RECONNAISSANCE–LEVEL BIOLOGICAL RESOURCES ASSESSMENT AT THE CACHE SLOUGH MITIGATION BANK, SOLANO COUNTY, CALIFORNIA

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ACRONYMS AND ABBREVIATIONS

Bank	Cache Slough Mitigation Bank
CCC	California Coastal Commission
CCR	California Code of Regulations
CDFW	California Department of Fish and Wildlife
CESA	California Endangered Species Act
CEQA	California Environmental Quality Act
CFGC	California Fish and Game Code
CFR	Code of Federal Regulations
CNDDB	California Natural Diversity Database
CNPS	California Native Plant Society
CRPR	California Rare Plant Rank
CWA	Clean Water Act
°F	degrees Fahrenheit
ESA	federal Endangered Species Act
ESHA	environmentally sensitive habitat area
FAC	facultative
FACU	facultative upland
FACW	facultative wetland
GIS	Geographic Information System
GPS	Global Positioning System
HBC	Helm Biological Consulting
HUC	hydrologic unit code
ITP	Incidental Take Permit
MBTA	Migratory Bird Treaty Act
MHW	mean high water
NAD83	North American Datum of 1983
NL	not listed
NRCS	Natural Resources Conservation Service
OBL	obligate
OHWM	ordinary high-water mark
RWQCB	regional water quality control board
SAA	Streambed Alteration Agreement
SR	State Route
UPL	upland
U.S.	United States

USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WES	Westervelt Ecological Services, LLC

1.0 INTRODUCTION

Helm Biological Consulting (HBC), a division of Tansley Team, Inc., was contracted by Westervelt Ecological Services, LLC (WES) to inventory and describe the biological resources (common and sensitive habitats and species) as part of a reconnaissance-level biological resources assessment at the Cache Slough Mitigation Bank (hereafter "Bank" or "site") in Solano County, California.

1.1 BANK LOCATION

The Bank property encompasses roughly 350 acres and is located approximately one mile northeast of the town of Rio Vista, along the west side of State Route (SR) Highway 84 in Solano County, California (Figure 1). The Bank also occurs in an un-sectionalized portion of Township 4 North, Range 3 East, and Mount Diablo Base & Meridian of the Rio Vista U.S. Geological Survey (USGS) 7.5-minute topographic quadrangle map (Figure 2). The approximate center coordinates of the Bank in decimal degrees of the North American Datum of 1983 (NAD83) are Latitude: 38.182254° and Longitude: -121.675259° (Figure 2). The Bank is bounded by the Mellin Levee Extension to the west, the Watson Hollow Slough to the north, the Cache Slough and Sacramento River to the east, and the Mellin Levee to the south (Figure 3). The Bank is being evaluated by WES as a potential mitigation land as described below.

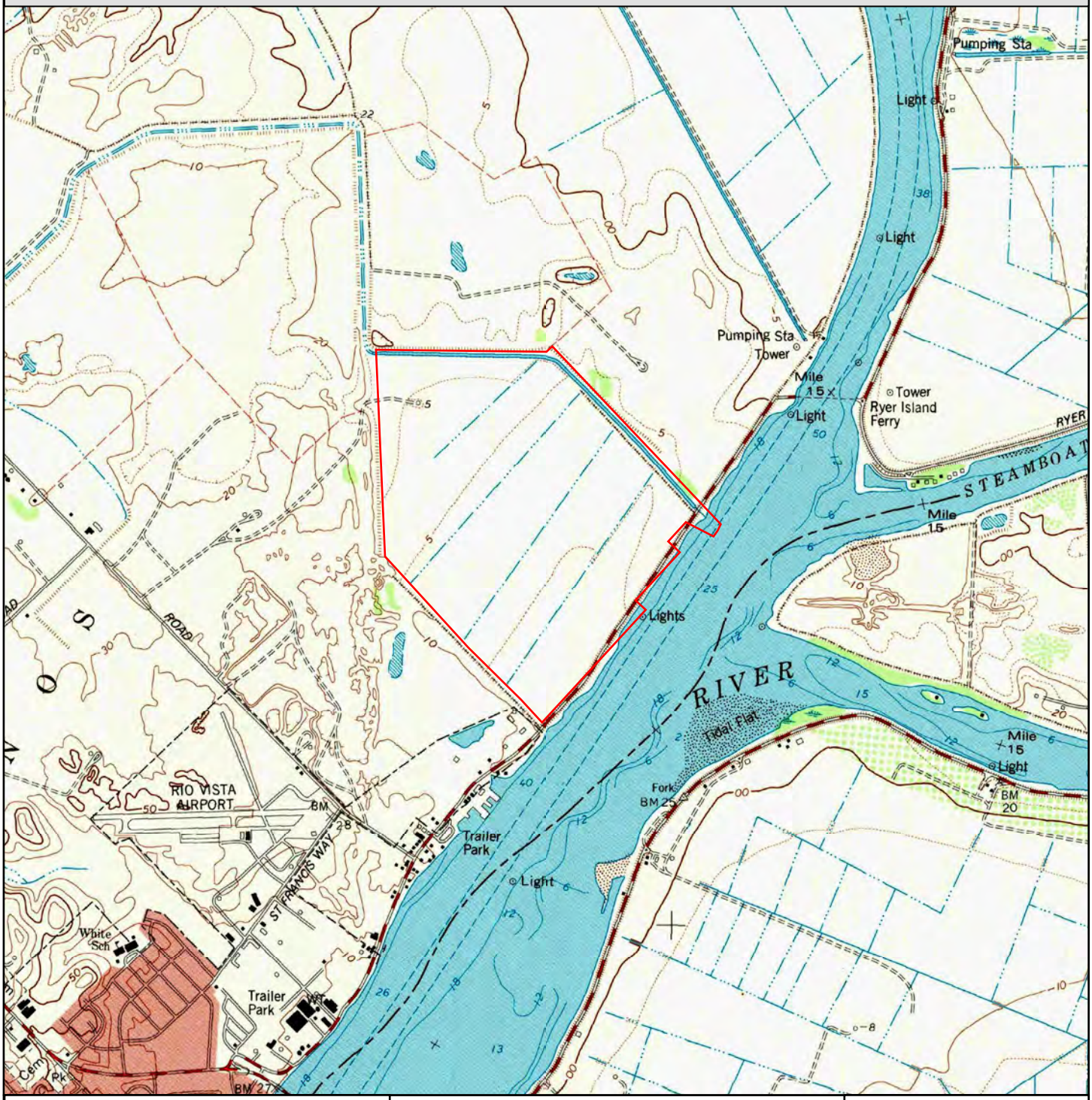
1.2 RESTORATION OVERVIEW

The restoration concept for the Bank is to re-establish tidal freshwater wetlands and floodplain-associated vegetation communities that reflect the historical accounts of the land cover onsite. To accomplish this concept, a series of open water features, including tidal and subtidal channels, will be excavated throughout the Bank property (Figure 4). These channels will be sized to accommodate water flows associated with daily tidal fluctuations to prevent scour velocities and avoid tidal muting. The onsite channels will connect directly to Cache Slough and the Sacramento River via an opening under SR 84 (e.g., box culverts or bridge). The direct hydraulic connection to tidal waters will be engineered to best allow full ecological functions and species access to the interior of the Bank and minimize erosion.

