru 9/17, 2017.
0
350
700
1,400
Feet

Attachment 3

Soil Survey Information

ATTACHMENT 3

Custom Soil Resource Report
Soil Map



Map Scale: 1:24,000 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 350 700 1400 2100

Feet
0 1000 2000 4000 6000

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 1:20,000.

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: Tehama County, California
Survey Area Data: Version 11, Sep 14, 2017

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

Date(s) aerial images were photographed: Feb 21, 2015—Oct 7, 2016

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
CmA	Columbia fine sandy loam, 0 to 3 percent slopes	343.8	43.3%
CsA	Columbia silt loam, 0 to 3 percent slopes	14.3	1.8%
Cu	Columbia complex, channeled	2.8	0.4%
NrE	Newville gravelly loam, 10 to 40 percent slopes, MLRA 17	5.2	0.7%
Rb	Red Bluff loam, 0 to 3 percent slopes, MLRA 17	4.5	0.6%
RnB	Redding gravelly loam, 0 to 8 percent slopes, MLRA 17	0.7	0.1%
Rr	Riverwash	206.5	26.0%
Tb	Tehama gravelly loam, 0 to 3 percent slopes, MLRA 17	5.7	0.7%
W	Water	210.8	26.5%
Totals for Area of Interest		**794.5**	**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.

Tehama County, California

CmA—Columbia fine sandy loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: hgdm
Elevation: 10 to 150 feet
Mean annual precipitation: 12 to 25 inches
Mean annual air temperature: 57 to 63 degrees F
Frost-free period: 230 to 340 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

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

Description of Columbia

Setting

Landform: Flood plains
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from igneous, metamorphic and sedimentary rock

Typical profile

H1 - 0 to 26 inches: fine sandy loam
H2 - 26 to 60 inches: fine sandy loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Rare
Frequency of ponding: None
Available water storage in profile: Moderate (about 7.8 inches)

Interpretive groups

Land capability classification (irrigated): 1
Land capability classification (nonirrigated): 3c
Hydrologic Soil Group: A
Ecological site: COARSE LOAMY (R015XD011CA)
Hydric soil rating: Yes

Minor Components

Unnamed

Percent of map unit: 10 percent
Hydric soil rating: No

Zamora

Percent of map unit: 5 percent
Hydric soil rating: No

CsA—Columbia silt loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: hgds
Elevation: 10 to 150 feet
Mean annual precipitation: 12 to 25 inches
Mean annual air temperature: 57 to 63 degrees F
Frost-free period: 230 to 340 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

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

Description of Columbia

Setting

Landform: Flood plains
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from igneous, metamorphic and sedimentary rock

Typical profile

H1 - 0 to 26 inches: silt loam
H2 - 26 to 60 inches: silt loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Rare
Frequency of ponding: None
Available water storage in profile: Moderate (about 9.0 inches)

Interpretive groups

Land capability classification (irrigated): 1
Land capability classification (nonirrigated): 3c
Hydrologic Soil Group: B

Other vegetative classification: LOAMY (015XD047CA_1)
Hydric soil rating: No

Minor Components

Unnamed
Percent of map unit: 5 percent
Landform: Drainageways
Hydric soil rating: Yes

Unnamed
Percent of map unit: 5 percent
Hydric soil rating: No

Zamora
Percent of map unit: 5 percent
Hydric soil rating: No

Cu—Columbia complex, channeled

Map Unit Setting
National map unit symbol: hgdw
Elevation: 10 to 2,900 feet
Mean annual precipitation: 8 to 25 inches
Mean annual air temperature: 46 to 63 degrees F
Frost-free period: 110 to 340 days
Farmland classification: Not prime farmland

Map Unit Composition
Columbia and similar soils: 25 percent
Columbia and similar soils: 25 percent
Riverwash: 25 percent
Minor components: 25 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Columbia

Setting
Landform: Flood plains
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread, riser
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Alluvium derived from igneous, metamorphic and sedimentary rock

Typical profile
H1 - 0 to 26 inches: fine sandy loam
H2 - 26 to 60 inches: fine sandy loam

Properties and qualities
Slope: 0 to 5 percent

Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Available water storage in profile: Moderate (about 7.8 inches)

Interpretive groups

Land capability classification (irrigated): 6w
Land capability classification (nonirrigated): 6w
Hydrologic Soil Group: A
Hydric soil rating: Yes

Description of Columbia

Setting

Landform: Flood plains
Landform position (two-dimensional): Summit
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from igneous, metamorphic and sedimentary rock

Typical profile

H1 - 0 to 26 inches: silt loam
H2 - 26 to 36 inches: silt loam
H3 - 36 to 60 inches: extremely gravelly sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Available water storage in profile: Low (about 5.9 inches)

Interpretive groups

Land capability classification (irrigated): 6w
Land capability classification (nonirrigated): 6w
Hydrologic Soil Group: B
Hydric soil rating: Yes

Description of Riverwash

Setting

Landform: Drainageways
Parent material: Sandy and gravelly alluvium

Typical profile

H1 - 0 to 6 inches: extremely gravelly sand
H2 - 6 to 60 inches: stratified gravelly sand to extremely gravelly coarse sand

Properties and qualities

Slope: 0 to 2 percent
Natural drainage class: Excessively drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: About 0 inches
Frequency of flooding: Frequent
Available water storage in profile: Very low (about 1.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydric soil rating: Yes

Minor Components

Unnamed

Percent of map unit: 10 percent
Hydric soil rating: No

Zamora

Percent of map unit: 5 percent
Hydric soil rating: No

Maywood

Percent of map unit: 5 percent
Hydric soil rating: No

Cortina

Percent of map unit: 5 percent
Hydric soil rating: No

NrE—Newville gravelly loam, 10 to 40 percent slopes, MLRA 17

Map Unit Setting

National map unit symbol: 2w8c9
Elevation: 260 to 1,720 feet
Mean annual precipitation: 21 to 33 inches
Mean annual air temperature: 58 to 62 degrees F
Frost-free period: 250 to 280 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Newville

Setting

Landform: Fan remnants
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Riser
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Pliocene alluvium derived from metamorphic and sedimentary rock

Typical profile

A1 - 0 to 2 inches: gravelly loam
A2 - 2 to 6 inches: gravelly loam
AB - 6 to 9 inches: gravelly loam
Bt1 - 9 to 13 inches: gravelly clay loam
Bt2 - 13 to 20 inches: gravelly clay loam
Bt3 - 20 to 42 inches: very gravelly sandy clay loam
Bt4 - 42 to 60 inches: gravelly sandy clay loam

Properties and qualities

Slope: 10 to 40 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline (0.2 to 0.5 mmhos/cm)
Available water storage in profile: Moderate (about 7.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: C
Ecological site: GRAVELLY LOAM (R015XD090CA)
Hydric soil rating: No

Minor Components

Altamont

Percent of map unit: 5 percent
Hydric soil rating: No

Dibble

Percent of map unit: 5 percent
Hydric soil rating: No

Corning

Percent of map unit: 5 percent
Hydric soil rating: No

Rb—Red Bluff loam, 0 to 3 percent slopes, MLRA 17

Map Unit Setting

National map unit symbol: 2t7r1
Elevation: 230 to 530 feet
Mean annual precipitation: 22 to 29 inches
Mean annual air temperature: 63 degrees F
Frost-free period: 250 to 280 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

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

Description of Red Bluff

Setting

Landform: Fan remnants
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from metamorphic and sedimentary rock

Typical profile

Ap - 0 to 6 inches: loam
AB - 6 to 20 inches: loam
Bt - 20 to 45 inches: clay loam
BCt - 45 to 72 inches: clay loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.14 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline (0.3 to 0.5 mmhos/cm)
Available water storage in profile: High (about 9.2 inches)

Interpretive groups

Land capability classification (irrigated): 3s
Land capability classification (nonirrigated): 3s
Hydrologic Soil Group: C
Other vegetative classification: LOAMY (015XD047CA_1)
Hydric soil rating: No

Minor Components

Unnamed, ponded
Percent of map unit: 5 percent
Landform: Terraces
Hydric soil rating: Yes

Corning
Percent of map unit: 4 percent
Hydric soil rating: No

Redding
Percent of map unit: 4 percent
Hydric soil rating: No

Perkins
Percent of map unit: 2 percent
Hydric soil rating: No

RnB—Redding gravelly loam, 0 to 8 percent slopes, MLRA 17

Map Unit Setting
National map unit symbol: 2w8bl
Elevation: 20 to 420 feet
Mean annual precipitation: 19 to 28 inches
Mean annual air temperature: 61 to 63 degrees F
Frost-free period: 230 to 320 days
Farmland classification: Not prime farmland

Map Unit Composition
Redding and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Redding

Setting
Landform: Fan remnants
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread, riser
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy alluvium derived from igneous, metamorphic and sedimentary rock over clayey alluvium derived from igneous, metamorphic and sedimentary rock over cemented alluvium derived from igneous, metamorphic and sedimentary rock

Typical profile
A1 - 0 to 8 inches: gravelly loam
A2 - 8 to 15 inches: gravelly loam
A3 - 15 to 19 inches: gravelly loam

Bt - 19 to 22 inches: clay
2Bqm1 - 22 to 24 inches: cemented gravelly material
2Bqm2 - 24 to 35 inches: cemented gravelly material

Properties and qualities

Slope: 0 to 8 percent
Depth to restrictive feature: About 19 inches to abrupt textural change; 20 to 39 inches to duripan
Natural drainage class: Moderately well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 in/hr)
Depth to water table: About 15 to 39 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline (0.2 to 0.5 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 2.0
Available water storage in profile: Very low (about 2.7 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: D
Ecological site: GRAVELLY LOAM (R015XD090CA)
Hydric soil rating: No

Minor Components

Keyes

Percent of map unit: 10 percent
Landform: Depressions
Hydric soil rating: No

Corning

Percent of map unit: 3 percent
Hydric soil rating: No

Unnamed, ponded

Percent of map unit: 2 percent
Landform: Fan remnants
Microfeatures of landform position: Vernal pools
Hydric soil rating: Yes

Rr—Riverwash

Map Unit Setting

National map unit symbol: hgmb
Elevation: 700 to 2,900 feet
Mean annual precipitation: 8 to 15 inches
Mean annual air temperature: 46 to 52 degrees F
Frost-free period: 110 to 180 days
Farmland classification: Not prime farmland

Map Unit Composition

Riverwash: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Riverwash

Setting

Landform: Drainageways
Down-slope shape: Linear, concave
Across-slope shape: Linear, convex
Parent material: Gravelly alluvium

Typical profile

H1 - 0 to 6 inches: extremely gravelly sand
H2 - 6 to 60 inches: stratified gravelly sand to extremely gravelly coarse sand

Properties and qualities

Slope: 0 to 2 percent
Natural drainage class: Excessively drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: About 0 inches
Frequency of flooding: Frequent
Available water storage in profile: Very low (about 1.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydric soil rating: Yes

Tb—Tehama gravelly loam, 0 to 3 percent slopes, MLRA 17

Map Unit Setting

National map unit symbol: 2srjb
Elevation: 100 to 1,970 feet
Mean annual precipitation: 17 to 43 inches
Mean annual air temperature: 61 to 64 degrees F
Frost-free period: 250 to 350 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

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

Description of Tehama

Setting

Landform: Stream terraces, stream terraces
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Riser, tread

Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Fine-loamy alluvium derived from metamorphic and sedimentary rock

Typical profile

Ap - 0 to 9 inches: gravelly loam
Bt - 9 to 27 inches: gravelly clay loam
BCtk - 27 to 60 inches: gravelly clay loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 1.28 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 5 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Moderate (about 7.2 inches)

Interpretive groups

Land capability classification (irrigated): 2s
Land capability classification (nonirrigated): 3s
Hydrologic Soil Group: C
Hydric soil rating: No

Minor Components

Arbuckle

Percent of map unit: 5 percent
Hydric soil rating: No

Hillgate

Percent of map unit: 5 percent
Hydric soil rating: No

Plaza

Percent of map unit: 5 percent
Hydric soil rating: No

W—Water

Map Unit Composition

Water: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Attachment 4

2005, 2010, 2012, and 2016 NAIP Imagery


Legend
Study Area
2005 NAIP Imagery
East Sand Slough
Data source: USDA-APFO National Agricultural Inventory Project
0
0.125
0.25
0.5
Miles
N


Legend
Study Area
2010 NAIP Imagery
East Sand Slough
Data source: USDA-APFO National Agricultural Inventory Project
N
0
0.125
0.25
0.5
Miles


Legend
Study Area
2012 NAIP Imagery
East Sand Slough
Data source: USDA-APFO National Agricultural Inventory Project
N
0
0.125
0.25
0.5
Miles


Legend
Study Area
2016 NAIP Imagery
East Sand Slough
Data source: USDA-APFO National Agricultural Inventory Project
N
0
0.125
0.25
0.5
Miles

Attachment 5

Botanical Survey Report

BOTANICAL SURVEY RECORD: EAST SAND SLOUGH

Survey Dates: 03/28-03/30/18; 04/09/18; 04/19/18; 07/10-07/11/18. **Location:** East Sand Slough

Person(s) present: Barbara Castro, Evan MacKinnon, Rob Irwin

Record Prepared by: Evan MacKinnon & Barbara Castro

Purpose: The purpose of this survey was to search for rare plants near planned project activities at East Sand Slough, an intermittent side channel of the Sacramento River. The project aims to improve salmonid habitat by maintaining continuous flows through the side channel. Potential impacts to botanical resources include sediment excavation, a spoils area, haul routes and staging areas for heavy equipment, as well as permanent inundation of the channel (which now supports plants associated with a hydrologic pattern involving both inundated and dry periods).

Target Rare Plants: A list of potential rare plants was generated from a nine-quad search of the California Natural Diversity Database using the California Department of Fish and Wildlife's Biological Information and Observation System. Using information on rare species' habitat, microhabitat, soil type, and elevation range (Janeway 2013; Consortium of California Herbaria; Jepson eFlora), the potential rare plant list was divided into a high likelihood list (Table 1), a moderate likelihood list (Table 2), and a low likelihood list (Table 3). The high likelihood list contains "target rare plants," which were the focus of field surveys.

Site Characterization: Land use of the surrounding area is a mix of agricultural, residential, and commercial development. The southern, downstream end of the side channel leads to the Red Bluff Recreation Area, a semi-natural area managed by the Mendocino National Forest.

Vegetation structure and composition is variable throughout East Sand Slough. At the upstream end north of Antelope Blvd, the side channel has varying ground elevations with multiple meandering channels and ponds (Fig. 1). Patches of mixed riparian forest exist, as well as open annual grassland, and scattered riparian trees and shrubs. The overstory at the upstream end consists of scattered patches of large tree species including Fremont cottonwood (*Populus fremontii)*, valley oak (*Quercus lobata*), Oregon ash (*Fraxinus latifolia*), and northern California walnut (*Juglans hindsii*). Understory vegetation consists of several willow species (*Salix spp*.), blue elderberry (*Sambucus nigra* ssp. *caerulea*), and Himalayan blackberry (*Rubus armeniacus*). South of Antelope Blvd, East Sand Slough becomes a narrow single channel with banks dominated by annual grasses with occasional valley oak, interior live oak (*Quercus wislizeni*), and tree of heaven (*Ailanthus altissima*). The southernmost portion of the project area, southeast of where East Sand Slough re-enters the Sacramento River, consists of valley oak savannah with an understory of annual grasses. Much of the vegetation at East Sand Slough is recovering from a wildfire that occurred in June 2013. Also, the recent decommissioning of the Red Bluff Diversion Dam and subsequent loss of Lake Red Bluff has most likely resulted in a hydrologic change that will continue to modify vegetation characteristics at East Sand Slough (Resource Conservation District of Tehama County 2017).