The excavated soil material generated from the dendritic channels and open water habitats will be used to create varying topography throughout the site, which will support zones of wetland, riparian, and upland communities based on elevation and expected ecological benefits to the Bank and surrounding area. For example, allowing full tidal exchange to occur throughout the emergent marsh areas onsite, the Bank will promote nutrient exchange, provide food-web support for aquatic species in adjacent waterways, and export organic carbon offsite into the Sacramento River and surrounding Delta waterways. In addition, riparian habitat will be enhanced and restored to create a broad mosaic of floodplains, upland refugia, and shaded riverine habitat that will support a mix of dependent terrestrial, semi-aquatic, and aquatic species onsite.

Figure 1. Bank Vicinity

CACHE SLOUGH MITIGATION BANK, SOLANO COUNTY, CALIFORNIA



Bank Site (350.14 acres)

USGS 24k Topo Map Boundaries

The Mitigation Bank is located within the Rio Vista, CA USGS 7.5-minute quadrangle map.

The Bank occurs within an unsectioned portion of Township 4 North and Range 3 East, Mt. Diablo Base & Meridian.

Center Coordinates (NAD83) for Bank:
Latitude 38.182254, Longitude -121.675259

0 1,000 2,000 Feet

N

Data Source:
USGS The National Map 2021;
ESRI USA Boundaries;
Public Land Survey System

Prepared by:

HELM BIOLOGICAL CONSULTING

Date: 9/21/2022

Figure 2. Bank Location

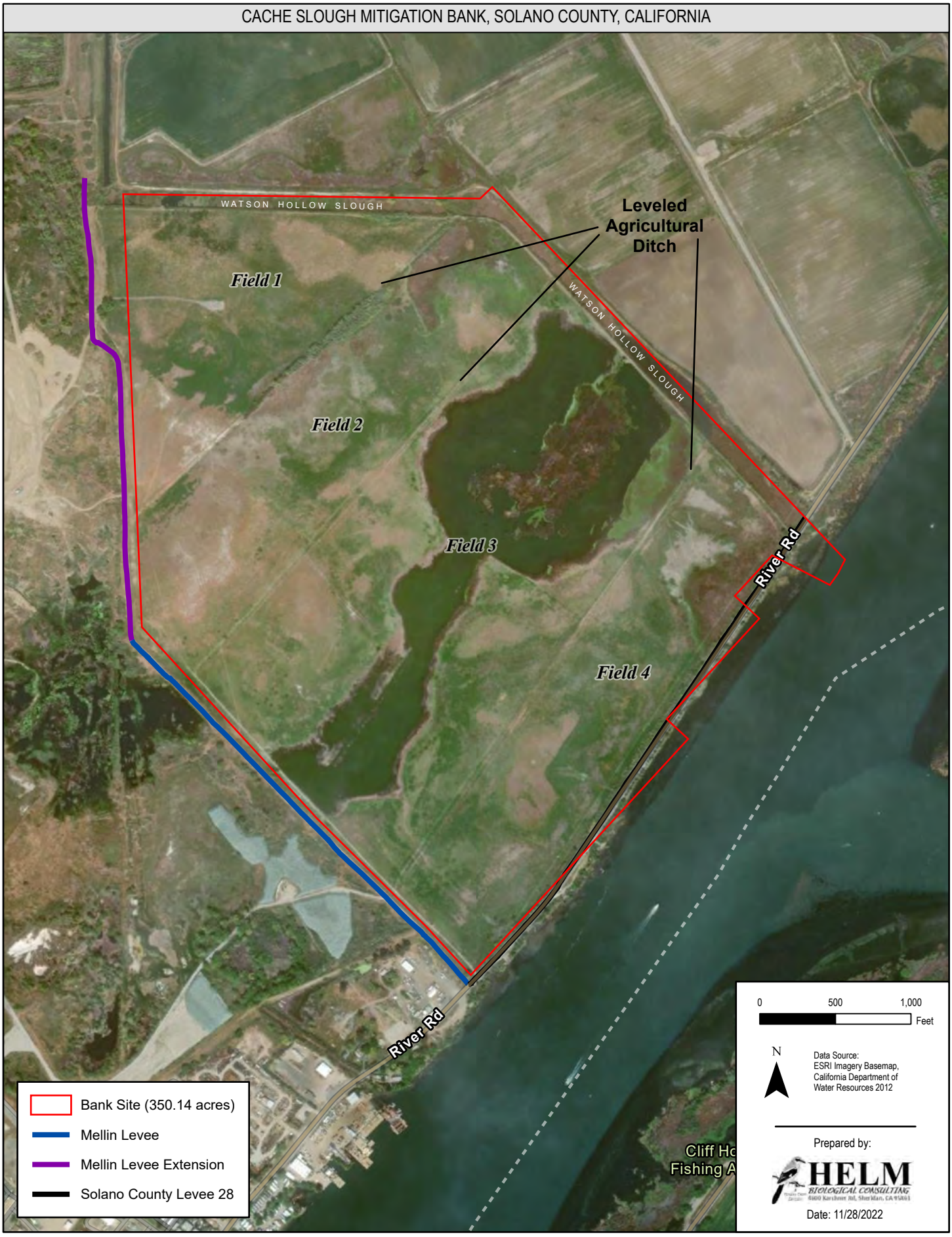


Figure 3. Bank Location on Aerial Imagery

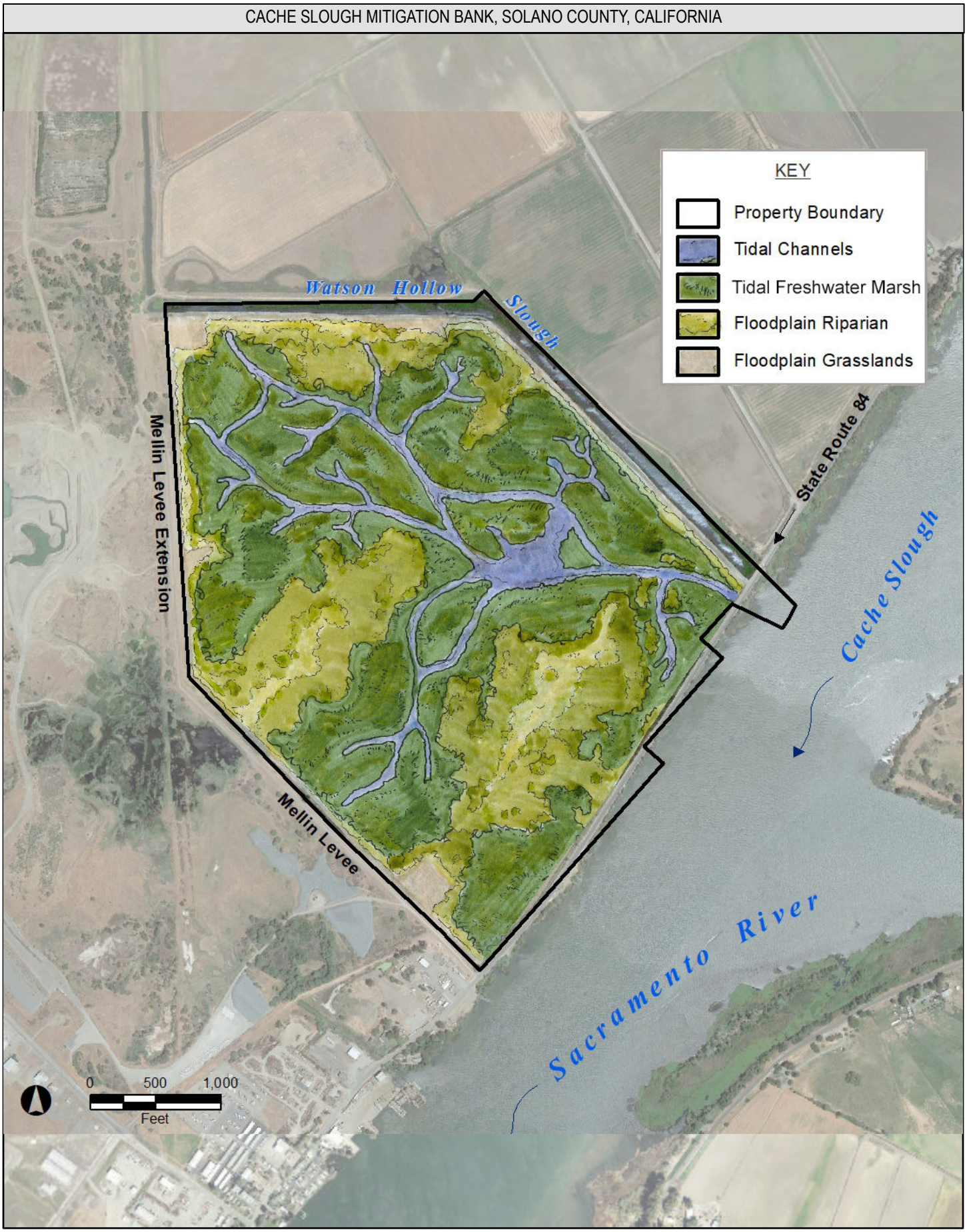


Figure 4. Restoration Concept

Vegetation establishment will be accomplished through a variety of planting methods, including container plantings, cuttings, and seeding. While vegetation in low-lying areas will likely not require irrigation when exposed to the restored tidal prism, container plantings in upland and riparian zones may require supplemental water for establishment after installation. Plantings will be sourced from onsite or from the surrounding areas whenever possible, ensuring that plants are locally adapted to site conditions and will likely develop self-sustaining populations through natural recruitment.

Post-restoration conditions will reflect natural reference sites in the north Delta. As part of restored increased daily tidal exchange, water will flow through a series of tidal channels into tule (*Schoenoplectus acutus*) marshes. As the topography rises above the daily influence of the tides, the site will transition to woody riparian scrub supporting willows (*Salix* spp.) and buttonbush (*Cephalanthus occidentalis*), similar to the composition of the Channel Islands within Cache Slough, Lindsay Slough, and Prospect Slough. Higher in the landscape, the riparian vegetation will shift to a woodland with an overstory that may comprise western sycamore (*Platanus racemosa*), white alder (*Alnus rhombifolia*), northern California walnut (*Juglans hindsii*), and Fremont's cottonwood (*Populus fremontii*). While riparian areas will be situated above the daily tidal zone, increasing water levels in the Sacramento River and Yolo Bypass due to sea-level rise will engage directly with these floodplain-associated habitats during high-flow periods and storm events further upstream in the Sacramento River and Cache Slough watersheds.

1.3 DEFINITIONS

Several terms relating to biological resources used in the report are described briefly below.

Community: A community is an assemblage of populations of plants, animals, bacteria, and fungi that live in an environment and interact with one another, forming a distinctive living system with its own composition, structure, environmental relationships, development, and functions (Whittaker 1975).

Habitat: Habitat is the place or type of site where a plant or animal naturally or normally lives and grows.

Sensitive Natural Community: Sensitive natural communities are communities that are of limited distribution statewide or within a county or region and are often vulnerable to the environmental effects of projects. These communities may or may not contain special-status plants or their habitat (California Department of Fish and Wildlife 2018). A sensitive community has particularly high ecological value or functions and is considered important because its degradation or destruction could threaten populations of dependent plant and wildlife species and significantly reduce the regional distribution and viability of the community.

As the number and extent of sensitive natural communities continue to diminish, the endangerment status of dependent special-status (i.e., rare, threatened, or endangered) species could become more precarious, and populations of currently stable species (i.e., non-special-status species) could become rare. Loss of sensitive natural communities can also eliminate or reduce important ecosystem functions, such as water filtration by wetlands and bank stabilization by riparian forests or wetlands.

VegCAMP and the California Native Plant Society's (CNPS) Vegetation Program use a rank calculator to rank natural communities using standardized quantitative rarity and threat parameters and to compute weighted scores for rarity and threats. This evaluation is done at both the global (full natural range within and outside of California) and state (within California) levels, resulting in a single G (global) and S (state) rank ranging from 1 (very rare and threatened) to 5 (demonstrably secure). The definitions of global and state rarities are the same for ranks 1 through 5, as listed below.

- 1 – Critically imperiled; at very high risk of extinction or elimination due to very restricted range, very few populations or occurrences (five or fewer known populations), very steep declines, very severe threats, or other factors.
- 2 – Imperiled; at high risk of extinction or elimination due to restricted range, few populations or occurrences (6 to 20 extant populations), steep declines, severe threats, or other factors.
- 3 – Vulnerable; at moderate risk of extinction or elimination due to a fairly restricted range, relatively few populations or occurrences (21 to 100 extant populations), recent and widespread declines, threats, or other factors
- 4 – Apparently secure; at fairly low risk of extinction or elimination due to an extensive range and/or many populations or occurrences (100 to 1,000 known extant populations) but with possible cause for some concern as a result of local recent declines, threats, or other factors.
- 5 – Secure; at very low risk of extinction or elimination due to a very extensive range, abundant populations or occurrences (1,000+ extant populations], and little to no concern from declines or threats.

Natural communities with ranks of S1–S3 are considered sensitive natural communities to be addressed in the environmental review processes of California Environmental Quality Act (CEQA) and its equivalents (CDFW 2022a).

Special-Status Species: Special-status species are generally defined as species that are assigned a status designation indicating possible risk to the species. These designations are assigned by state and federal resource agencies (e.g., California Department of Fish and Wildlife [CDFW], U.S. Fish and Wildlife Service [USFWS]) or by private research or conservation groups (e.g., CNPS).

Special-status designation is typically assigned based on a declining or potentially declining population—locally, regionally, or nationally. To what extent a species or population is at risk usually determines the status designation. The factors that determine risk to a species or population generally fall into one of several categories, such as habitat loss or modification affecting the distribution and abundance of a species; environmental contaminants affecting the reproductive potential of a species; or a variety of mortality factors such as hunting or fishing, interference with human-made objects (e.g., collision, electrocution), invasive species, or toxins.

Special-Status Plant Species: For the purposes of this document, special-status plants include all those that meet one or more of the following criteria.

- Listed or proposed for listing as threatened or endangered under the federal Endangered Species Act (ESA) or candidates for possible future listing as threatened or endangered under the ESA (50 Code of Federal Regulations [CFR], § 17.12).
- Listed or candidates for listing by the state of California as threatened or endangered under the California Endangered Species Act (CESA) (California Fish and Game Code [CFGC], § 2050 et seq.). In CESA, "endangered species" means a native species or subspecies of plant that is in serious danger of becoming extinct throughout all, or a significant portion, of its range due to one or more causes, including loss of habitat, change in habitat, overexploitation, predation, competition, or disease (CFGC, § 2062). "Threatened species" means a native species or subspecies of plant that, although not presently threatened with extinction, is likely to become an endangered species in the foreseeable future in the absence of the special protection and management efforts required by CESA (CFGC, § 2067). "Candidate species" means a native species or subspecies of plant that the California Fish and Game Commission has formally noticed as being under review by CDFW for addition to either the list of endangered species or the list of threatened species, or a species for which the California Fish and Game Commission has published a notice of proposed regulation to add the species to either list (CFGC, § 2068).
- Listed as rare under the California Native Plant Protection Act (CFGC, § 1900 et seq.). A plant is rare when, although not presently threatened with extinction, the species, subspecies, or variety is found in such small numbers throughout its range that it may be endangered if its environment worsens (CFGC, § 1901).
- Meet the definition of endangered, rare, or threatened species under State CEQA Guidelines section 15380, subdivisions (b) and (d), which may include:
    - Plants tracked by the California Natural Diversity Database (CNDDB) as California Rare Plant Rank (CRPR) 1 or 2; and
    - Plants that may warrant consideration based on declining trends, recent taxonomic information, or other factors. This includes plants tracked by the CNDDB as CRPR 3 or 4.

- Considered locally significant plants, that is, plants that are not rare from a statewide perspective but are rare or uncommon in a local context such as within a county or region (State CEQA Guidelines, § 15125, subd. [c]); or as designated in local or regional plans, policies, or ordinances (State CEQA Guidelines, Appendix G). Examples include plants that are at the outer limits of their known geographic range or plants occurring in an atypical soil type.

Special-Status Wildlife Species: For purposes of this report, special-status wildlife species are generally defined as follows.

- Species that are listed or proposed for listing as threatened or endangered under the federal ESA (50 CFR 17.11 [listed animals] and various notices in the Federal Register [proposed species]).
- Species that are candidates for possible future listing as threatened or endangered under the ESA (70 Federal Register 24870–24934, May 11, 2005), or as species of special concern designated by the National Marine Fisheries Service.
- Species that are listed or proposed for listing under CESA (CFGC 1992, § 2050 et seq.; 14 California Code of Regulations [CCR], § 670.1 et seq.).
- Species that are designated as species of special concern by CDFW.
- Species that are designated as fully protected by CDFW (CFGC, § 3511 [birds], § 4700 [mammals], § 5050 [reptiles and amphibians], and § 5515 [fish]).
- Species that meet the definition of rare or endangered under CEQA (14 CCR, § 15380).

Waters of the United States: The term "waters of the United States (U.S.)" is defined as follows.

1. All waters which are currently used, or were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the ebb and flow of the tide;
2. All interstate waters including interstate wetlands;
3. All other waters such as intrastate lakes, rivers, streams (including intermittent streams), mudflats, sandflats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds, the use, degradation or destruction of which could affect interstate or foreign commerce including any such waters:
    I. Which are or could be used by interstate or foreign travelers for recreational or other purposes; or
    I. From which fish or shellfish are or could be taken and sold in interstate or foreign commerce; or

II. Which are used or could be used for industrial purposes by industries in interstate commerce;

4. All impoundments of waters otherwise defined as waters of the United States under this definition;
5. Tributaries of waters identified in paragraphs (s)(1) through (4) of this section;
6. The territorial sea;
7. Wetlands adjacent to waters (other than waters that are themselves wetlands) identified in paragraphs 1 through 6 of this section; waste treatment systems, including treatment ponds or lagoons designed to meet the requirements of the Clean Water Act (CWA) (other than cooling ponds as defined in 40 CFR 423.11(m) which also meet the criteria of this definition) are not waters of the United States.

Wetlands: For the purposes of this document, wetlands are a subset of waters of the U.S.; they are defined as transitional areas between aquatic habitats and upland habitats and generally include habitats such as marshes and swamps.

Under the U.S. Army Corps of Engineers (USACE) jurisdiction, wetlands generally must possess the following three mandatory criteria: (1) a prevalence or dominance of hydrophytes (water-loving plants), (2) hydric soils (e.g., waterlogged soils), and (3) wetland hydrology (i.e., soils that are inundated or saturated to the surface for extended periods during the growing season).

Waters of the State: According to Section II of California's *State Policy for Water Quality Control: State Wetland Definition and Procedures for Discharges of Dredged or Fill Material to Waters of the State*, the Water Boards define an area as *wetlands* as follows.

> An area is wetland if, under normal circumstances, (1) the area has continuous or recurrent saturation of the upper substrate caused by groundwater, or shallow surface water, or both; (2) the duration of such saturation is sufficient to cause anaerobic conditions in the upper substrate; and (3) the area's vegetation is dominated by hydrophytes or the area lacks vegetation.

Waters of the state are defined broadly in the Porter-Cologne Water Quality Control Act and include the following.

> … "any surface water or groundwater, including saline waters, within the boundaries of the state." "Waters of the state" includes all "waters of the U.S." The following wetlands are waters of the state:
>
> 1. Natural wetlands,
> 2. Wetlands created by modification of a surface water of the state, and
> 3. Artificial wetlands…

Wildlife: For the purposes of this document, wildlife includes mammals, birds, reptiles, amphibians, fish, and invertebrates.

2.0 REGULATORY PROTECTION OF SPECIES AND HABITATS

2.1 CLEAN WATER ACT SECTIONS 401, 402, AND 404

Section 404 of the CWA protects waters of the U.S., including wetlands and drainages, by requiring projects that would discharge dredge or fill material into them to obtain a permit or authorization from USACE. The permitting program is designed to minimize the fill of waters of the U.S. and, when impacts cannot be avoided, require compensatory mitigation.

Section 401 of the CWA requires any applicant for a federal license or permit that could result in any discharge into a navigable water (e.g., a USACE permit to fill wetlands), to obtain water quality certification from the regional water quality control board (RWQCB).

Section 402 of the CWA requires projects that disturb one acre or more, or are part of a larger project, to notify the State Water Resources Control Board and to prepare a Storm Water Pollution Prevention Plan that will minimize construction and storm water-related impacts on waterways.

Because the RWQCB accepts the USACE definition of wetlands, delineations from a final USACE-verified aquatic resource report can be used to determine the extent of wetlands and waters of the state. Any wetlands or waters not delineated in a USACE-verified report would be evaluated in a similar method to delineations of federal wetlands and waters to determine additional waters of the state.

2.2 PORTER-COLOGNE WATER QUALITY ACT

The Porter-Cologne Water Quality Act extends the RWQCB jurisdiction over waters of the state and defines waters of the state as any surface water or groundwater, including saline waters, within the boundaries of the state (California Water Code § 13050[e]). In the absence of CWA Section 404 jurisdiction over isolated waters or other waters of the state, California retains authority to regulate discharges of wastes into any waters of the state.