Target microenvironments: The current hydrologic pattern involves both inundated and dry periods, which could produce conditions associated with several rare plants. The periodic inundation followed by gradual soil dry-down may be analogous to nearby vernal pool habitats, which support rare plants like Red Bluff dwarf rush (*Juncus leiospermus* var. *leiospermus*), Boggs Lake hedge-hyssop (*Gratioloa heterosepala*), and legenere (*Legenere limosa*). This hydrology also creates several ponds, which can support rare plants like Sanford's arrowhead (*Sagittaria sanfordii*) and Brazilian watermeal (*Wolffia brasiliensis*). Intermittent stream gravel bars and streambeds in nearby tributaries to the Sacramento River support rare plants like Stony Creek spurge (*Euphorbia ocellata* ssp. *rattanii*), silky cryptantha (*Cryptantha crinita*), and shield-bracted monkeyflower (*Erythranthe glaucescens*) which are all more typical of higher elevations.

Activities: The first survey was performed 3/28-3/30 to target early-season target rare plants (Table 1). A follow-up early season survey on 4/09 focused on upland acreage that had been added to the project area for a possible spoils area (Fig. 1). A highly focused survey on 4/19 targeted silky cryptantha at the northernmost end of East Sand Slough, after the plant was confirmed to be present and identifiable at a nearby reference site. This north end of East Sand Slough is less than one mile from a known CNDDB occurrence of silky Cryptantha, and closely resembles the conditions of the reference site (gravely substrate and similar species composition). A late-season survey was performed on 7/10-7/11, which focused on gravel bars, ponds, and moist areas likely to support late-season target rare plants (Table 1).

Survey Results: In total, 194 species were observed within the East Sand Slough project area (Table 4; Fig. 1). Interesting findings that resulted in voucher specimens included Azure penstemon (*Penstemon azureus* var. *azureus*) and contorted sun cup (*Camissonia contorta*). No rare plants were found, although we did encounter Valley spurge (*Euphorbia ocellata* ssp. *ocellata*), a close relative of the rare Stony Creek spurge (*Euphorbia ocellata* ssp. *rattanii*), and weak-stemmed cryptantha (*Cryptantha flaccida*), a relative and associate species of the rare silky cryptantha (*Cryptantha crinita*). We also found *Mimulus guttatus* and *Mimulus pilosus*, two relatives of the rare shield-bracted monkeyflower (*Mimulus glaucescens*).

The hydrology of East Sand Slough creates areas that experience shallow inundation followed by gradual soil dry-down. We found these conditions favored plants often associated with vernal pools, such as toothed downingia (*Downingia cuspidata*), Orcutt's quillwort (*Isoetes orcuttii*), stalked popcornflower (*Plagiobothrys stipitatus* ssp. *micranthus*) and purslane speedwell (*Veronica peregrina* ssp. *xalapensis*). Similar hydrologic conditions have also been produced from willow removal by beaver, an activity that exposes moist soil to sunlight. Despite hydrologic conditions comparable to nearby vernal pool habitats, we did not encounter any rare vernal pool obligate plants.

Minimization Measures: Based on findings from field surveys, we do not anticipate the project to have a negative effect on botanical resources. Because no rare plants were observed, we propose no minimization measures for rare plant protection; however unique environments should be preserved to the extent possible. For example, riparian trees and shrubs serve an important ecological and hydrological role and should be preserved as much as possible during construction.

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Table 1. Potential Rare Plants with a High Likelihood of Occurring at East Sand Slough

Scientific Name	Common Name	CRPR	Blooming Period	Habitat	Micro Habitat	Elevation Low (ft)	Elevation High (ft)
Juncus leiospermus var. *leiospermus*	Red Bluff dwarf rush	1B.1	Mar-Jun	Chaparral, Cismontane woodland, Meadows and seeps, Valley and foothill grassland, Vernal pools	Vernally mesic	110	4100
Cryptantha crinita	silky cryptantha	1B.2	Apr-May	Cismontane woodland, Lower montane coniferous forest, Riparian forest, Riparian woodland, Valley and foothill grassland	Gravelly streambeds	200	3985
Gratiola heterosepala	Boggs Lake hedge-hyssop	1B.2	Apr-Aug	Marshes and swamps (lake margins), Vernal pools	Clay	30	7790
Legenere limosa	legenere	1B.1	Apr-Jun	Wet areas	Vernal pools and ponds	0	2885
Wolffia brasiliensis	Brazillian watermeal	2B.3	Jun-Aug	Ponds	Sloughs	0	300
Erythranthe glaucescens	shield-bracted monkeyflower	4.3	Feb-Aug(Sep)	Chaparral, Cismontane woodland, Lower montane coniferous forest, Valley and foothill grassland	Serpentinite seeps, sometimes streambanks	195	4070
Euphorbia ocellata ssp. *rattanii*	Stony Creek spurge	1B.2	May-Sep	sandy, gravel river bed		600	600

Table 2. Potential Rare Plants with a Moderate Likelihood of Occurring at East Sand Slough

Scientific Name	Common Name	CRPR	Blooming Period	Habitat	Micro Habitat	Elevation Low (ft)	Elevation High (ft)
Astragalus pauperculus	depauperate milk-vetch	4.3	Mar-Jun	Chaparral, Cismontane woodland, Valley and foothill grassland	Vernally mesic, volcanic	195	3985
Limnanthes floccosa ssp. *floccosa*	woolly meadowfoam	4.2	Mar-May(Jun)	Chaparral, Cismontane woodland, Valley and foothill grassland, Vernal pools	Vernally mesic	195	4380
Agrostis hendersonii	Henderson's bent grass	3.2	Apr-Jun	Valley and foothill grassland (mesic), Vernal pools	Vernally mesic tuscan mudflow	225	1000
Sagittaria sanfordii	Sanford's arrowhead	1B.2	May-Oct(Nov)	Marshes and swamps (assorted shallow freshwater)	Ponds	0	2135
Sidalcea celata	Redding checkerbloom	3	Apr-Aug	Cismontane woodland	Sometimes serpentinite	440	5005

Table 3. Potential Rare Plants with a Low Likelihood of Occurring at East Sand Slough

Scientific Name	Common Name	CRPR	Blooming Period	Habitat	Micro Habitat	Elevation Low (ft)	Elevation High (ft)
Downingia pusilla	dwarf downingia	2B.2	Mar-May	Valley and foothill grassland (mesic), Vernal pools	Vernal pools	0	1460
Juncus leiospermus var. ahartii	Ahart's dwarf rush	1B.2	Mar-May	Valley and foothill grassland (mesic)		95	750
Navarretia leucocephala ssp. bakeri	Baker's navarretia	1B.1	Apr-Jul	Cismontane woodland, Lower montane coniferous forest, Meadows and seeps, Valley and foothill grassland, Vernal pools	Mesic, Vernal pools	15	5710
Navarretia heterandra	Tehama navarretia	4.3	Apr-Jun	Valley and foothill grassland (mesic), Vernal pools	Vernal pools	95	3315
Polygonum bidwelliae	Bidwell's knotweed	4.3	Apr-Jul	Chaparral, Cismontane woodland, Valley and foothill grassland	Volcanic, thin vernally moist soils	195	3935
Orcuttia tenuis	slender Orcutt grass	1B.1	May-Sep(Oct)	Vernal pools	Often gravelly. Vernal pools	110	5775
Paronychia ahartii	Ahart's paronychia	1B.1	Feb-Jun	Cismontane woodland, Valley and foothill grassland, Vernal pools		95	1675
Fritillaria pluriflora	adobe-lily	1B.2	Feb-Apr	Chaparral, Cismontane woodland, Valley and foothill grassland	Often adobe	195	2315
Hemizonia congesta ssp. calyculata	Mendocino tarplant	4.3	Jul-Nov	Clay. Grassland		660	4600
Eriogonum tripodum	tripod buckwheat	4.2	May-Jun	Serpentine		900	2400
Cypripedium montanum	mountain lady's-slipper	4.2	Mar-Aug	Broadleafed upland forest, Cismontane woodland, Lower montane coniferous forest, North Coast coniferous forest	Conifer forest	605	7300
Acmispon rubriflorus	red-flowered bird's-foot trefoil	1B.1	Apr-Jun	Cismontane woodland, Valley and foothill grassland	Clay	655	1395

Table 4. East Sand Slough Species List

Family	Scientific Name	Common Name	Wetland Indicator Status (incomplete)	OBSERVED 03-28-18 to 03-30-18	OBSERVED 04-09-18	OBSERVED 07-10-18 to 07-11-18
Eudicots						
Adoxaceae	*Sambucus nigra* subsp. *caerulea*	Blue elderberry	FAC	X		X
Amaranthaceae	***Amaranthus albus***	**Pigweed amaranth**				X
Anacardiaceae	*Toxicodendron diversilobum*	Poison oak			X	X
Apiaceae	***Anthriscus caucalis***	**Bur chervil**			X	
	Conium maculatum	**Poison hemlock**				
	Daucus carota	**Queen Anne's lace**		X		X
	Torilis arvensis	**Field hedge parsley**			X	
Apocynaceae	***Vinca major***	**Periwinkle**			X	
Aristolochiaceae	*Aristolochia californica*	California pipevine		X		X
Asteraceae	*Ambrosia psilostachya*	Western ragweed		X		X
	Artemesia douglasiana	Mugwort	FAC	X		X
	Baccharis salicifolia	Mule-fat	FAC	X		X
	Blennosperma nanum	Yellow carpet		X		
	Brickellia californica	California brickelbush		X		X
	Calycadenia ciliosa	Klamath calycadenia				X
	Calycadenia fremontii (?, dry)	Fremont's calycadenia		X		
	Centaurea solstitialis	**Yellow starthistle**			X	X
	Centromadia fitchii	Fitch's spikeweed				X
	Chicory intybus	**Chicory**				X
	Erigeron annuus	Annual fleabane				X
	Erigeron canadensis	Horseweed	FAC	X		X
	Euthamia occidentalis	Western goldenrod				X
	Gnaphalium palustre	Lowland cudweed		X		X
	Grindelia camporum	Valley gumplant	UPL	X		X
	Helenium puberulum	Rosilla				X
	Heterotheca grandiflora	Telegraph weed	UPL	X		X
	Heterotheca oregona	Oregon false goldenaster	FACU	X		X
	Hypochaeris glabra	**Smooth cats-ear**				
	Lactuca serriola	**Prickly lettuce**	FAC	X		X
	Leontodon saxatilis* ssp. *longirostris	**Long-beaked hawkbit**	FACU	X		X
	Logfia gallica	**Narrowleaf**		X		
	Matricaria discoidea	Pineapple weed			X	
	Senecio vulgaris	**Old-man-of-spring**		X		
	Silybum marianum	**Milk-thistle**		X		
	Sonchus oleraceus	**Common sow-thistle**		X		
	Symphyotrichum subulatum var. *parviflorum*	Annual saltmarsh aster		X		
	Xanthium strumarium	Cocklebur	FAC	X		X
Bignoniaceae	***Catalpa speciosa***	**Northern catalpa**				X
Boraginaceae	*Amsinckia lycopsoides*	Bugloss fiddleneck		X		
	Cryptantha flaccida	Weak-stemmed cryptantha		X		
	Eriodictyon californicum	Yerba santa		X		X
	Heliotropium europaeum	**European heliotrope**				X
	Heliotropium curassavicum var. *oculatum*	Wild heliotrope				X (1 indiv.)
	Plagiobothrys canescens	Valley popcornflower		X		
	Plagiobothrys stipitatus ssp. *micranthus*	Small-flowered stalked	FACW	X		
Brassicaceae	***Arabidopsis thaliana***	**Thalecress**		X		
	Barbarea verna	**Early winter cress**		X		
	Brassica nigra	**Black mustard**	UPL	X		X
	Brassica rapa	**Field mustard**				
	Cardamine hirsuta	**Hairy bittercress**		X		
	Cardamine oligosperma	Western bittercress		X		
	Hirschfeldia incana	**Summer mustard**	UPL	X		
	Lepidium latifolium	**Perennial**				X
	Lepidium nitidum	Shining peppergrass		X		
	Nasturtium officinale	Watercress				
	Raphanus sp.	**Radish**		X		
	Rorippa curvisiliqua var. *occidentalis*	Curvepod yellow cress		X		

Table 4 (continued). East Sand Slough Species List

Family	Scientific Name	Common Name	Wetland Indicator Status (incomplete)	OBSERVED 03-28-18 to 03-30-18	OBSERVED 04-09-18	OBSERVED 07-10-18 to 07-11-18
Campanulaceae	*Downingia cuspidata*	Toothed downingia				X
Caryophyllaceae	***Herniaria hirsuta* var. *hirsuta***	**Hairy rupturewort**		X		
	Petrorhagia dubia	**Grass-pink**		X		
	Scleranthus annuus	**German knotgrass**		X		
	Spergula arvensis	**Corn spurry**				
	Spergularia bocconi	**Red sand-spurry**	FAC	X		
	Stellaria media	**Common chickweed**			X	
Chenopodiaceae	***Chenopodium album***	**Lamb's quarters**				X
	Dysphania botrys	**Jerusalem-oak**		X		X
Cleomaceae	*Polanisia dodecandra* ssp. *trachysperma*	Western clammyweed	FACU	X		X
Convolvulaceae	***Convolvulus arvensis***	**Field bindweed**				X
Crassulaceae	***Crassula tillaea***	**Mediterranean pygmy weed**		X		
Cucurbitaceae	*Marah fabacea*	California manroot		X		
Euphorbiaceae	*Croton setigerus*	Turkey mullein				X
	Euphorbia maculata	**Spotted spurge**				X
	Euphorbia ocellata ssp. *ocellata*	Valley spurge				X
	Euphorbia peplus	**Petty spurge**		X		
	Euphorbia serpyllifolia	Thyme-leaved spurge				X
Fabaceae	*Acmispon americanus* var. *americanus*	Spanish lotus				X
	Cercis occidentalis	Western redbud			X	
	Lotus corniculatus	**Bird's foot trefoil**				X
	Lupinus albifrons	Silver bush lupine			X	
	Lupinus bicolor	Bicolored lupine		X		
	Lupinus succulentus	Succulent lupine		X		
	Medicago polymorpha	**Burclover**	FACU	X		
	Melilotus albus	**White sweetclover**				X
	Melilotus indicus	**Yellow sweetclover**	FACU	X		
	Robinia pseudoacacia	**Black locust**			X	X
	Sesbania punicea	**Scarlet wisteria**				X
	Soartium junceum	**Spanish broom**				
	Trifolium hirtum	**Rose clover**		X		
	Vicia villosa* ssp. *varia	**Winter vetch**	UPL	X		
Fagaceae	*Quercus lobata*	Valley oak	FAC	X		X
	Quercus wislizeni	Interior live oak			X	X
Gentianaceae	*Zeltnera venusta*	Charming centaury				
Geraniaceae	***Erodium cicutarium***	**Red-stemmed filaree**	UPL	X		
	Geranium molle	**Crane's bill geranium**		X		
Hypericaceae	*Hypericum anagalloides*	Creeping St. John's-wort		X		
	Hypericum mutilum	**Small-flowered St. John's-wort**				X
	Hypericum perforatum	**Klamath-weed**	FACU	X		X
Juglandaceae	*Juglans hindsii*	Northern California black walnut	FAC	X		X
Lamiaceae	***Lamium amplexicaule***	**Giraffehead**		X		
	Lamium purpureum	**Purple dead nettle**				
	Lycopus americanus	Cut-leaved				X
	Marrubium vulgare	**Horehound**		X		X
	Mentha pulegium	**Pennyroyal**		X		X
	Trichostema lanceolatum	Vinegarweed				X
Lauraceae	*Umbellularia californica*	California bay			X	
Loasaceae	*Mentzelia laevicaulis*	Giant blazing star				X
Lythraceae	*Ammannia robusta*	Grand ammania				X
	Ficus carica	**Fig**				X
	Lythrum hyssopifolia	**Hyssop loosestrife**	FACW	X		

Table 4 (continued). East Sand Slough Species List

Family	Scientific Name	Common Name	Wetland Indicator Status (incomplete)	OBSERVED 03-28-18 to 03-30-18	OBSERVED 04-09-18	OBSERVED 07-10-18 to 07-11-18
Molluginaceae	***Mollugo verticillata***	**Green carpetweed**				X
Montiaceae	*Calandrinia menziesii*	Red maids		X		
	Claytonia perfoliata	Miner's lettuce			X	
Moraceae	***Maclura pomifera***	**Osage orange**				
	Morus alba	**Mulberry**		X		X
Myrtaceae	***Eucalyptus sp.***	**Eucalyptus**			X	
Oleaceae	*Fraxinus latifolia*	Oregon ash	FACW	X		X
Onagraceae	*Camissonia contorta*	Contorted sun cup			X	
	Epilobium brachycarpum	Tall annual	UPL	X		
	Epilobium ciliatum ssp. *ciliatum*	Fringed willowherb				X
	Ludwigia peploides	**Water primrose**	OBL	X		X
	Oenothera elata ssp. *hirsutissima*	Evening primrose				X
Orobanchaceae	*Castilleja attenuata*	Valley-tassels			X	
	Triphysaria eriantha	Johnny tuck		X		
Papaveraceae	*Eschscholzia caespitosa*	Foothill poppy				
	Platystemon californicus	Cream cups		X		
Phrymaceae	*Mimulus guttatus (Erythranthe guttata)*	Seep monkey-flower	OBL	X		
	Mimulus pilosus (Mimetanthe pilosa)	Downy mimetanthe				X
Pinaceae	***Pinus halepensis?***	**Aleppo pine?**			X	X
	Pinus sabiniana	Gray pine			X	X
Plantaginaceae	*Antirrhinum cornutum*	Spurred snapdragon				X
	Kickxia elatine	**Sharp-leaved fluellin**	NI	X		X
	Penstemon azureus var. *azureus*	Azure beardtongue		X		X
	Plantago erecta	California plantain			X	
	Plantago lanceolata	**English plantain**	FACW	X		X
	Veronica anagallis-aquatica	**Water speedwell**	OBL	X		X
	Veronica arvensis	**Speedwell**			X	
	Veronica peregrina ssp. *xalapensis*	Purslane speedwell	OBL	X		
Platanaceae	*Platanus racemosa*	Western sycamore	FACW	X		X
Polemoniaceae	*Leptosiphon sp.*			X		
	Linanthus (?)					
Polygonaceae	*Eriogonum nudum*	Naked buckwheat		X		X
	Eriogonum wrightii var. *trachygonum*	Wright's buckwheat		X		X
	Persicaria hydropiper	**Common smartweed**				X
	Polygonum aviculare	**Prostrate knotweed**				
	Rumex crispus	**Curly dock**	FACW	X		X
Potamogetonaceae	***Potamogeton crispus***	**Curly pondweed**				X
Rhamnaceae	*Frangula californica*	Coffeeberry			X	X
Rosaceae	*Heteromeles arbutifolia*	Toyon			X	
	Prunus cerasifera (green leaf)	**Cherry plum**				X
	Prunus cerasifera (purple leaf)	**Cherry plum**				X
	Prunus dulcis	**Almond**				X
Rosaceae	*Rosa californica*	California rose	FAC	X		X
	Rubus armeniacus	**Himalayan blackberry**	FACW	X		X
Rubiaceae	***Galium parisiense***	**Wall bedstraw**	UPL	X		
Salicaceae	*Populus fremontii*	Fremont cottonwood	FAC	X		X
	Salix exigua	Sandbar willow	OBL	X		X
	Salix goodingii	Black willow			X	X
	Salix laevigata	Red willow				X
	Salix lasiolepis	Arroyo willow	FACW	X		X

Table 4 (continued). East Sand Slough Species List

Family	Scientific Name	Common Name	Wetland Indicator Status (incomplete)	OBSERVED 03-28-18 to 03-30-18	OBSERVED 04-09-18	OBSERVED 07-10-18 to 07-11-18
Sapindaceae	*Acer negundo*	Box elder	FACW	X		X
Scrophulariaceae	***Verbascum blattaria***	**Moth mullein**	UPL	X		X
	Verbascum thapsus	**Wooly mullein**	FACU	X		X
Simaroubaceae	***Ailanthus altissima***	**Tree of heaven**			X	X
Solanaceae	*Datura wrightii*	Jimsonweed			X	X
	Solanum americanum	American black nightshade				X
Verbenaceae	*Phyla nodiflora* var. *nodiflora*	Creeping lippia (large leaf)				X
	Phyla nodiflora* var. *rosea	**Rosy lippia (small leaf-compact mat)**				X
	Verbena bonariensis	**Purple top vervain**	UPL			X
Vitaceae	*Vitis californica*	California wild grape	FACW	X		X
Zygophyllaceae	***Tribulus terrestris***	**Puncturevine**				X
Monocots						
Alismataceae	*Echinodorus bertoroi*	Burhead				**X (9/13/18)**
Cyperaceae	*Eleocharis macrostachya*	Creeping spike rush		X		
	Carex barbarae	Santa barbara sedge				X
	Cyperus sp.	Nutsedge				
	Schoenoplectus acutus var. *occidentalis*	Tule				X
Juncaceae	*Juncus balticus*	Baltic rush		X		
	Juncus bufonius var. *bufonius*	Toad rush	FACW	X		
	Juncusacuminatus					
Poaceae	***Aira caryophyllea (?)***	**Silver hairgrass**				
	Alopecurus carolinianus	Carolina foxtail		X		
	Arundo donax	**Giant reed**				
	Avena barbata or A. fatua	**Wild oats**	UPL	X		
	Brachypodium distachyon	**False brome**	UPL	X		
	Bromus diandrus	**Ripgut brome**	UPL	X		
	Bromus hordeaceus	**Soft chess**	FACU	X		
	***Bromus madritensis* ssp. rubens**	**Red brome**	UPL	X		
	Cynodon dactylon	**Bermudagrass**	FAC	X		X
	Echinochloa sp.			X		
	Elymus glaucus(?)	Blue wildrye				
	Festuca (=Vulpia) myuros	**Rattail sixweeks grass**		X		
	Festuca perennis	**Italian rye grass**		X		
	Hordeum marinum* ssp. *gussoneanum	**Mediterranean barley**	FAC	X		
	Hordeum murinum	**Wall barley**		X		
	Paspalum dilatatum	**Dallis grass**				X
	Phalaris arundinacea (?)	Reed canarygrass				X
	Secale cereale	**Cereal rye**			X	
	Sorghum halepense	**Johnsongrass**				X
	Stipa miliacea* ssp. *miliacea	**Smilo grass**		X		X
Themidaceae	*Dichelostemma capitatum*	Blue-dicks			X	
Typhaceae	*Typha sp.*	Cattail	OBL	X		X
Pteridophytes						
Equisetaceae	*Equisetum hyemale*	Scouringrush		X		X

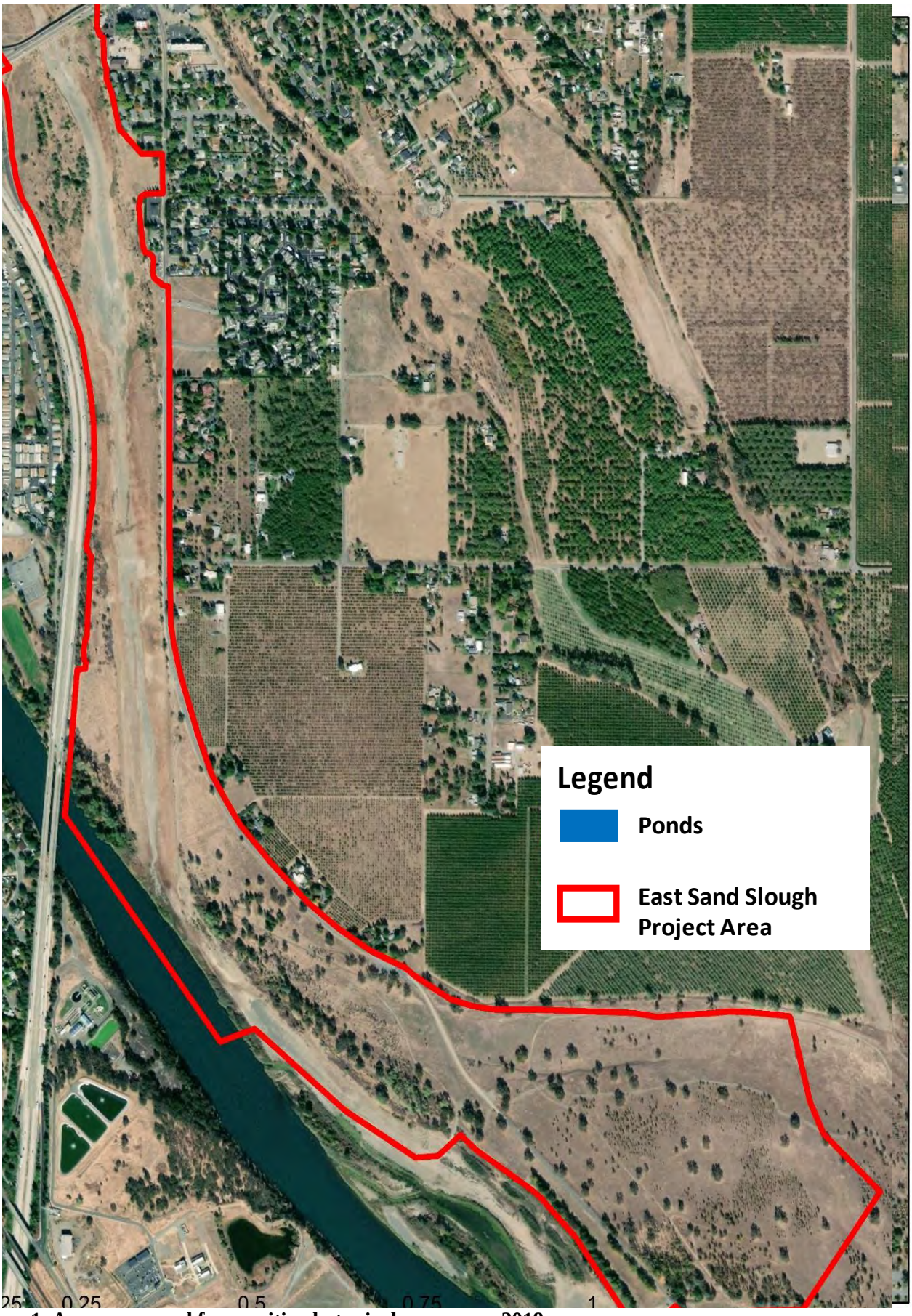


Figure 1. Areas surveyed for sensitive botanical resources -2018

Note: Minor boundary modifications were made in September 2018 that did not require a re-survey.

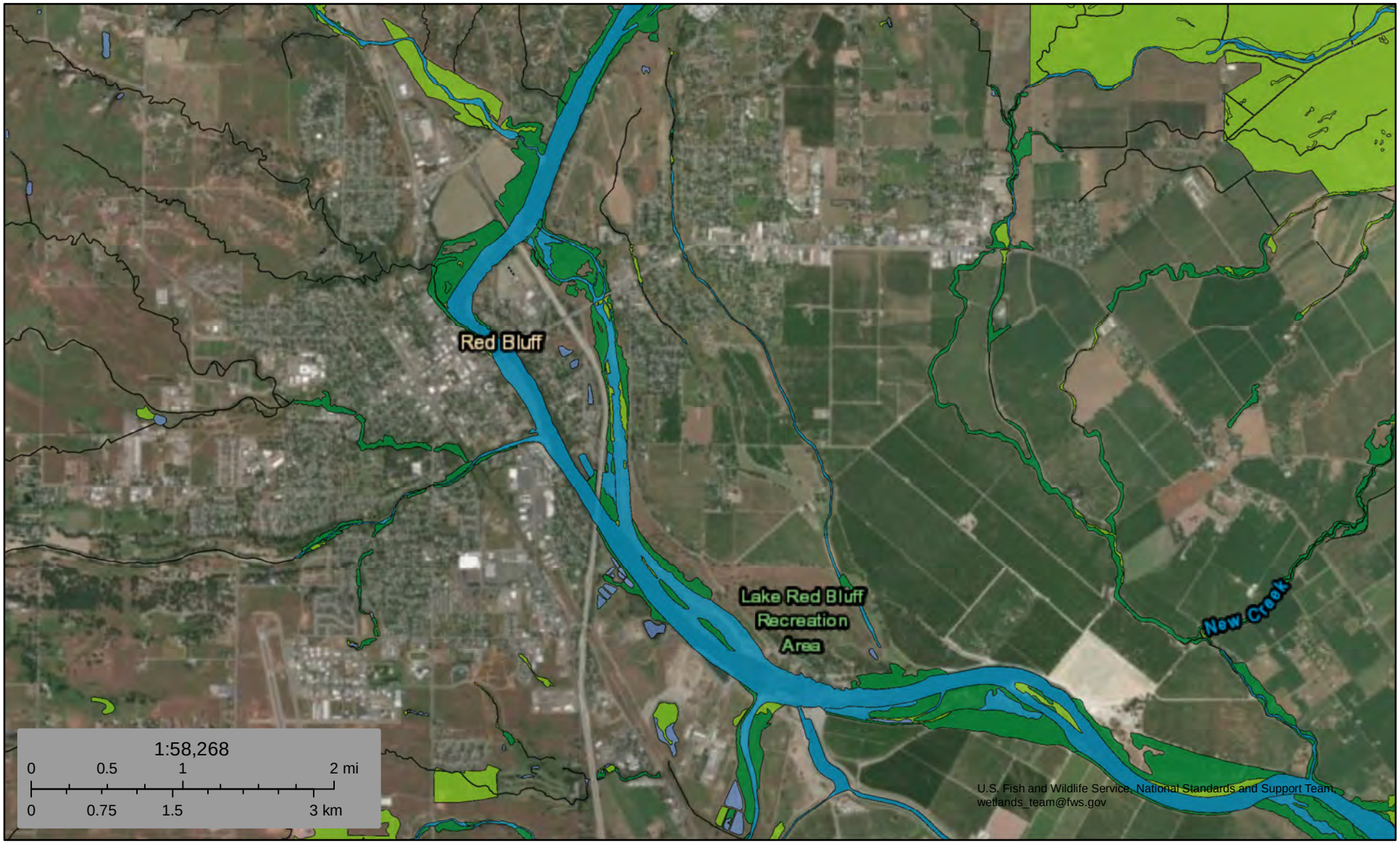
Attachment 6

National Wetlands Inventory Map

ATTACHMENT 6

U.S. Fish and Wildlife Service
National Wetlands Inventory

East Sand Slough NWI Map



March 12, 2018

Wetlands

- Estuarine and Marine Deepwater
- Estuarine and Marine Wetland
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Other
- Riverine

This map is for general reference only. The US Fish and Wildlife Service is not responsible for the accuracy or currentness of the base data shown on this map. All wetlands related data should be used in accordance with the layer metadata found on the Wetlands Mapper web site.