2.3 CALIFORNIA DEPARTMENT OF FISH AND GAME CODE SECTIONS 1600–1607

Under the CFGC, Sections 1600–1607, CDFW may enter into a Streambed Alteration Agreement (SAA) with an applicant if a project would divert, obstruct, or change the natural flow of the bed, channel, or bank of any river, stream, or lake. Through an SAA, CDFW can develop mitigation measures with applicants who propose projects that would obstruct the flow of, or alter the bed, channel, or bank of, a river, stream, or lake in which there is a fish or wildlife resource, including seasonal drainages.

2.4 MIGRATORY BIRD TREATY ACT AND CALIFORNIA FISH AND GAME CODE SECTIONS 3503.5, 3511, AND 3513

The federal Migratory Bird Treaty Act (MBTA) (16 U.S. Code, § 703, 1989) prohibits killing, possessing, or trading migratory birds except in accordance with regulations prescribed by the Secretary of the Interior. This act encompasses whole birds, parts of birds, bird nests, and eggs. The MBTA is administered by USFWS, and special permits from the agency are generally required for the take of any migratory birds. This act applies to all persons and agencies in the U.S., including federal agencies. Eggs and nests of all birds are protected from take under CFGC Section 3503. Raptors and raptor nests or eggs are protected from take under CFGC Section 3503.5. Migratory birds are expressly prohibited from take under CFGC Section 3513; and species designated by CDFW as fully protected species are protected from take under CFGC Sections 3511, 4700, 5050, and 5515.

2.5 FEDERAL AND STATE ENDANGERED SPECIES ACTS

The USFWS and CDFW are the federal and state agencies, respectively, responsible for the protection of endangered and threatened plants, fish, and wildlife and for regulation of activities that could affect those species. The regulatory vehicles that protect sensitive species administered by these two agencies are the ESA and CESA.

Section 7 of the ESA provides a means for authorizing the incidental take of federally endangered or threatened species that results from federally conducted, permitted, or funded projects. Section 10 authorizes the incidental take of federally endangered or threatened species by non-federal agencies.

In exchange for habitat conservation and other commitments, USFWS and CDFW will each issue an Incidental Take Permit (ITP) that grants take for covered species resulting from implementation of covered activities, including urban development and infrastructure construction and maintenance activities. The entities that receive *take* coverage under the ITPs are exempt from the take prohibitions of Section 9 of the ESA for take of covered species incidental to otherwise legal activities.

3.0 METHODS

To determine whether the Bank supports special-status species or suitable habitat for special-status species or other sensitive biological resources (e.g., sensitive habitats such as wetlands), a two-phase approach was conducted that included a pre-field survey and follow-up field surveys, described below.

3.1 DATA COMPILATION

Prior to conducting field surveys, an investigation was conducted to identify sensitive biological resources with potential to occur at the Bank. Several data sources were reviewed, including the following.

- A records search of CDFW's CNDDB and the CNPS Inventory of Rare and Endangered Plants Database of the Rio Vista USGS 7.5-minute topographic quadrangle map, to determine whether any special-status plants or wildlife had been reported onsite or within a five-mile radius of the Bank (CDFW 2022b; CNPS 2022).
- An Information for Planning and Consulting species list for the Bank generated by the USFWS Environmental Conservation Online System (USFWS 2022a).
- National Wetland Inventory maps for aquatic features (USFWS 2022b).
- Soils information and maps from the US Department of Agriculture, Natural Resources Conservation Service (NRCS) Web Soil Survey (NRCS 2022a).
- Soil series descriptions from the NRCS Web Soil Survey (NRCS 2022a).
- General topography from the Rio Vista USGS 7.5-minute topographic quadrangle map.
- Watershed hydrologic unit code (HUC) maps.
- Precipitation data and seasonal temperature data from Western Regional Climate Center (WRCC, 2023).
- Google Earth© (2022) images.
- Site descriptions provided by WES.

A list of special-status plant and wildlife species known from the vicinity of the Bank was developed based on the review of existing information. The list was used to focus the site investigation on the special-status species and associated communities or habitats with potential to be present in the area, described below in the *Special-Status Species Habitat Assessment* section.

3.2 FIELD SURVEYS

Various biological field surveys were conducted on the Bank property to document existing habitats and species (Table 1).

Table 1. Summary of Field Surveys, Dates, and Personnel

Survey Type	Survey Date(s)	Personnel
Federally-listed Large Branchiopod Habitat Assessment	February 2020 - May 2020	Dr. Helm and Mr. O'Brien
Aquatic Delineation	March 6, 2020	Dr. Helm, Mr. O'Brien, and Mr. Kovet
	March 26-28, 2020	Dr. Helm and Mr. O'Brien
	April 16, 2020	Dr. Helm and Mr. O'Brien
	February 8, 2023	Ms. Rachel Powell
Tree Assessment	March 19, 29, and 30, 2020	Dr. Brent Helm, Mr. Sean O'Brien, and Mr. Milo Kovet
Habitat Mapping	April 8, 14, 16, 23, and 27, 2020	Dr. Brent Helm, Mr. Sean O'Brien, and Mr. Milo Kovet
Reconnaissance-level and Aquatic Resource Delineation Surveys	January – April 2020	Dr. Brent Helm, Mr. Sean O'Brien, and Mr. Milo Kovet
Baseline Biological Resource Surveys (Rare Plant Surveys)	May 1, 9, 10-12, 15, and 17, 2021; and June 10, 11, and 14, 2021	Dr. Brent Helm and Mr. Sean O'Brien
Baseline Biological Resource Surveys (Nesting Bird Surveys)	May 5, 9, 10, 15, 2021 and June 14 and 24, 2021	Dr. Brent Helm, Mr. Sean O'Brien
Botanical Surveys	July 8, 2022	Dr. Brent Helm and Rachel Powell
Federally-listed Large Branchiopod Dry-Season Sampling	August 28, 2022	Dr. Brent Helm and Ms. Rachel Powell
Federally-listed Large Branchiopod Wet-Season Sampling	December 2022 – April 2023	Dr. Brent Helm and Ms. Rachel Powell
Post-storm Site Visit	February 8, 2023	Dr. Brent Helm and Ms. Rachel Powell

Surveys focused on the following.

- Describing and mapping common and sensitive communities/habitats present.
- Identifying special-status and common plant and wildlife species' occurrences.
- Conducting an assessment of habitat types present for suitability to support special-status species.

Areas potentially qualifying as waters of the U.S. or state, including wetlands, were also mapped (HBC 2022). Specific methods are described below under appropriate headings.

3.3 HABITAT MAPPING

HBC biologists walked or rode on an all-terrain vehicle to cover the entire Bank. All vegetation communities were mapped, including wetlands (HBC 2022) either on aerial photographic base maps or using a handheld Trimble Geo7X global positioning system (GPS) unit with sub-meter accuracy. GPS data were collected in Zone 2 of the California State Plan Coordinate System in latitude/longitude in the NAD83 system. Wetland and upland habitat types were classified based on dominant vegetation, soil types, and hydrology.

Habitat polygons were plotted on aerial photographs using ArcView Geographic Information System (GIS) software and attributed with a unique number, habitat type, and acreage. Acreage calculations were compiled using GIS for each habitat polygon and summed for each habitat type.

3.4 AQUATIC RESOURCES, INCLUDING WETLANDS DETERMINATION

HBC biologists conducted ~~a~~quatic-resources delineation field surveys according to current state and federal guidelines to identify and map potential waters of the U.S. and state, including wetlands, streams, and lakes, to determine the extent of regulatory jurisdiction for the RWQCB and CDFW (HBC 2022).