National Wetlands Inventory (NWI)
This page was produced by the NWI mapper

Attachment 7

Data Sheets

ATTACHMENT 7

Transect -1a -1a

Arid West Ephemeral and Intermittent Streams OHWM Datasheet

Project: East Sand Slough Restoration **Date:** 4/30/18 **Time:** 10:30 AM
Project Number: **Town:** Red Bluff **State:** CA
Stream: Sacramento River **Photo begin file#:** **Photo end file#:**
Investigator(s): Alex Woodward, Jamie LeFevre, Luke Davis, Sarah Perrin, Spencer Marshall

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

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

Location Details:
NE tip connection to Sacramento River

Projection: UTM 10N **Datum:** NAD83
Coordinates: 40.187885°N; -122.227317°W

Potential anthropogenic influences on the channel system:
Shasta Dam regulates Sacramento River flow. USACE levees on Sacramento River.

Brief site description:
Backwater, side channel with raised island separating it from main river flow. Facing upstream on right-hand side

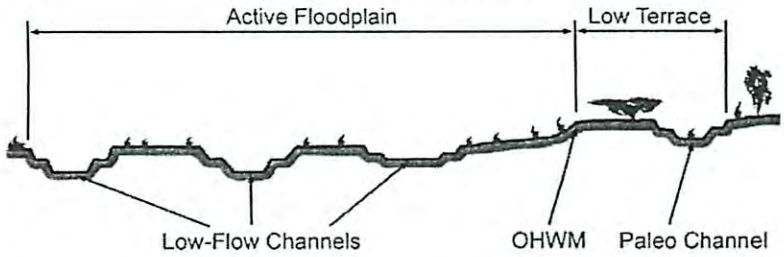
Checklist of resources (if available):

- [X] Aerial photography Google Earth: Dates: 7/27/11, 8/27/13, 4/15/15, 5/24/17.
- [X] Topographic maps NAIP: 6/30/05, 7/20/10, 1/1/16, 10/26/17
- [ ] Geologic maps
- [X] Vegetation maps
- [X] Soils maps
- [ ] Rainfall/precipitation maps
- [ ] Existing delineation(s) for site
- [X] Global positioning system (GPS)
- [X] Other studies LiDAR

- [X] Stream gage data — Gage number: USGS 11377100 Sac River AB Bend Bridge near Red Bluff, CA — Period of record: 10/4/1988 – present
- [ ] 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 — 10/01/2007 – present

Red Bluff East, CA USGS 7.5' Quad

Hydrogeomorphic Floodplain Units

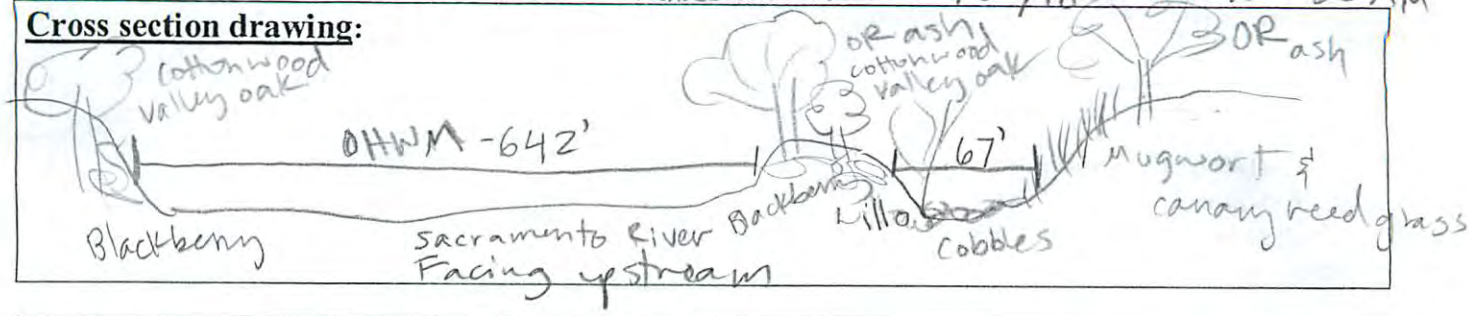


Procedure for identifying and characterizing the floodplain units to assist in identifying the OHWM:

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
   - [X] Digitized on computer
   - [X] GPS Datapoint
   - [X] Other: Hydraulic modeling shapefiles for 1.5-2 year event

Project ID: **Cross section ID:** Transect 1a-1a **Date:** 4/30/18 **Time:** 10:30 AM

Cross section drawing:



OHWM

GPS point: UTM 4448894 N, 565775 W

Indicators:

- [x] Change in average sediment texture
- [ ] Change in vegetation species
- [x] Change in vegetation cover
- [x] Break in bank slope
- [ ] Other: _____
- [ ] Other: _____

Comments:

Fines & cobbles in low-flow channel, then fine sand as move up-slope. More dense veg. & trees as move up-slope.

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

GPS point: See map for transect

Characteristics of the floodplain unit:

Average sediment texture: Sandy shore, cobbly low-flow

Total veg cover: 15 % Tree: 3 % Shrub: ____ % Herb: 12 %

Community successional stage:

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

Indicators:

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

Comments:

Right low-flow backwater area has no flow, but soil development present & transitions to cobbles downstream

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: East Sand Slough City/County: Red Bluff Sampling Date: 4/30/18

Applicant: Bureau of Reclamation State: CA Sampling Point: DP1 (SSW-4)

Investigator(s): Alex Woodward, Jamie LeFevre, Luke Davis Section, Township, Range: S17, T27N, R3W

Landform (hillslope, terrace, etc.): channel depression Local relief (concave, convex, none): concave Slope (%): 3%

Subregion (LRR): C Lat: 40.187207°N Long: -122.227377°W Datum: NAD83

Soil Map Unit Name: Water/Rr – Riverwash NWI classification: R2UBH/PFOIA

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓ No ____	**Is the Sampled Area within a Wetland?** Yes ✓ No ____
Hydric Soil Present?	Yes ✓ No ____	
Wetland Hydrology Present?	Yes ✓ No ____	

Remarks:
Depression at foot of island, with deposited fines. Surrounded by channel cobbles.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 1m²)	Absolute % Cover	Dominant Species?	Indicator Status
1. Salix exigua	80	X	FACW
2.			
3.			
4.			
	80% = Total Cover		
Sapling/Shrub Stratum (Plot size: 1m²)			
1.			
2.			
3.			
4.			
5.			
	____ = Total Cover		
Herb Stratum (Plot size: 1m²)			
1. Phalaris arundinacea	25	X	FACW
2. Nasturtium officinale	8	X	OBL
3.			
4.			
5.			
6.			
7.			
8.			
.5=16.5 .2=6.6	33% = Total Cover		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
	____ = Total Cover		

% Bare Ground in Herb Stratum ____ % Cover of Biotic Crust ____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 3/3 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species ____	x 1 = ____
FACW species ____	x 2 = ____
FAC species ____	x 3 = ____
FACU species ____	x 4 = ____
UPL species ____	x 5 = ____
Column Totals: ____ (A)	____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

X Dominance Test is >50%

__ Prevalence Index is ≤3.0[1]

__ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

__ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

Remarks:
Only vegetation in water were herb stratum species, with willows along edges.

SOIL

Sampling Point: DP1 (SSW-14)

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-8	10YR 4/1	60	5YR 4/6	40	C	PL	Loamy sand	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) **(LRR C)**
- ___ 1 cm Muck (A9) **(LRR D)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ✓ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) **(LRR C)**
- ___ 2 cm Muck (A10) **(LRR B)**
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ✓ No ___

Remarks:

Very wet with red iron concentrations.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ✓ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) **(Nonriverine)**
- ___ Sediment Deposits (B2) **(Nonriverine)**
- ___ Drift Deposits (B3) **(Nonriverine)**
- ___ Surface Soil Cracks (B6)
- ✓ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ✓ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) **(Riverine)**
- ___ Sediment Deposits (B2) **(Riverine)**
- ✓ Drift Deposits (B3) **(Riverine)**
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ✓ No ___ Depth (inches): 2"

Water Table Present? Yes ___ No ___ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes ___ No ___ Depth (inches): _____

Wetland Hydrology Present? Yes ✓ No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Ponded water as river rises and connects. Appears to be partially fed by groundwater due to proximity to river.

Transect - 2a-2a

Arid West Ephemeral and Intermittent Streams OHWM Datasheet

Project: East Sand Slough Restoration
Project Number:
Stream: East Sand Slough
Investigator(s): Alex Woodward, Jamie Lefevre, Luke Davis, Sarah Perrin, Spencer Marshall

Date: 4/30/18 **Time:** 1:15 PM
Town: Red Bluff **State:** CA
Photo begin file#: **Photo end file#:**

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

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

Location Details:
Halfway down, North of portion of bridge

Projection: UTM 10N **Datum:** NAD83
Coordinates: 40.1842729°N; -122.2272389°W

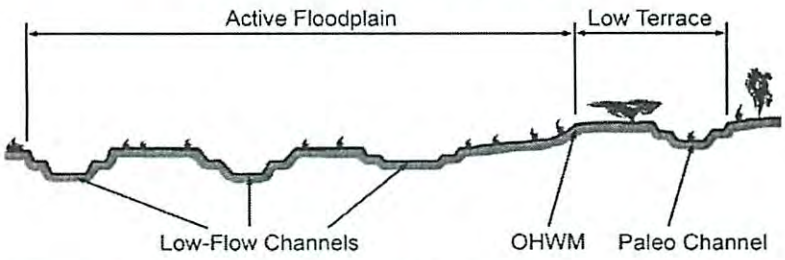
Potential anthropogenic influences on the channel system:
Shasta Dam controls flow on Sacramento River. Operation of Red Bluff Diversion Dam gates decommissioned in 2012, so water no longer backs up into East Sand Slough.

Brief site description:
Active floodplain, North part of site. Total of 3 low flow channels along this transect, with island upland in middle.

Checklist of resources (if available):

- [X] Aerial photography
  Dates: See previous form
- [X] Topographic maps Red Bluff East, CA 7.5' Quad
- [ ] Geologic maps
- [X] Vegetation maps
- [Y] Soils maps
- [ ] Rainfall/precipitation maps
- [ ] Existing delineation(s) for site
- [X] Global positioning system (GPS)
- [X] Other studies LiDAR
- [X] Stream gage data
  Gage number: USGS 11377100 Sac River AB Bend Bridge near
  Period of record: Red Bluff, CA 10/04/1988 - present
- [ ] 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
  10/01/2007 - present

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.
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   b) Describe the sediment texture (using the Wentworth class size) and the vegetation characteristics of the floodplain unit.
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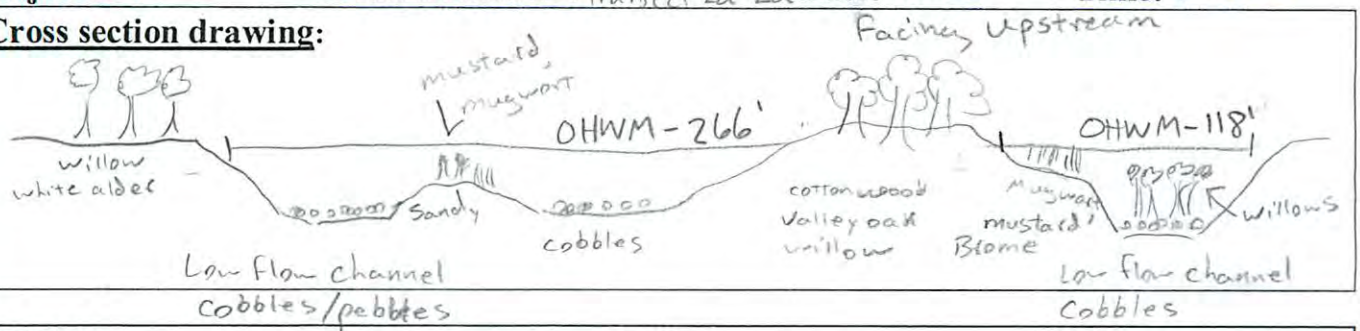
4. Repeat for other points in different hydrogeomorphic floodplain units across the cross section.
5. Identify the OHWM and record the indicators. Record the OHWM position via:
   - [X] Mapping on aerial photograph
   - [X] Digitized on computer
   - [X] GPS Datapoint taken then walked across.
   - [X] Other:

1.5-2 year event hydraulic modeling shapefiles.

Project ID: **Cross section ID:** Transect 2a-2a **Date:** 4/30/18 **Time:** 1:15 PM

Cross section drawing:



OHWM

UTM

GPS point: 4448497 N 565783 E

Indicators:

- [x] Change in average sediment texture
- [x] Change in vegetation species
- [x] Change in vegetation cover
- [x] Break in bank slope
- [ ] Other: _____
- [ ] Other: _____

Comments:

Walked from North Low channel to South low channel, crossed higher plateau. Barren cobbley low flow channels. Sandy loam textures in higher elevations. Mixture of upland species in non-flood areas.

Floodplain unit:

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

UTM

GPS point: 444849 N 565802 E

Characteristics of the floodplain unit:

Average sediment texture: Small pebbles to large cobbles

Total veg cover: 23 % Tree: 3 % Shrub: 6 % Herb: 14 %

Community successional stage:

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

Indicators:

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

Comments:

Similar to North low channel but with fewer willows

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: East Sand Slough City/County: Red Bluff Sampling Date: 4/3b/18
Applicant: Bureau of Reclamation State: CA Sampling Point: DP2 (UPL)
Investigator(s): Woodward, LeFerre, Daris, Perrin, Marshall Section, Township, Range: S 20; T27N, R 3W
Landform (hillslope, terrace, etc.): terrace Local relief (concave, convex, none): concave Slope (%): 0.5%
Subregion (LRR): C Lat: 40.185901 °N Long: -122.226083 °W Datum: NAD83
Soil Map Unit Name: Rr - Riverwash NWI classification: PFO1A
Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No _____ (If no, explain in Remarks.)
Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No _____
Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes X No _____
Hydric Soil Present? Yes _____ No X
Wetland Hydrology Present? Yes X No _____
Is the Sampled Area within a Wetland? Yes _____ No X

Remarks:
Middle of valley oak riparian area. Slight depression with drainage patterns on floodplain. See Hydrology Remarks

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: r=30')	Absolute % Cover	Dominant Species?	Indicator Status
1. Populus fremontii	40	X	FAC
2. Carya illinoinensis	35	X	FAC
3. Quercus lobata	25	X	FACU
4. Salix lasiolepis	8		FACW
Salix exigua (narrow leaf)	5		FACW
	120%	= Total Cover	.5=60 .2=24

Sapling/Shrub Stratum (Plot size: —)			
1.			
2.			
3.			
4.			
5.			
		= Total Cover	

Herb Stratum (Plot size: 1 m²)			
1. Artemisia douglasiana	55	X	FAC
2. Carex senta	35	X	OBL
3. Aristolochia californica	20		UPL
4. Galium aparine	5		UPL
5.			
6.			
7.			
8.			
.5=52.5 .2=21	105	= Total Cover	

Woody Vine Stratum (Plot size: _____)			
1.			
2.			
		= Total Cover	

% Bare Ground in Herb Stratum _____ % Cover of Biotic Crust _____

Dominance Test worksheet:
Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)
Total Number of Dominant Species Across All Strata: 5 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 80% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:	
OBL species	x 1 =	
FACW species	x 2 =	
FAC species	x 3 =	
FACU species	x 4 =	
UPL species	x 5 =	
Column Totals: (A)		(B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:
X Dominance Test is >50%
___ Prevalence Index is ≤3.0[1]
___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No _____

Remarks:
Hydrophytic vegetation likely came in after the 3-4 large flow events in winter/spring 2017.

SOIL

Sampling Point: DP 2 (UPL)

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-12	10YR 3/2	100	—	—			loamy sand	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) **(LRR C)**
- ___ 1 cm Muck (A9) **(LRR D)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) **(LRR C)**
- ___ 2 cm Muck (A10) **(LRR B)**
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes _____ No X

Remarks:

Depth of hole 12 inches. Water not ponded/present long enough to create hydric soils.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) **(Nonriverine)**
- ___ Sediment Deposits (B2) **(Nonriverine)**
- ___ Drift Deposits (B3) **(Nonriverine)**
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) **(Riverine)**
- X Sediment Deposits (B2) **(Riverine)**
- ___ Drift Deposits (B3) **(Riverine)**
- X Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No X Depth (inches): _____

Water Table Present? Yes _____ No X Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No X Depth (inches): _____

Wetland Hydrology Present? Yes X No _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

USGS 11377100 gage at Bend Bridge ~11 miles upstream: Winter 2017 high flows: 64K - 97K cfs.

Remarks:

Small wrack deposit at base of tree likely from high water in 2017. There were 3-4 large storms with flows ~64,000 – 97,700 cfs from December 2016 – early March 2017. This DP is located within the floodplain of East Sand Slough, and so the drainage patterns likely show the path of waterflow during the 2017 large flow events.

Transect 2b-2b

Arid West Ephemeral and Intermittent Streams OHWM Datasheet

Project: East Sand Slough Restoration **Date:** 5/1/18 **Time:** 8:40AM
Project Number: **Town:** Red Bluff **State:** CA
Stream: East sand slough **Photo begin file#:** **Photo end file#:**
Investigator(s): Woodward, LeFevre, Davis, Perrin, Marshall

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

Y ☐ / N ☑ Is the site significantly disturbed?

Location Details: NW corner of Del Taco parking lot, looking across

Projection: UTM 10N **Datum:** NAD83
Coordinates: 40.183740°N; -122.221990°W

Potential anthropogenic influences on the channel system:

Shasta Dam regulates flows on Sac. River. Red Bluff Diversion Dam gates decommissioned 2012, so flows no longer back up into East Sand Slough.

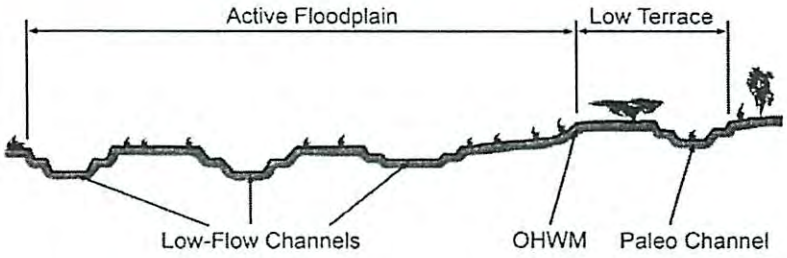
Brief site description:

Braided channel just north of Antelope Blvd Bridge. Has low flow terrace and island. Three low flow channels along this transect as well.

Checklist of resources (if available):

- ☒ Aerial photography
  - Dates: See previous form
- ☒ Topographic maps — Red Bluff East, CA 7.5' Quad
- ☐ Geologic maps
- ☒ Vegetation maps
- ☒ Soils maps
- ☐ Rainfall/precipitation maps
- ☐ Existing delineation(s) for site
- ☒ Global positioning system (GPS)
- ☒ Other studies LiDAR
- ☒ Stream gage data
  - Gage number: USGS 11377100 (Sac R AB Bend Bridge NR Red Bluff CA)
  - Period of record: 10/04/1988 - present
- ☐ 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
  - 10/01/2007 - present

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.
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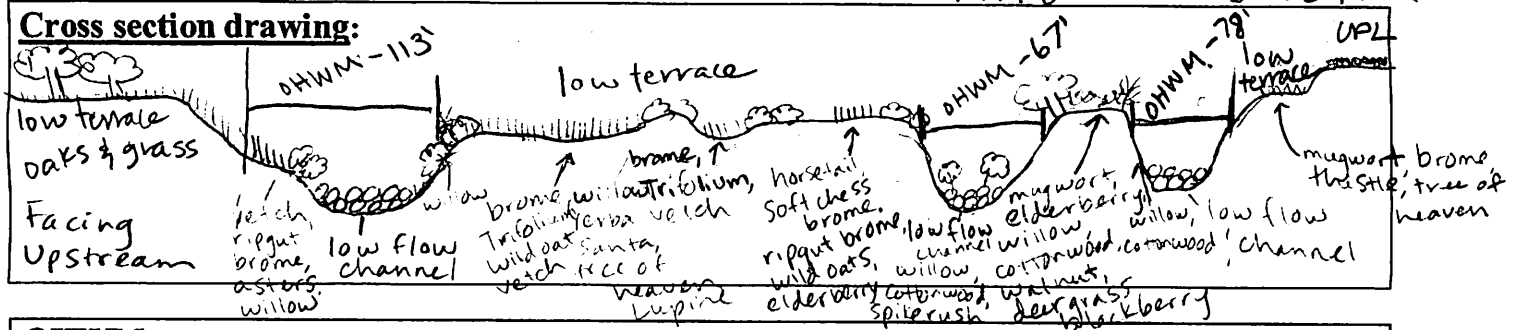
   b) Describe the sediment texture (using the Wentworth class size) and the vegetation characteristics of the floodplain unit.
   c) Identify any indicators present at the location.
4. Repeat for other points in different hydrogeomorphic floodplain units across the cross section.
5. Identify the OHWM and record the indicators. Record the OHWM position via:
   - ☒ Mapping on aerial photograph
   - ☒ Digitized on computer
   - ☒ GPS Datapoint taken then walked across
   - ☒ Other: 1.5-2 year event hydraulic modeling shapefile

Project ID: **Cross section ID:** Transect 2b-2b **Date:** 5/1/18 **Time:** 8:43 AM

Cross section drawing:



OHWM

GPS point: 4448429 N, 566223 E
4448386 N, 566091 E

Indicators:

- [x] Change in average sediment texture
- [ ] Change in vegetation species
- [x] Change in vegetation cover
- [x] Break in bank slope
- [ ] Other: _____
- [ ] Other: _____

Comments:

Floodplain unit:

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

GPS point: See map for transect

Characteristics of the floodplain unit:

Average sediment texture: low flow - cobbles, upland - sandy, finer

Total veg cover: 75 % Tree: 20 % Shrub: 5 % Herb: 50 %

Community successional stage:

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

Indicators:

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

Comments:

3 braiding channels in active floodplain with low-terraces/islands in the middle. Clear transition from large cobbles to pebbles, sand and silt as moved up in elevation.

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: East Sand Slough City/County: Red Bluff Sampling Date: 5/1/18

Applicant: Bureau of Reclamation State: CA Sampling Point: DP3 (UPL)

Investigator(s): Woodward, LeFevre, Davis, Perrin, Marshall Section, Township, Range: S20, T27N, R3W

Landform (hillslope, terrace, etc.): terrace Local relief (concave, convex, none): concave Slope (%): 2%

Subregion (LRR): C Lat: 40.184002°N Long: -122.222402°W Datum: NAD83

Soil Map Unit Name: Rr - Riverwash NWI classification: PF01A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____	No ✓	Is the Sampled Area within a Wetland? Yes ____ No ✓
Hydric Soil Present?	Yes ____	No ✓	
Wetland Hydrology Present?	Yes ____	No ✓	

Remarks:
slight depression near upland island area, upstream of bridge. Forested until 2012 reduced water regime from RBDD, and 2013 fire.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	____ = Total Cover		
Sapling/Shrub Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
	____ = Total Cover		
Herb Stratum (Plot size: 1m²)			
1. Bromus hordeaceus	40	X	FACU
2. Brassica nigra	35	X	UPL
3. Equisetum hyemale	20	X	FACW
4.			
5.			
6.			
7.			
8.			
.5=47.5 .2=19	95	= Total Cover	
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
	____ = Total Cover		

% Bare Ground in Herb Stratum ____ % Cover of Biotic Crust ____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 33% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	
FACW species	1	x 2 =	2
FAC species	0	x 3 =	
FACU species	1	x 4 =	4
UPL species	1	x 5 =	5
Column Totals:	3 (A)		11 (B)

Prevalence Index = B/A = 11/3 = 3.666

Hydrophytic Vegetation Indicators:

- ___ Dominance Test is >50%
- ___ Prevalence Index is ≤3.0[1]
- ___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ____ No X

Remarks:
Surrounded by invasive upland herbaceous species, with some interspersed, but less than 5% cover.

SOIL

Sampling Point: DP3 (UPL)

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-12	10YR 4/3	100					~~loamy clay~~ silt loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) **(LRR C)**
- ___ 1 cm Muck (A9) **(LRR D)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) **(LRR C)**
- ___ 2 cm Muck (A10) **(LRR B)**
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes _____ No X

Remarks: depth of hole 12 inches. Soil map shows area to contain Riverwash. Likely saturated from rain events, then quickly drains after.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) **(Nonriverine)**
- ___ Sediment Deposits (B2) **(Nonriverine)**
- ___ Drift Deposits (B3) **(Nonriverine)**
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) **(Riverine)**
- ___ Sediment Deposits (B2) **(Riverine)**
- ___ Drift Deposits (B3) **(Riverine)**
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No ✓ Depth (inches): _____

Water Table Present? Yes _____ No ✓ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No ✓ Depth (inches): _____

Wetland Hydrology Present? Yes _____ No ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: East Sand Slough City/County: Red Bluff Sampling Date: 5/1/18

Applicant: Bureau of Reclamation State: CA Sampling Point: DP4(UPL)

Investigator(s): Woodward, LeFevre, Perrin, Marshall, Davis Section, Township, Range: S20, T27N, R3W

Landform (hillslope, terrace, etc.): terrace Local relief (concave, convex, none): concave Slope (%): 2.5%

Subregion (LRR): C Lat: 40.183885°N Long: -122.222452°W Datum: NAD83

Soil Map Unit Name: Rr - Riverwash NWI classification: PFO1A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓	No ____	Is the Sampled Area within a Wetland? Yes ____ No X
Hydric Soil Present?	Yes ____	No ✓	
Wetland Hydrology Present?	Yes ____	No ✓	

Remarks: Slight depression near DP3 (up) on upland island upstream of bridge. See notes for DP3.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	____ = Total Cover		
Sapling/Shrub Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
	____ = Total Cover		
Herb Stratum (Plot size: 1 m²)			
1. Carex senta	95	X	FACW
2. Geranium dissectum	5		UPL
3.			
4.			
5.			
6.			
7.			
8.			
5=50, 2=20	100 = Total Cover		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
	____ = Total Cover		

% Bare Ground in Herb Stratum ____ % Cover of Biotic Crust ____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 1/1 = 100% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:	
OBL species	x 1 =	
FACW species	x 2 =	
FAC species	x 3 =	
FACU species	x 4 =	
UPL species	x 5 =	
Column Totals: (A)		(B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

- ___ Dominance Test is >50%
- ___ Prevalence Index is ≤3.0[1]
- ___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✓ No ____

Remarks:

SOIL

Sampling Point: DP4 (UPL)

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-12	10YR 3/2	100					silty loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) **(LRR C)**
- ___ 1 cm Muck (A9) **(LRR D)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) **(LRR C)**
- ___ 2 cm Muck (A10) **(LRR B)**
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ____ No ✓

Remarks:

Hole to 12". Some organics & charcoal in top root layer.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) **(Nonriverine)**
- ___ Sediment Deposits (B2) **(Nonriverine)**
- ___ Drift Deposits (B3) **(Nonriverine)**
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) **(Riverine)**
- ___ Sediment Deposits (B2) **(Riverine)**
- ___ Drift Deposits (B3) **(Riverine)**
- ✓ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ____ No ____ Depth (inches): _____

Water Table Present? Yes ____ No ____ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes ____ No ____ Depth (inches): _____

Wetland Hydrology Present? Yes ____ No ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Some evidence of water moving over sedges throughout depression. Likely from very heavy rain that dries up within 14 days, not long enough to create hydric soils.

Transect 2c-2c

Arid West Ephemeral and Intermittent Streams OHWM Datasheet

Project: East Sand Slough Restoration | **Date:** 5/1/18 | **Time:** 11:45 AM
Project Number: | **Town:** Red Bluff | **State:** CA
Stream: East Sand Slough | **Photo begin file#:** | **Photo end file#:**
Investigator(s): Woodward, LeFeure, Davis, Perrin, Marshall

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

Y ☐ / N ☑ Is the site significantly disturbed?

Location Details: Left bank facing upstream, immediately south of Bridge

Projection: UTM 10N **Datum:** NAD83
Coordinates: 40.181455°N; -122.222376°W

Potential anthropogenic influences on the channel system:

Shasta Dam regulates Sacramento River; Antelope Blvd bridge channelized slough

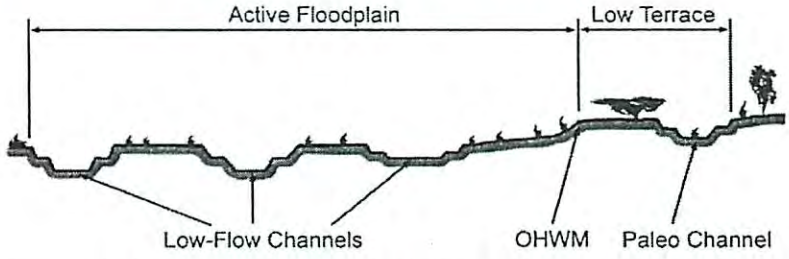
Brief site description:

Immediately downstream of bridge, slough channel widens a bit and flattens more, with some small islands.