- CWA Section 401 jurisdiction includes all aquatic features under federal jurisdiction, including ephemeral, intermittent, and perennial streams as determined using ordinary high-water mark (OHWM) indicators and three parameter wetlands. In addition to federal aquatic resources, CWA Section 401 jurisdiction also includes isolated wetlands, riparian vegetation, isolated seeps and springs, and human-induced wetlands with natural conditions present.

- CDFW jurisdictional limits are usually delineated by the top of the stream or lake banks, or the outer edge of riparian vegetation—whichever is wider. CDFW jurisdiction also includes wetlands that are connected to and immediately adjacent to any stream or lake.

Surveyors conducted pre-delineation investigations by walking transects across the entire site, where accessible, to ensure that the entire area was surveyed. Areas with hydrophytic vegetation dominance or suspected hydrology were noted and recorded using sub-meter accuracy GPS units. Locations with potential wetland conditions documented during the pre-delineation surveys were revisited and delineated using current state guidelines to identify and map potential wetlands and waters of the state to determine the extent of regulatory jurisdiction for the RWQCB and CDFW.

Riparian vegetation within and adjacent to rivers, streams, and creeks was delineated in the field from the edge of the wetland or stream out to the stands' lateral extent, using the CDFW-CNPS protocol for rapid assessment (CDFW and CNPS 2023). The outer edge of riparian vegetation was

used as the line of demarcation between riparian and upland habitats. Hydrophytic vegetation, hydric soil, and wetland hydrology data were collected to complete rapid assessment, including the OHWM. Where accessible, and when GPS accuracy allowed, aquatic features, wetland boundaries, top of bank along creeks, sampling points, and culvert locations were mapped using a sub-meter accuracy GPS unit. Wetlands were not mapped within the OHWM. All potential waters of the U.S. were classified using the Cowardin *et al.* (1979) classification system.

During the field investigation, HBC biologists gathered data on the vegetation, soils, and hydrology of the site to determine what areas met the USACE's three mandatory technical criteria for a wetland (i.e., exhibited positive indicators of wetland vegetation, soils, and hydrology) and to map the OHWM of non-tidal streams.

The OHWM method was used for determining the lateral limits of non-wetland waters. Non-wetland waters are regulated under waters of the U.S. in Section 404 of the CWA (33 U.S. Code 1344) and are defined by a line on the shore established by fluctuations of water. This OHWM line is indicated by shelving, changes in sediment texture, and changes in vegetation. The OHWM method was used to determine waters of the U.S. and state in non-tidal perennial and seasonal drainages. CDFW jurisdiction was determined by the "top of bank" or the "canopy (aerial cover) of riparian vegetation," whichever extended farther from the OHWM.

A formal delineation of aquatic resources, including wetlands, was conducted by HBC, and a separate Aquatic Resources Delineation Report was prepared (HBC 2022).

3.5 Special-Status Species Habitat Assessment

Special-status species and sensitive habitats identified during the pre-survey investigation as having the potential to occur within the Bank were targeted during field surveys. All plant communities were surveyed to determine presence or absence of any special-status species from the list developed of special-status plant and wildlife species with potential to occur within the Bank or vicinity of the Bank. Additionally, any nests observed onsite were mapped with the GPS.

For species that were not identifiable at the time of the field survey, plant communities were assessed for potential to support the targeted species. The habitat assessment was based on habitat suitability comparisons with reported occupied habitats using the following definitions.

- None – Species distribution is restricted by substantive habitat requirements that do not occur onsite; therefore, no further survey or study is necessary to determine likely presence or presumed absence of this species.

- Not Probable – Species distribution is restricted by substantive habitat requirements that are negligible onsite; therefore, it is assumed that no further survey or study is necessary to determine likely presence or presumed absence of this species.

- Low – The species has a low probability of occurrence within the site.
- Moderate – The species has a moderate probability of occurrence within the site.
- High – The species has a high probability of occurrence within the site.
- Present – Species or species sign were observed onsite or historically has been documented onsite.
- Critical habitat – The site is located within a USFWS-designated critical habitat unit.

Survey methods are described below for plants and wildlife.

3.5.1 Plant Surveys

The entire Bank was walked in tight meandering transects, and all plants observed were identified to the taxonomic level necessary to determine rarity status according to *The Jepson Manual: Vascular Plants of California, 2nd Edition* (Baldwin *et al.* 2012) and internet resources such as CNPS (2022) and Calflora (2023). Scientific nomenclature follows *The Jepson Manual* (Baldwin et al. 2012) and updates published online by the Jepson Flora Project, Jepson Online Interchange (University of California, Berkeley 2021). Common names followed Calflora (2022). Species not readily identifiable in the field were collected and later identified using *The Jepson Manual* (Baldwin et al. 2012). A list of all plant species encountered during the botanical field survey was compiled. Each plant was assigned a wetland indicator status using *The National Wetland Plant List: 2016 Update of Wetland Ratings* (Lichvar *et al.* 2016) as follows.

- OBL – Obligate wetland plants. Almost always occur in wetlands.
- FACW – Facultative wetland plants. Usually occur in wetlands but may occur in non-wetlands.
- FAC – Facultative plants. Occur in wetlands and non-wetlands.
- FACU – Facultative upland plants. Usually occur in non-wetlands but may occur in wetlands.
- UPL – Obligate upland plants. Almost never occur in wetlands.

Additionally, NL is used in this text for Not Listed in Lichvar *et al.* (2016). By default, NL is generally considered UPL.

Every plant was determined to be native or nonnative (introduced) based on Calflora (2022). All nonnative plant species were further evaluated for any invasive status using the California Invasive Plant Council (Cal-IPC 2022) ratings as follows.

- High –These species have severe ecological impacts on physical processes, plant and animal communities, and vegetation structure. Their reproductive biology and other attributes are conducive to moderate to high rates of dispersal and establishment. Most are widely distributed ecologically.

- Moderate –These species have substantial and apparent, but generally not severe, ecological impacts on physical processes, plant and animal communities, and vegetation structure. Their reproductive biology and other attributes are conducive to moderate to high rates of dispersal, though establishment is generally dependent upon ecological disturbance. Ecological amplitude and distribution may range from limited to widespread.

- Limited –These species are invasive, but their ecological impacts are minor on a statewide level or there was not enough information to justify a higher score. Their reproductive biology and other attributes result in low to moderate rates of invasiveness. Ecological amplitude and distribution are generally limited, but these species may be locally persistent and problematic.

All plants observed onsite were recorded in field notes and compiled into a complete species list (Table 6 in Appendix E).

3.5.2 Wildlife Surveys

With the exception of USFWS protocol-level surveys for large branchiopods (fairy shrimp, tadpole shrimp, and clam shrimp) that are listed under the federal Endangered Species Act (e.g., vernal pool fairy [*Branchinecta lynchi*] and vernal pool tadpole shrimp [*Lepidurus packardi*]) conducted by HBC (2022, 2023), no other protocol-level wildlife surveys were conducted as part of the habitat assessment. All wildlife species observed were identified based on HBC biologists' knowledge and following field guides: Reid (2006) for mammals, Peterson (2020) for birds, Stebbins (2018) for reptiles and amphibians, and Gross et al. (2020) for insects. Common and scientific names of birds followed the Working Group on Avian Nomenclature of the International Ornithologists' Union. Common and scientific names for reptiles and amphibians followed nomenclature of Nafis (2022) California Herps (California Herps 2023).