Checklist of resources (if available):

- ☒ Aerial photography — Dates: See previous form
- ☒ Topographic maps — Red Bluff East, CA 7.5' Quad
- ☐ Geologic maps
- ☒ Vegetation maps
- ☒ Soils maps
- ☐ Rainfall/precipitation maps
- ☐ Existing delineation(s) for site
- ☒ Global positioning system (GPS)
- ☒ Other studies LiDAR
- ☒ Stream gage data — Gage number: USGS 11377100 Sac River AB Bend Bridge near Red Bluff, CA
- Period of record: 10/4/1988 – present
- ☐ 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 — 10/01/2007 – present

Hydrogeomorphic Floodplain Units



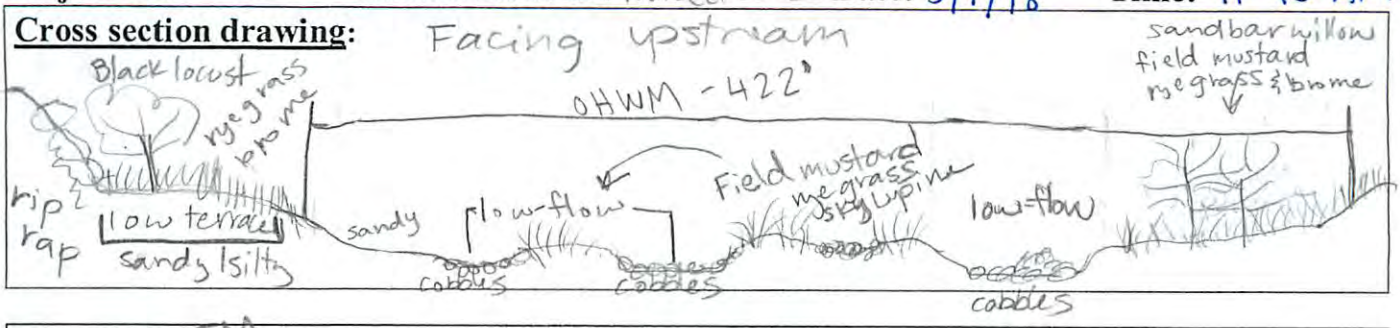
Procedure for identifying and characterizing the floodplain units to assist in identifying the OHWM:

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 Datapoint taken, then walked across.
   - ☒ Other:

1.5-2 year hydraulic modeling Shapefile

Project ID: **Cross section ID:** Transect 2c-2c **Date:** 5/1/18 **Time:** 11:45 AM

Cross section drawing: Facing upstream



OHWM UTM 4448242 N; 566276 E

GPS point: 4448188 N; 566204 E

Indicators:

- [x] Change in average sediment texture
- [x] Change in vegetation species
- [x] Change in vegetation cover
- [x] Break in bank slope
- [ ] Other: _____
- [ ] Other: _____

Comments:

Lower OHWM compared to upstream bridge since slough widens and flattens here. Finer sediment shows erosion and cut bank at OHWM.

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

GPS point: _____

Characteristics of the floodplain unit:

Average sediment texture: cobbly low-flow channels; silty/sandy islands and terrace.

Total veg cover: 30 % Tree: 0 % Shrub: 8 % Herb: 22 %

Community successional stage:

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

Indicators:

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

Comments:

Water doesn't flow under outer edges of bridge due to being higher elevation, above ~255 feet

Transect 2d-2d

Arid West Ephemeral and Intermittent Streams OHWM Datasheet

Project: East Sand Slough Restoration **Date:** 5/1/18 **Time:** 1:28 PM
Project Number:
Town: Red Bluff **State:** CA
Stream: East Sand Slough **Photo begin file#:** **Photo end file#:**
Investigator(s): Woodward, LeFevre, Davis, Perrin, Marshall

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

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

Location Details: West edge, just south of bridge, side channel

Projection: UTM 10N **Datum:** NAD83

Coordinates: 40.180687°N ; -122.222535°W

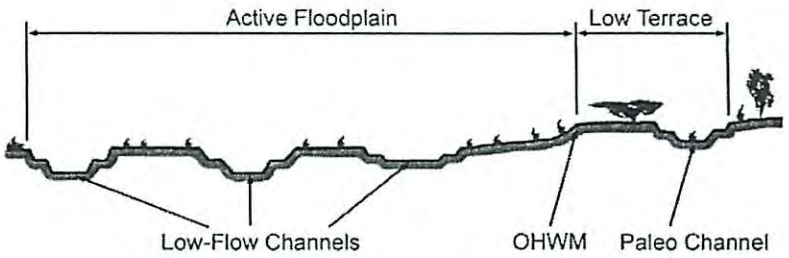
Potential anthropogenic influences on the channel system:
Shasta Dam regulates Sacramento River
Antelope Blvd upstream

Brief site description:
facing upstream. Intermittent channel, 4ft side

Checklist of resources (if available):

- [X] Aerial photography — Dates: See previous forms
- [X] Topographic maps — Red Bluff East, CA 7.5' Quad
- [ ] Geologic maps
- [X] Vegetation maps
- [X] Soils maps
- [ ] Rainfall/precipitation maps
- [ ] Existing delineation(s) for site
- [X] Global positioning system (GPS)
- [X] Other studies LiDAR
- [X] Stream gage data — Gage number: USGS 11377100 Sac River AB Bend Bridge near Red Bluff, CA — Period of record: 10/4/1988 - present
- [ ] 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 — 10/01/2007 - present

Hydrogeomorphic Floodplain Units

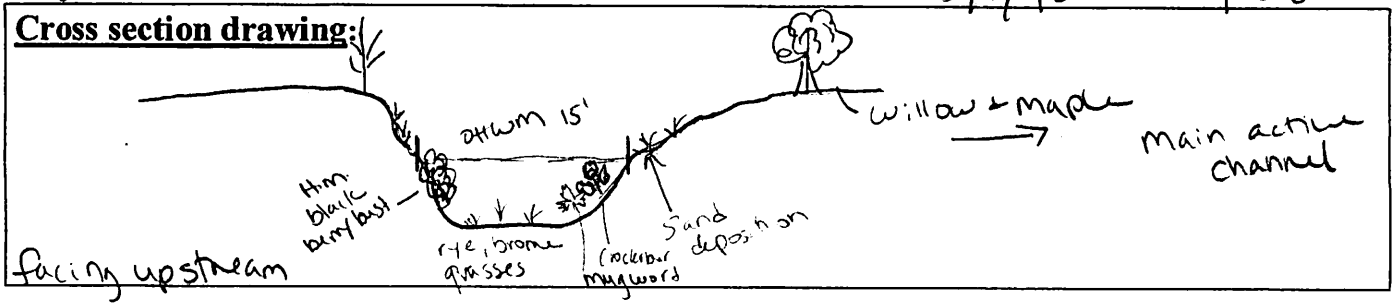


Procedure for identifying and characterizing the floodplain units to assist in identifying the OHWM:

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
   - [X] Digitized on computer
   - [X] GPS
   - [X] Other: 1.5-2 year hydraulic modeling shapefile

Project ID: **Cross section ID:** Transect 2d-2d **Date:** 5/1/18 **Time:** 1:28 PM

Cross section drawing:



OHWM

GPS point: UTM 4448101 N; 566188 E

Indicators:

- [x] Change in average sediment texture
- [ ] Change in vegetation species
- [ ] Change in vegetation cover
- [x] Break in bank slope
- [ ] Other: _____
- [ ] Other: _____

Comments:

Mostly silty loam in channel with loose sand deposition in bends. Similar veg. species, such as brome and rye throughout due to infrequent flows.

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

GPS point: _____

Characteristics of the floodplain unit:

Average sediment texture: sandy silt

Total veg cover: 95 % Tree: 0 % Shrub: 5 % Herb: 90 %

Community successional stage:

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

Indicators:

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

Comments:

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: East Sand Slough City/County: Red Bluff Sampling Date: 5/2/18

Applicant: Bureau of Reclamation State: CA Sampling Point: DP 5 (FW-15)

Investigator(s): Woodward, LeFevre, Davis, Perrin, Marshall Section, Township, Range: S20, T27N, R3W

Landform (hillslope, terrace, etc.): hillslope Local relief (concave, convex, none): concave Slope (%): 5%

Subregion (LRR): C Lat: 40.172540°N Long: -122.221104°W Datum: NAD83

Soil Map Unit Name: CmA- Columbia fine sandy loam, 0-3% slopes NWI classification: PSSIA

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?** Yes X No ____
Hydric Soil Present?	Yes X	No ____	
Wetland Hydrology Present?	Yes Y	No ____	

Remarks:
Facing upstream, left hillside depression/drainage

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: r = 30')	Absolute % Cover	Dominant Species?	Indicator Status
1. Carya illinoensis	15	X	FAC
2. Fraxinus latifolia	18	X	FACW
3. Quercus lobata	7		FACW
4.			
.5=20 .2=8	40	= Total Cover	

Sapling/Shrub Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
	____	= Total Cover	

Herb Stratum (Plot size: 1 m²)			
1. Carex santa	60	X	OBL
2. Cardus pycnocephalus	30	X	UPL
3. Galium appanine	20		UPL
4.			
5.			
6.			
7.			
8.			
.5=60 .2=22	110	= Total Cover	

Woody Vine Stratum (Plot size: ____)			
1.			
2.			
	____	= Total Cover	

% Bare Ground in Herb Stratum 3 % Cover of Biotic Crust ____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3/4 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 3/4 = 75% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:	
OBL species ____	x 1 =	____
FACW species ____	x 2 =	____
FAC species ____	x 3 =	____
FACU species ____	x 4 =	____
UPL species ____	x 5 =	____
Column Totals: ____ (A)		____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

Remarks:
More densely forested as move south/downstream

SOIL

Sampling Point: DP5 (FW-45)

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-6	10YR 4/2	100					silt loam	
6-15	2.5YR 4/4	100					loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (LRR C)
- ___ 1 cm Muck (A9) (LRR D)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ✓ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (LRR C)
- ___ 2 cm Muck (A10) (LRR B)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ✓ No ___

Remarks:

Very crumbly, dry.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (Nonriverine)
- ___ Sediment Deposits (B2) (Nonriverine)
- ___ Drift Deposits (B3) (Nonriverine)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (Riverine)
- ___ Sediment Deposits (B2) (Riverine)
- ___ Drift Deposits (B3) (Riverine)
- ✓ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No ✓ Depth (inches): _____

Water Table Present? Yes ___ No ✓ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes ___ No ✓ Depth (inches): _____

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Appears as drainage from highway during storm events and groundwater when high flows move through ESS.

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: East Sand Slough City/County: Red Bluff Sampling Date: 5/2/18
Applicant: Bureau of Reclamation State: CA Sampling Point: PP 6 (PISv-6)
Investigator(s): Woodward, LeFevre, Davis, Pemin, Marshall Section, Township, Range: S20, T27N, R3W
Landform (hillslope, terrace, etc.): terrace Local relief (concave, convex, none): concave Slope (%): 1.5%
Subregion (LRR): C Lat: 40.169994°N Long: -122.219448°W Datum: NAD83
Soil Map Unit Name: Rr - Riverwash NWI classification: PEMC
Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ____ (If no, explain in Remarks.)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ____
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____	No X	**Is the Sampled Area within a Wetland?** Yes ____ No X
Hydric Soil Present?	Yes ✓	No ____	
Wetland Hydrology Present?	Yes ✓	No ____	

Remarks:
Sacramento River used to back up into slough when Red Bluff Diversion Dam gates were down. This operation stopped in 2012, so water no longer backs up to ~~create the features as often as indicated on~~ NWI maps

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
	____ = Total Cover		
Sapling/Shrub Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
	____ = Total Cover		
Herb Stratum (Plot size: 1m²)			
1. Lolium multiflorum	65	X	FAC
2. Hordeum depressum	35	X	FACW
3. Medicago polymorpha	~~45~~ 5		FACU
4. Leontodon taraxacoides	10		FACU
5.			
6.			
7.			
8.			
.5=57.5, .2=23	115 = Total Cover		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
	____ = Total Cover		

% Bare Ground in Herb Stratum ____ % Cover of Biotic Crust ____

Dominance Test worksheet:
Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)
Total Number of Dominant Species Across All Strata: 2 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 1/2 = 50% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species ____	x 1 = ____
FACW species 1	x 2 = 2
FAC species 1	x 3 = 3
FACU species 2	x 4 = 8
UPL species ____	x 5 = ____
Column Totals: 4 (A)	13 (B)

Prevalence Index = B/A = 13/4 = 3.25

Hydrophytic Vegetation Indicators:
___ Dominance Test is >50%
___ Prevalence Index is ≤3.0[1]
___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ____ No X

Remarks:
See Hydrology Remarks.

SOIL

Sampling Point: DP6 (RISV-6)

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Redox Features Type[1]	Redox Features Loc[2]	Texture	Remarks
0-2.5	10YR 3/4	100					loam	
2.5-7	7.5YR 5/1	85	10YR 5/8	15	C	M	loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (LRR C)
- ___ 1 cm Muck (A9) (LRR D)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ✓ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (LRR C)
- ___ 2 cm Muck (A10) (LRR B)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: Cobbles

Depth (inches): 7 in

Hydric Soil Present? Yes ✓ No ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (Nonriverine)
- ___ Sediment Deposits (B2) (Nonriverine)
- ___ Drift Deposits (B3) (Nonriverine)
- ✓ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ✓ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (Riverine)
- ___ Sediment Deposits (B2) (Riverine)
- ___ Drift Deposits (B3) (Riverine)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ✓ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No ✓ Depth (inches): ___

Water Table Present? Yes ___ No ✓ Depth (inches): ___

Saturation Present? (includes capillary fringe) Yes ___ No ✓ Depth (inches): ___

Wetland Hydrology Present? Yes ✓ No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

The NWI map indicates areas along the edge of East Sand Slough as PEMIC, which I believe is based on when ESS was more frequently flooded with backwater with RBDD gate operations. This DP site is a little higher than the remaining channel with a slight depression and likely pooled water long enough to grow emergent vegetation. Since the end of RBDD gate operation in 2012, water only flows through during high flows, and pooling from rain events, but not long enough to grow hydrophytic veg. Observed in early May, beginning of growing season, during non-drought year.

Transect 3a-3a

Arid West Ephemeral and Intermittent Streams OHWM Datasheet

Project: East Sand Slough Restoration **Date:** 5/2/18 **Time:** 11:10 AM
Project Number:
Town: Red Bluff **State:** CA
Stream: Ephemeral drainage along East Sand Slough **Photo begin file#:** **Photo end file#:**
Investigator(s): Woodward, LeFevre, Davis, Perrin, Marshall

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

Y ☐ / N ☑ Is the site significantly disturbed?

Location Details: side drainage along I-5

Projection: UTM 10N **Datum:** NAD83
Coordinates: 40.170490°N; -122.221445°W

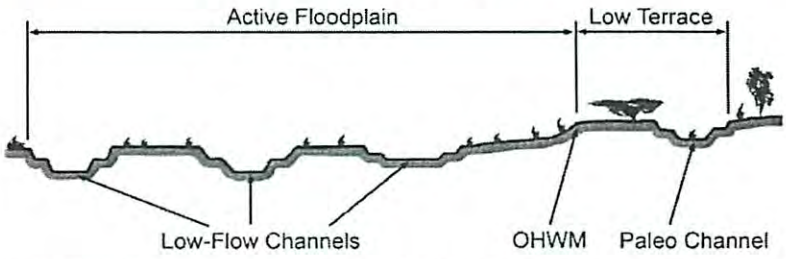
Potential anthropogenic influences on the channel system:
Interstate-5 stormwater culvert

Brief site description: Facing upstream, ephemeral drainage parallel to Interstate-5 on west edge of study area, along toe slope. Forested.