All wildlife observed onsite during field surveys were recorded in field notes and compiled into a complete list (Table 7 in Appendix E).

4.0 RESULTS

4.1 HISTORICAL SITE CONDITIONS

In the early 1800's, prior to major European influence, the Bank would have supported natural habitats associated with the central Sacramento-San Joaquin Delta. More specifically, the Bank was mostly tidal freshwater emergent wetlands that transitioned into wet meadow and seasonal wetlands along the upper edge (Whipple *et al.* 2012) (Exhibit 1 in Appendix A). The tidal freshwater emergent wetlands would have been perennially inundated, influenced by spring tides during low river stages and dominated by marsh species (e.g., tules [*Schoenoplectus* spp.], cattails [*Typha* spp.]), possibly containing a woody vegetation component (e.g., willows [*Salix* spp.]). The wet meadow and seasonal wetlands would have been temporarily or seasonally flooded and contained herbaceous communities characterized by poorly drained, clay-rich soils. (*Whipple et al*. 2012).

A historical perspective from 1881 describes the areas around Cache Slough as shallow water occurring along a network of channels, with small patches of exposed channel margins (Palmer *et al.* 1881). This is apparent from the USGS map from 1910, showing the majority of the Bank as aquatic habitat (i.e., part of the Yolo Basin) (USGS 2020) (Exhibit 2 in Appendix A). However, a USGS map from 1947 shows that the former Yolo Basin, including the Bank, was drained, likely for flood control and agricultural purposes (Exhibit 3 in Appendix A).

Some of the earliest available historical aerial imagery shows that lands on the Bank were routinely plowed for agricultural purposes (Historic Aerials 2020). This routine plowing appears to have prevented the establishment of emergent vegetation associated with the perennial and seasonal wetlands presently occurring onsite. By 1993, some emergent vegetation had established itself within wetlands occurring in the Bank; and by 2002, most of the habitats presently occurring at the Bank appear to have been established (Google Earth 2020©).

4.2 CURRENT SITE CONDITIONS

There are two primary land/water uses within the Bank: agricultural and recreational. The Bank is currently used for hunting waterfowl during winter and seasonal cattle grazing during spring and summer. The Rio Vista Gas Field underlies the Bank and adjacent properties. Currently, a gas well is in the northwest corner of the Bank. This well is inactive and is scheduled for abandonment and removal in 2023 by the lease holder, California Resources Production Corporation.

The riverine habitat along the east boundary of the Bank (Sacramento River and Cache Slough) is utilized by commercial ships that move up and down the Sacramento River through Cache Slough to the Sacramento Deep Water Ship Channel to the Port of Sacramento (Photograph 1 in

Appendix B). More frequently, however, these rivers and sloughs are used for recreational purposes by boaters and fishermen.

The Bank is divided into four former agricultural fields (Fields 1 through 4, numbered from west to east) (Figure 3). These fields form somewhat hydrologically-isolated basins, at least from shallow surface water. The fields are derived from three elevated agricultural ditches that parallel each other and are oriented in a northeast/southwest direction (Figure 3). These ditches are composed of mounded dirt (displaced soil); they rise roughly 2 to 2.5 feet above existing grade and function as berms. However, the only elevated agricultural ditch that is active (conveys water) at the Bank separates Field 1 from Field 2. These elevated ditches may have once supported irrigation pipe (Photograph 2 in Appendix B) but now are earthen lined. A brief description of each field follows.

Field 1 is triangular (Figure 3). The active elevated ditch, described above, occurs along the southeastern boundary. Except for the lower third, this leaky ditch contains perennial water. Water spills from the central portion of the degraded berm to the northwest, creating a human-made and managed emergent marsh and seasonal wetland (Sheet A1 in Appendix C). A small (< 1.5 foot wide and deep) inactive (abandoned) ditch occurs along two-thirds of the northern edge of this field. A natural gas well site is in the center of this field, with its access road to the west (Sheet A1 in Appendix C). The only other significant features in this field are three clay flats (Sheet A1 in Appendix C), one of which is elevated above the others, more alkaline, and supports numerous small alkaline seasonal wetlands (Photograph 3 in Appendix B). Unlike the elevated clay flat, the two clay flats lower in elevation are occasionally seasonally flooded by the managed emergent marsh and seasonal wetland.

Field 2 is capsule-shaped and shares the active elevated ditch with Field 1 along its northwest boundary (Figure 3). Water spills from the elevated ditch in a southeast direction near its northwest corner and in its center. The water released from the elevated ditch creates two emergent marshes that are separated by a human-made berm located in the upper quarter of the field. The southwest corner supports a large clay flat habitat similar to the two low-lying flats described for Field 1; this habitat also is occasionally flooded by the managed emergent marsh (Sheet A1 in Appendix C).

Based on historical photographs (USGS 2020), Field 3, the largest, was once two separate fields (Figure 3). However, the elevated ditch that had separated the two fields is no longer present; in its place is a wide ditch situated below the existing grade (Photograph 4 in Appendix B; Sheets A1, A2, and B1 in Appendix C). Portions of the relic elevated ditch are apparent in the north during low water levels. This wide ditch is active and is perennially inundated from Watson Hollow Slough. The outfall culvert from Watson Hollow Slough and infall culvert to the wide ditch have operable gate valves located at the north end of the ditch (Photograph 5 in Appendix B). Water is released into the wide ditch, which overflows its banks to the west and east. An emergent marsh and seasonal wetland are maintained from the water releases and utilized as waterfowl habitat. A small seep occurs along the toe slope of the adjacent Mellin Levee (outside the Bank property) in

the southwest corner of the field. This patch of lush vegetation has presumably resulted from water leaking through the levee from the abutting aggregate wetlands. The hydrology of this seep is also supported during high water events from flooding of the north/south oriented portion of Watson Hollow Slough (during high rainfall years) or the managed wetlands.

The most eastern Field 4 is separated by an abandoned elevated ditch along its northwest boundary (Figure 3). Water is brought to the field from a small ditch in the northeast corner. Water flows from the small ditch (Photograph 6 in Appendix B) into a low topographic area in the northern third of the field (Photograph 7 in Appendix B). The small ditch connects to a larger ditch (Photograph 8 in Appendix B) that is connected to Watson Hollow Slough, which parallels the western edge of the Bank and Solano County Levee 28. The ditch supports a scrubby woody riparian habitat (Photograph 9 in Appendix B) similar to that occurring along the south bank of Watson Hollow Slough. When the roadside ditch overflows its banks, it spills into a second low topographic area in the southern half of Field 4. Both of the low areas support emergent wetlands that are managed for waterfowl.

The Bank's climate, geology and soils, topography and hydrology, and terrestrial and aquatic habitats are further described below.