Checklist of resources (if available):

- ☒ Aerial photography
  Dates: See previous form
- ☒ Topographic maps Red Bluff East, CA
- ☐ Geologic maps USGS 7.5' Quad
- ☒ Vegetation maps
- ☒ Soils maps
- ☐ Rainfall/precipitation maps
- ☐ Existing delineation(s) for site
- ☒ Global positioning system (GPS)
- ☒ Other studies LiDAR
- ☐ 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

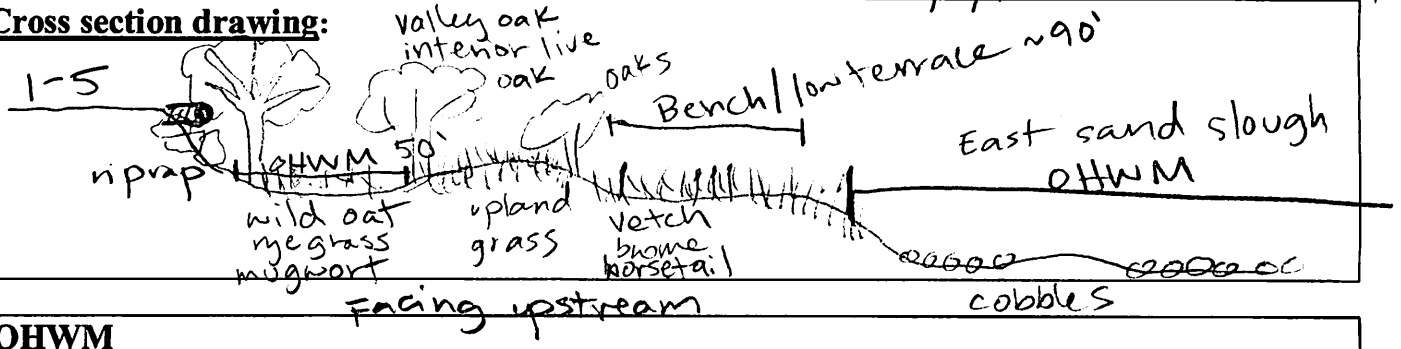


Procedure for identifying and characterizing the floodplain units to assist in identifying the OHWM:

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 Walked a transect line across
   - ☒ Other: 1.5-2 year hydraulic modeling shapefile

Project ID: **Cross section ID:** Transect 3a-3a **Date:** 5/2/18 **Time:** 11:10 AM

Cross section drawing:



OHWM

GPS point: see transect on map

Indicators:

- ☐ Change in average sediment texture
- ☒ Change in vegetation species
- ☐ Change in vegetation cover
- ☐ Break in bank slope
- ☐ Other: _____
- ☐ Other: _____

Comments:

See Floodplain unit comments, Culvert-fed.

Floodplain unit:

☐ Low-Flow Channel ☐ Active Floodplain ☒ Low Terrace

GPS point: " "

Characteristics of the floodplain unit:

Average sediment texture: loam in thalweg with riprap on slope.

Total veg cover: ____% 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: culvert from road
- ☐ Other: _____
- ☐ Other: _____

Comments:

Herbaceous (rye, oat, thistle) throughout most of drainage, with interior live oak, valley oak, ornamental plum, cottonwood scattered throughout 50'-wide drainage.

Transect 2e-2e

Arid West Ephemeral and Intermittent Streams OHWM Datasheet

Project: East Sand Slough Restoration **Date:** 5/2/18 **Time:** 1:53 PM
Project Number: **Town:** Red Bluff **State:** CA
Stream: East sand slough **Photo begin file#:** **Photo end file#:**
Investigator(s): Woodward, LeFevre, Davis

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

Y ☐ / N ☒ Is the site significantly disturbed?

Location Details: Low terrace, west bank near riparian connection to Sac R.
Projection: UTM 10N **Datum:** NAD83
Coordinates: 40.162140°N; -122.218900°W

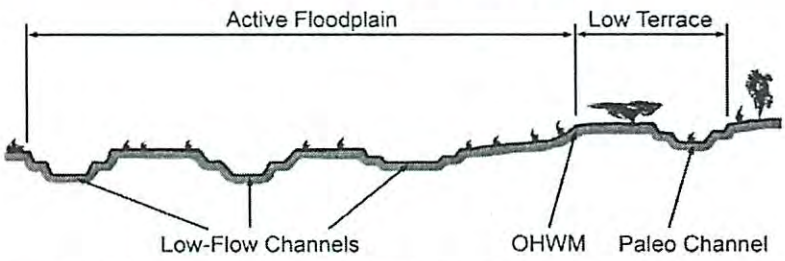
Potential anthropogenic influences on the channel system:
Shasta Dam regulates Sacramento River; stopped putting RBDD gates down to cause backwater in ESS in 2012.

Brief site description:
Near middle edge of riparian forested area along SW bank of ESS, I-5, and connection to Sacramento River.

Checklist of resources (if available):

- ☒ Aerial photography
  Dates: See previous form
- ☒ Topographic maps Red Bluff East, CA
- ☐ Geologic maps
- ☒ Vegetation maps
- ☒ Soils maps
- ☐ Rainfall/precipitation maps
- ☐ Existing delineation(s) for site
- ☒ Global positioning system (GPS)
- ☒ Other studies LiDAR
- ☒ Stream gage data
  Gage number: USGS 11377100 Sac River AB Bend Bridge near Red Bluff, CA
  Period of record: 10/4/1988 - present
- ☐ 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
  10/01/2007 - present

Hydrogeomorphic Floodplain Units

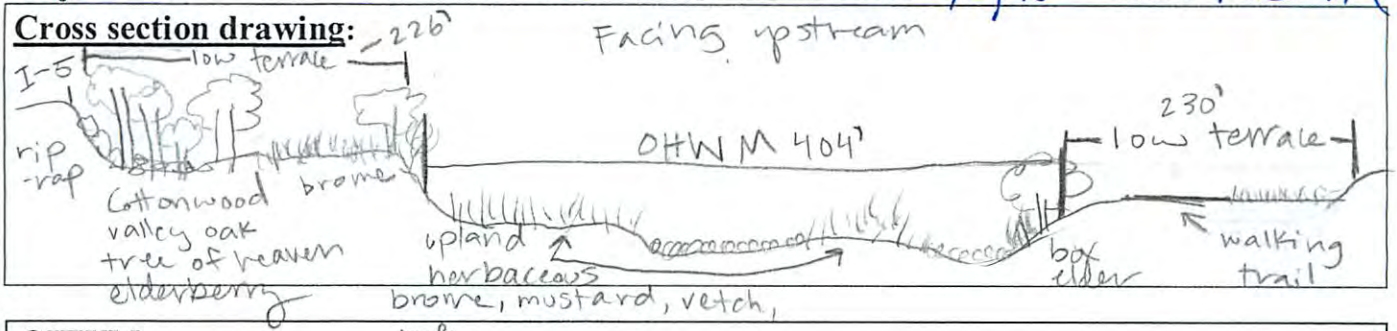


Procedure for identifying and characterizing the floodplain units to assist in identifying the OHWM:

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 Took datapoint & walked transect
   - ☒ Other: 1.5-2 year hydraulic modeling shapefile

Project ID: **Cross section ID:** Transect 2e-2e **Date:** 5/2/18 **Time:** 1:53 PM

Cross section drawing:



OHWM

GPS point: UTM 4446601 N ; 566510 E
4446576 N ; 566390 E

Indicators:

- [x] Change in average sediment texture
- [ ] Change in vegetation species
- [ ] Change in vegetation cover
- [x] Break in bank slope
- [ ] Other: _____
- [ ] Other: _____

Comments:

See Active Floodplain comments.

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

GPS point: UTM 4446585 N ; 566367 E

Characteristics of the floodplain unit:

Average sediment texture: loam

Total veg cover: ~~395~~% Tree: 23 % Shrub: 12 % Herb: 65 %

Community successional stage:

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

Indicators:

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

Comments:

Low terrace has lower channel/depression along hillslope of I-5 where collects ephemeral drainage.

Project ID: **Cross section ID:** Transect 2e-2e **Date:** 5/2/18 **Time:** 2:23PM

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

GPS point: see OHWM transect on map

Characteristics of the floodplain unit:

Average sediment texture: _____

Total veg cover: 80 % Tree: 0 % Shrub: 3 % Herb: 77 %

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: _____
- ☐ Other: _____
- ☐ Other: _____

Comments:

low flow channels in active floodplain here concentrate more to center as approach Sac River downstream. All invasive upland/FAC herbaceous. Pebble/Cobbles in low-flow channel & sand/loam in active floodplain.

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

GPS point: _____

Characteristics of the floodplain unit:

Average sediment texture: _____

Total veg cover: _____ % 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: _____
- ☐ Other: _____
- ☐ Other: _____

Comments:

Transect 1b-1b

Arid West Ephemeral and Intermittent Streams OHWM Datasheet

Project: East Sand Slough | **Date:** 5/2/18 | **Time:** 3:37 PM
Project Number:
Stream: East Sand Slough / Sacramento River | **Town:** Red Bluff | **State:** CA | **Photo begin file#:** | **Photo end file#:**
Investigator(s): Woodward, LeFevre, Davis.

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

Y ☐ / N ☑ Is the site significantly disturbed?

Location Details: Downstream bend where ESS meets Sac. River
Projection: UTM 10N **Datum:** NAD83
Coordinates: 40.163984°N; -122.217568°W

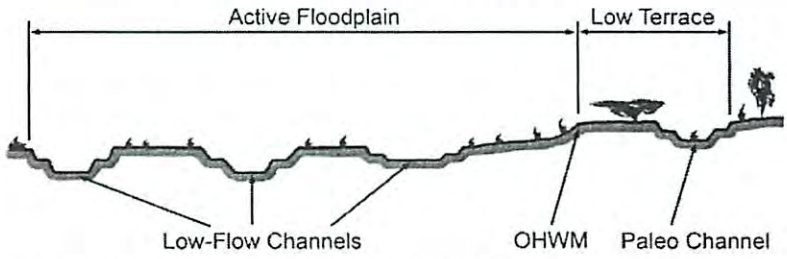
Potential anthropogenic influences on the channel system:
Shasta Dam regulates Sacramento River. RBDD gates no longer used since 2012 to backwater ESS.

Brief site description:
Downstream bend of ESS, where meets Sac. River. Upstream of RBDD mitigation site.

Checklist of resources (if available):

- ☒ Aerial photography
  Dates: See previous form
- ☒ Topographic maps USGS 7.5' Quad Red Bluff East, CA
- ☐ Geologic maps
- ☐ Vegetation maps
- ☒ Soils maps
- ☐ Rainfall/precipitation maps
- ☐ Existing delineation(s) for site
- ☒ Global positioning system (GPS)
- ☒ Other studies LiDAR
- ☒ Stream gage data
  Gage number: USGS 11377100 Sac River AB Bend Bridge near Red Bluff, CA
  Period of record: 10/04/1988 - present
- ☐ 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
  10/01/2007 - present

Hydrogeomorphic Floodplain Units

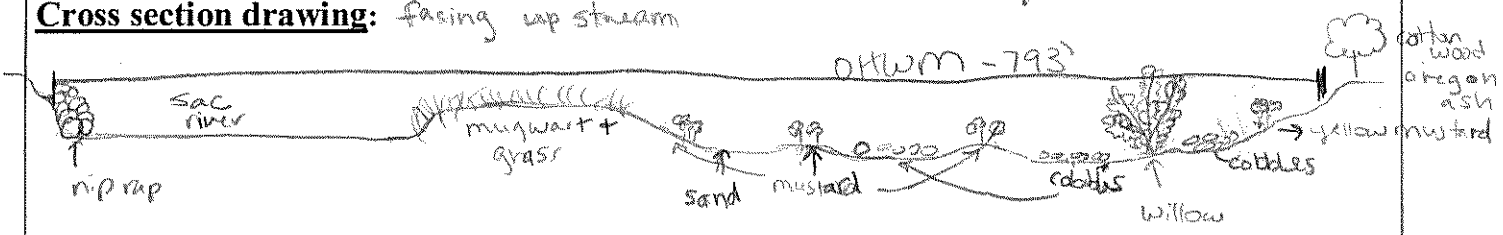


Procedure for identifying and characterizing the floodplain units to assist in identifying the OHWM:

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 Took datapoint
   - ☒ Other: 1.5-2 year hydraulic modeling shapefile

Project ID: **Cross section ID:** Transect 1b-1b **Date:** 5/2/18 **Time:** 3:37 PM

Cross section drawing: facing up stream



OHWM

GPS point: 4441625 N 5606622 E

Indicators:

- [x] Change in average sediment texture
- [x] Change in vegetation species
- [ ] Change in vegetation cover
- [ ] Break in bank slope
- [ ] Other: _____
- [ ] Other: _____

Comments: OHWM determined by:
Change from cobbles to sand/silt
Change in veg. - mustard → willows → cottonwoods & oregon ash + blackberry debris in willows.

Floodplain unit:

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

GPS point: See map for transect

Characteristics of the floodplain unit:

Average sediment texture: sandy cobble

Total veg cover: 30 % Tree: 2 % Shrub: 7 % Herb: 21 %

Community successional stage:

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

Indicators:

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

Comments:

Across lower bend of ESS and Sac. River.

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: East Sand Slough City/County: Red Bluff Sampling Date: 5/3/18

Applicant: Bureau of Reclamation State: CA Sampling Point: DP 7 (SSW-33)

Investigator(s): Woodward, LeFevre, Davis Section, Township, Range: S28, T27N, R3W

Landform (hillslope, terrace, etc.): foot of embankment Local relief (concave, convex, none): concave Slope (%): 2.5%

Subregion (LRR): C Lat: 40.160508°N Long: -122.212803°W Datum: NAD83

Soil Map Unit Name: Water / Rr – Riverwash NWI classification: R2UBH

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes ✓ No ____

Hydric Soil Present? Yes ____ No ✓ ★

Wetland Hydrology Present? Yes ✓ No ____

Is the Sampled Area within a Wetland? ★ Yes ✓ No ____ ↗ See Remarks for Problematic Soils Test results.

Remarks: Scrub-shrub wetland below OHWM. Located within Sacramento River floodplain, in a slight depression at toe of bank slope, likely pooling water after high flows recede & rain events. Likely a recently developed wetland. Site stopped receiving long, common flows through site since 2012 Red Bluff Diversion Dam decommissioning. Drought through 2016, then high flows winter 2016/17, the events of which likely deposited new soils (3 layers in soils section), and haven't been present long enough to develop hydric indicators.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	____ = Total Cover		
Sapling/Shrub Stratum (Plot size: r = 15')			
1. Salix exigua	25	✓	FACW
2.			
3.			
4.			
5.			
.5 = 12.5%. .2 = 5%	25% = Total Cover		
Herb Stratum (Plot size: 1m²)			
1. Equisetum hyemale	30	✓	FACW
2. Lolium multiflorum	25	✓	FAC
3. Brassica nigra	5		UPL
4. Hordeum depressum	5		FACU
5.			
6.			
7.			
8.			
.5 = 32.5%. .2 = 13%	65% = Total Cover		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
	____ = Total Cover		

% Bare Ground in Herb Stratum 25% % Cover of Biotic Crust ____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species ____	x 1 = ____
FACW species ____	x 2 = ____
FAC species ____	x 3 = ____
FACU species ____	x 4 = ____
UPL species ____	x 5 = ____
Column Totals: ____ (A)	____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

✓ Dominance Test is >50%

__ Prevalence Index is ≤3.0[1]

__ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

__ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✓ No ____

Remarks:

As move up bank to the OHWM, there is more sedge & field mustard.

SOIL

Sampling Point: DP 7 (SSW-33)

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-3.5	10YR 3/2	100					loam	
3.5-7.5	10YR 3/2	100					sand	more change in texture from
7.5-15.5	2.5Y 4/3	90	10YR 5/8	10			silt loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) **(LRR C)**
- ___ 1 cm Muck (A9) **(LRR D)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) **(LRR C)**
- ___ 2 cm Muck (A10) **(LRR B)**
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ___ No ✓

Remarks:

Likely new soils deposited in high 2016/2017 flows (3 different layers in profile), which haven't been present long enough to show hydric indicators since new flow regime, and coming out of drought. Also at edge of

HYDROLOGY

Columbia fine sandy loam mapunit. Did Problematic Soils Test in Summary of Findings.

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) **(Nonriverine)**
- ___ Sediment Deposits (B2) **(Nonriverine)**
- ___ Drift Deposits (B3) **(Nonriverine)**
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ✓ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) **(Riverine)**
- ___ Sediment Deposits (B2) **(Riverine)**
- ✓ Drift Deposits (B3) **(Riverine)**
- ✓ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No ___ Depth (inches): _____

Water Table Present? Yes ___ No ___ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes ___ No ___ Depth (inches): _____

Wetland Hydrology Present? Yes ✓ No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Site located below, near edge of OHWM. Appears to be temporarily flooded during high flows, with ponded water evaporating within a few days.

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: East Sand Slough Restoration City/County: Red Bluff Sampling Date: 5/3/18

Applicant: Bureau of Reclamation State: CA Sampling Point: DP8 (upl)

Investigator(s): Woodward, LeFevre, Davis Section, Township, Range: S 28, T 27N, R 3W

Landform (hillslope, terrace, etc.): terrace Local relief (concave, convex, none): concave Slope (%): 1%

Subregion (LRR): C Lat: 40.162130 °N Long: -122.212070 °W Datum: NAD83

Soil Map Unit Name: Rr - Riverwash NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____	No ✓	**Is the Sampled Area within a Wetland?** Yes ____ No ✓
Hydric Soil Present?	Yes ____	No ✓	
Wetland Hydrology Present?	Yes ✓	No ____	

Remarks:
Very slight depression in what looks like used to be an old access road. There are a lot of game trails in these upland areas of the Red Bluff Recreation Area, north of this part of the Sacramento River. These areas either see very temporary ponding or drainage as low points on a terrace post-rain and dry up within a couple days. Don't feed or contribute to other waters.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	____ = Total Cover		
Sapling/Shrub Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
	____ = Total Cover		
Herb Stratum (Plot size: 1m²)			
1. Lupinus nanus	15	✓	UPL
2. Acmispon wrangelianus	5	✓	UPL
3. Eriogonum luteolum	5	✓	UPL
4.			
5.			
6.			
7.			
8.			
.5 = 12.5% .2 = 5%	25% = Total Cover		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
	____ = Total Cover		

% Bare Ground in Herb Stratum 5% % Cover of Biotic Crust ____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	—	x 1 =	
FACW species	—	x 2 =	
FAC species	—	x 3 =	
FACU species	—	x 4 =	
UPL species	3	x 5 =	15
Column Totals:	3 (A)		15 (B)

Prevalence Index = B/A = 5

Hydrophytic Vegetation Indicators:

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ____ No ✓

Remarks:
No morphological adaptations or Problematic Hydrophytic Vegetation, as no hydric soil either.

SOIL

Sampling Point: DP8 (UPL)

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Redox Features Type[1]	Redox Features Loc[2]	Texture	Remarks
0-4	10YR 4/3	100					sandy loam	
4-14	10YR 4/4	100						

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes _____ No ✓

Remarks:

No depleted matrix and no redox features.
Dug to 14 inches - hard ground.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ✓ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No ✓ Depth (inches): _____

Water Table Present? Yes _____ No ✓ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No ✓ Depth (inches): _____

Wetland Hydrology Present? Yes ✓ No _____

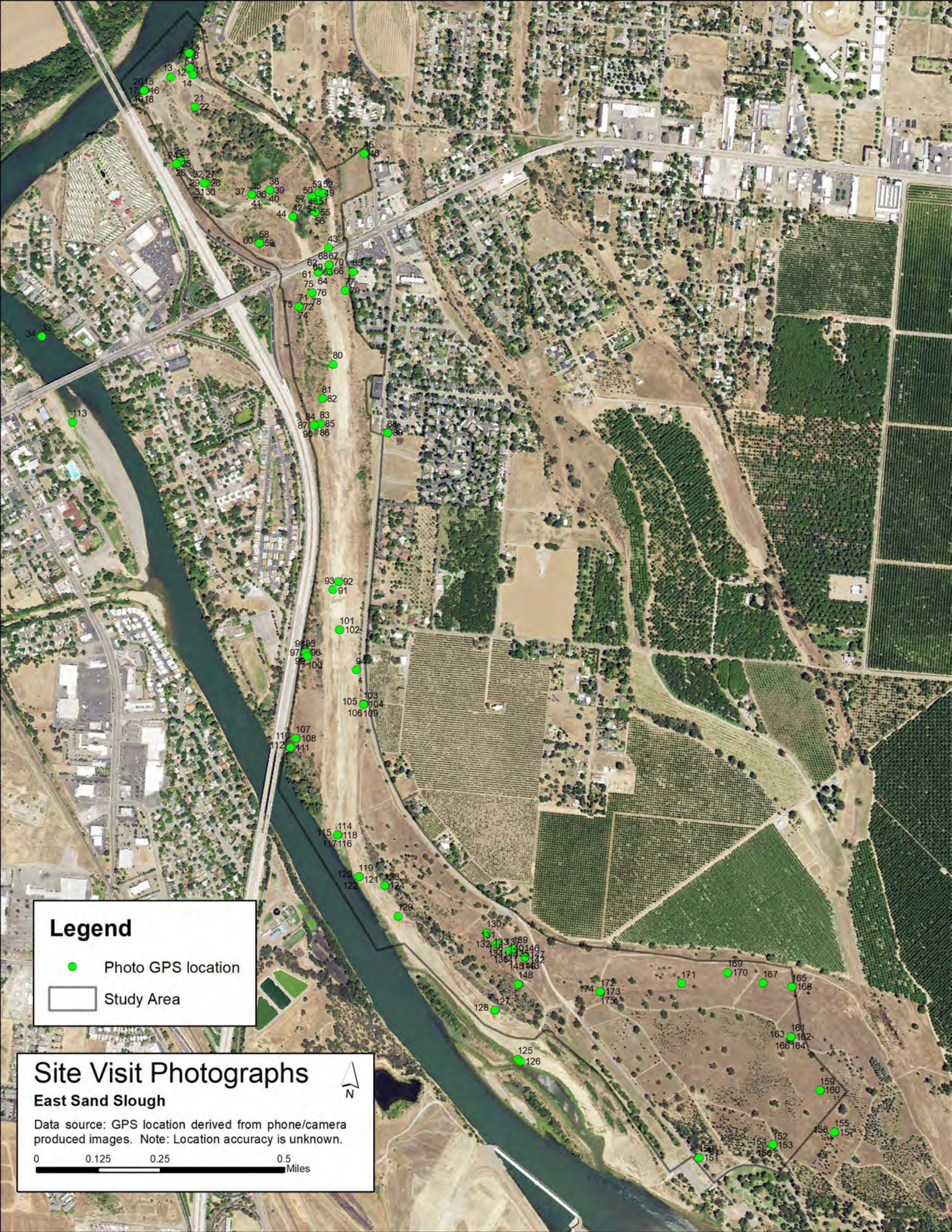
Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Soil cracks likely from temporary rainwater pooling in lower surface relief; from old use as access road.

Attachment 8

Site Visit Photographs


Legend
Photo GPS location
Study Area
Site Visit Photographs
East Sand Slough
Data source: GPS location derived from phone/camera produced images. Note: Location accuracy is unknown.
0
0.125
0.25
0.5
Miles
N

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FileName	20180430_110011.jpg

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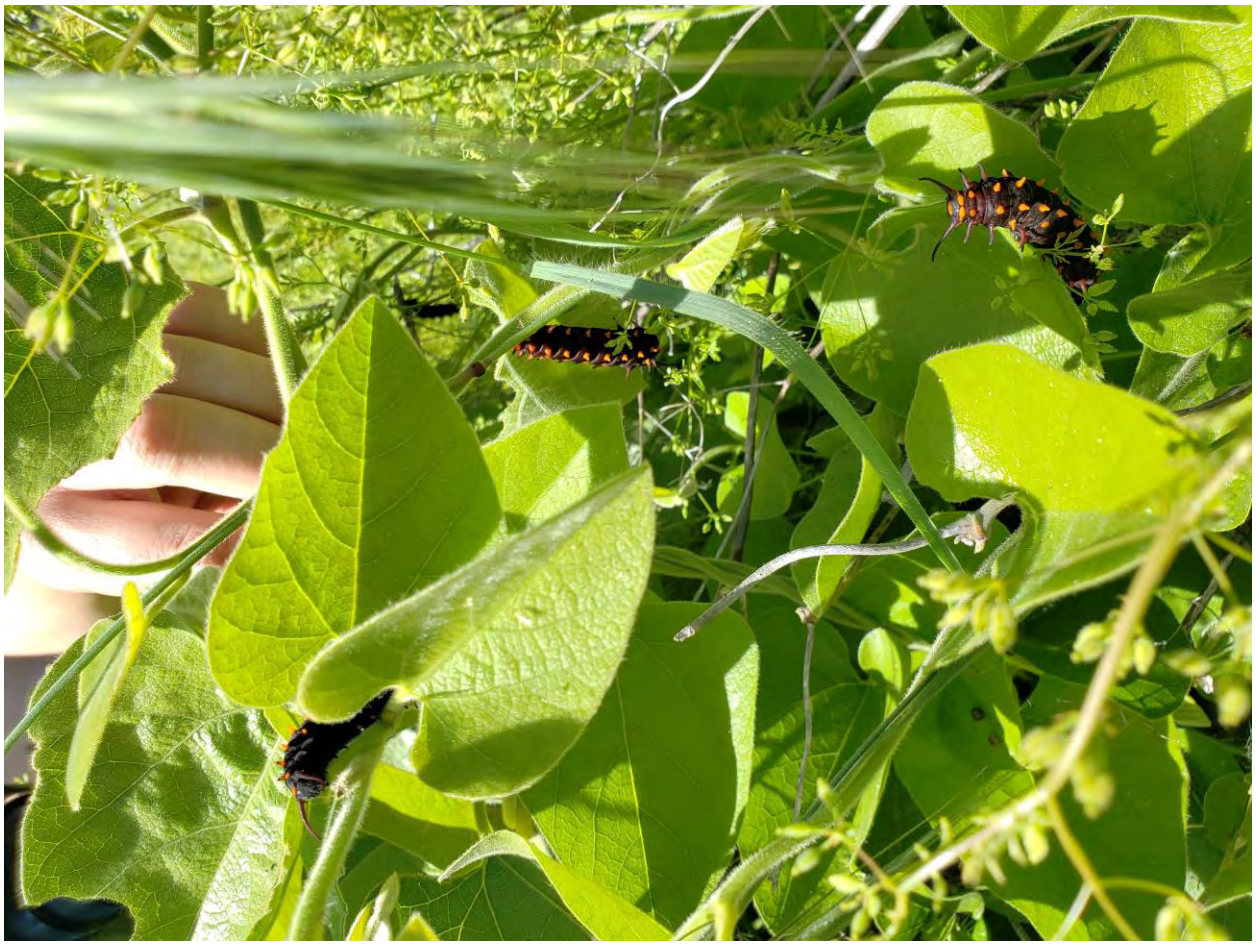

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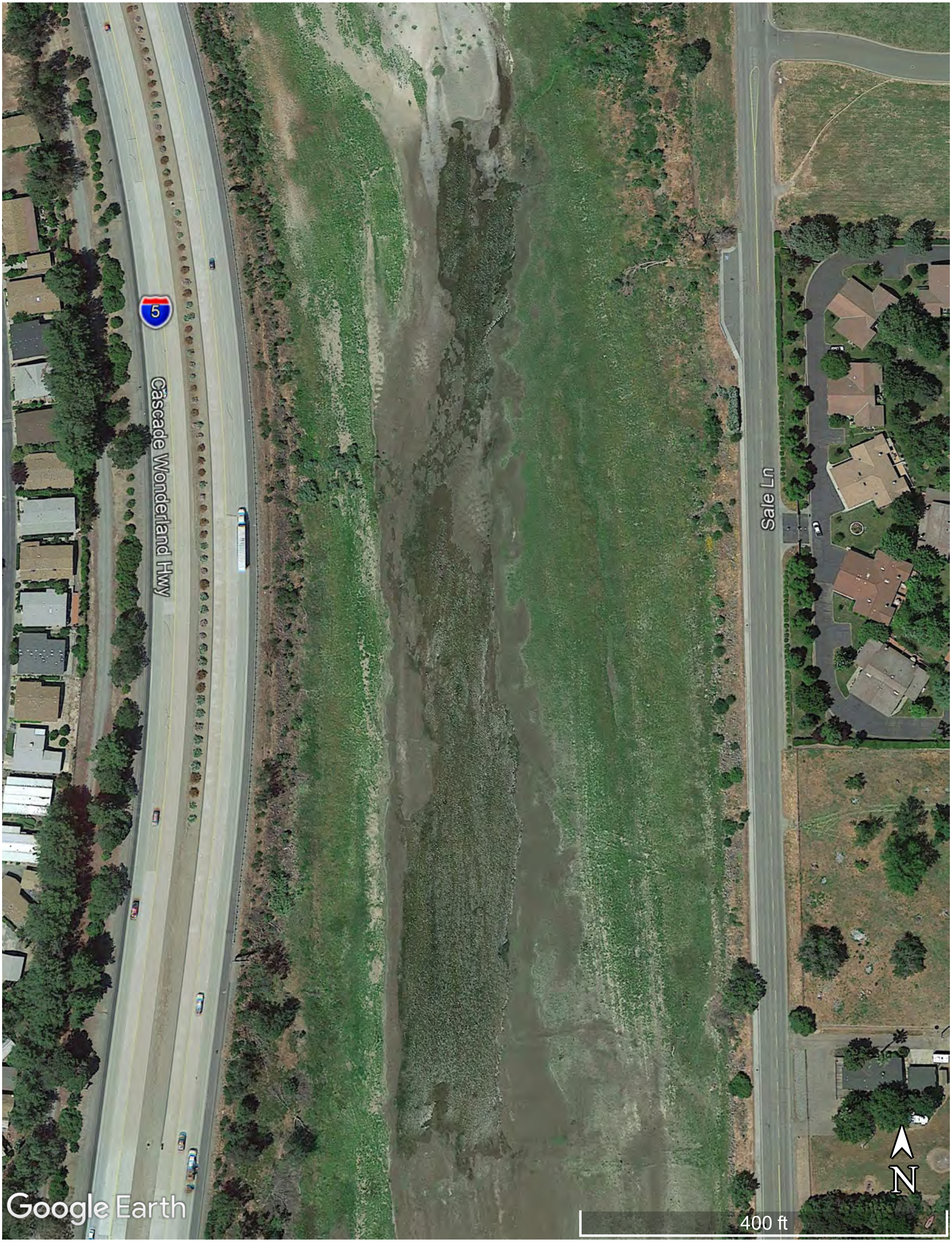
Attachment 9

Aerial Photography


Google Earth
N
500 ft


5
Gilm
Sale Ln
N
Google Earth
500 ft



5
Cascade Wonderland Hwy
Sale Ln
Google Earth
400 ft
N


Google Earth
N
400 ft


Antelope Blvd
36
N
400 ft
Google Earth


Red Bluff Recreation Area
Sale Ln
Google Earth
N
1000 ft