4.2.1 CLIMATE

The Bank region has hot, mostly dry summers and cold, wet, sometimes foggy winters. Climate details for the Bank are represented by historical data collected by a Western Regional Climate Center at the monitoring station at the Antioch Pumping Plant #3, approximately 14 miles south of the Bank. The climate station at the Antioch Pumping Plant #3 has records from 1971 through 2023, with data on daily temperature (minimum and maximum) and precipitation. Temperatures range from an average high in August of 90.9 degrees Fahrenheit (°F) to an average low in December of 37.1°F (WRCC 2023). The average annual temperature is approximately 60.8°F. Precipitation occurs primarily in October through May, with only negligible amounts of rainfall during June through August (WRCC 2023). The average annual rainfall is 14.04 inches. The 2022/2023 rainfall likely will be above average for this wet-season year (Table 2).

Table 2. Comparisons of Monthly and Annual Rainfall to Long-term Average Rainfall within the Vicinity of the Bank, Solano County

Rainfall Year	Monthly Rainfall in Inches												
	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Total
Long-term Average	0.19	0.54	1.66	2.46	2.80	2.65	2.41	0.79	0.44	0.09	0.00	0.01	14.04
2009/2010	0.06	2.81	0.22	3.00	3.98	1.88	1.84	2.17	0.77	0.00	0.00	0.00	16.73
2010/2011	0.00	0.92	2.22	4.56	1.40	2.39	4.58	0.12	0.84	1.38	0.00	0.00	18.41
2011/2012	0.02	1.43	1.09	0.23	2.09	0.94	3.89	2.25	0.00	0.04	0.00	0.00	11.98
2012/2013	0.00	0.66	3.42	3.73	0.66	0.26	0.62	0.80	0.30	0.10	0.00	0.01	10.56
2013/2014	0.18	0.54	1.66	1.87	2.80	2.59	2.41	0.79	0.38	0.08	0.00	0.01	13.31
2014/2015	0.21	0.37	1.36	7.56	0.09	1.48	0.24	0.64	0.00	0.08	0.00	0.01	12.04
2015/2016	0.01	0.16	1.50	2.20	4.32	0.71	3.80	1.09	0.09	0.00	0.00	0.00	13.88
2016/2017	0.04	3.03	1.09	3.22	5.92	0.06	1.03	0.77	0.03	0.00	0.00	0.00	15.19
2017/2018	0.00	0.11	1.79	0.04	4.34	0.24	3.46	2.15	0.01	0.00	0.00	0.00	12.14
2018/2019	0.01	0.06	2.13	2.32	0.78	6.67	3.34	0.40	2.00	0.00	0.00	0.00	17.71
2019/2020	0.13	0.02	0.71	2.14	0.86	0.15	1.12	0.51	0.38	0.00	0.00	0.00	6.02
2020/2021	0.00	0.03	0.99	3.21	1.30	1.30	0.38	0.80	0.05	0.00	0.00	0.00	8.06
2021/2022	0.05	0.97	0.90	3.61	0.11	0.00	0.50	0.47	0.04	0.04	0.00	0.89	7.58
2022/2023**	0.31	0.00	0.33	4.64	4.92	0.45**	**	**	**	**	**	**	10.65**

*All rainfall data is from the Twitchell Island weather monitoring station located approximately 5 miles southeast of the Bank. Long-term average rainfall is calculated from 1997 to 2022 (UCIPM)

**Rainfall that occurred after 2/6/2022 is not included in this table, since the table was created on this date

4.2.2 Geology and Soils

The geology within the Bank is composed of mostly non-marine Quaternary alluvium and marine deposits (Pliocene to Holocene) consisting of alluvium, lake, playa, and terrace deposits—unconsolidated and semi-consolidated (Jennings et al. 1977).

According to the NRCS (2020a) custom soil report, the Bank supports the following three soil map units (Figure 5).

- Pescadero silty clay loam, 0 percent slopes, Major Land Resource Area 17 (Pc)
- Valdez silt loam, drained, 0 to 2 percent slopes, Major Land Resource Area 16 (Va)
- Water (W)

Except for water, these soil maps units are included on the National Hydric Soil List (NRCS 2020b) (Table 3).

Table 3. Natural Resource Conservation Service's Soil Map Units and Hydric Soil Components/ Inclusions Occurring at the Cache Slough Mitigation Bank, Solano County, California

Area Name	Map Unit Name	Map Unit #	Component Name and Phase	Component Landform	Hydric Rating	Hydric Criterion*
Solano County, California	Pescadero silty clay loam, 0 percent slopes, MLRA 17	Pc	Willows	Basin floors	Yes	2
	Valdez silt loam, drained, 0 to 2 percent slopes, MLRA 16	Va	Valdez	Flood plains	Yes	2
			Sacramento	Flood plains	Yes	2
			Sycamore	Flood plains	Yes	2
			Maria	Flood plains	Yes	2
			Laugenour	Flood plains	Yes	2

*Hydric Criterion Ratings 1-4 are defined below (NRCS 2020b)

1. All Histels except Folistels and Histosols except Folists; or

2. Map unit components in Aquic suborders, great groups, or subgroups, Albolls suborder, Historthels great group, Histoturbels great group, or Andic, Cumulic, Pachic, or Vitrandic subgroups that:

   a. Based on the range of characteristics for the soil series, will at least in part meet one or more Field Indicators of Hydric Soils in the United States, or

   b. Show evidence that the soil meets the definition of a hydric soil;

3. Map unit components that are frequently ponded for long duration or very long duration during the growing season that:

   a. Based on the range of characteristics for the soil series, will at least in part meet one or more Field Indicators of Hydric Soils in the United States, or

   b. Show evidence that the soil meets the definition of a hydric soil; or

4. Map unit components that are frequently flooded for long duration or very long duration during the growing season that:

   a. Based on the range of characteristics for the soil series, will at least in part meet one or more Field Indicators of Hydric Soils in the United States, or

   b. Show evidence that the soils meet the definition of a hydric soil.

4.2.3 Topography and Hydrology

Except for the levees, small berms, and ditches, the Bank is plane, with elevations between 4 and 5 above mean sea level (Figure 2). The Bank slopes slightly to the southeast toward the Sacramento River and Cache Slough.

The Bank is located mostly within the Threemile Slough-Sacramento River (HUC-12: 180201630703) watershed; the extreme north and east portions are within the Watson Hollow (HUC-12: 18020163605) watershed and the Toe Drain-Cache Slough (HUC-12: 180201630606) watershed, respectively (Figure 6).

The livestock operator purposely floods the low areas of the Bank, through manual operation of water control structures on Watson Hollow Slough, to provide a water source for livestock and forage plants throughout summer and fall and during waterfowl hunting in winter.

Cache Slough and the Sacramento River are tidally influenced and have been deepened to allow large ships to move up and down the Sacramento Deep Water Ship Channel (located between Liberty Island and Prospect Island) that is marked by elevated lights.

Watson Hollow Slough along the northern portion of the Bank consists of a wide (100–200 feet) and deep (>3.5 feet) human-excavated canal that receives offsite water from storm runoff and agricultural irrigation via numerous small tributaries, most of which have been channelized. However, the main hydrologic source of Watson Hollow Slough is from the adjacent Cache Slough via large culverts fitted with screw gates. According to Mr. Gause (pers. comm.) of WES, these gates are ajar and inoperable. Therefore, the water level fluctuations within Watson Hollow Slough generally mimic those of Cache Slough and are tidally influenced. The open water portion of Watson Hollow Slough supports a thick mat of common water hyacinth (*Eichhornia crassipes*) (OBL) with a few clumps of tules (*Schoenoplectus acutus* var. *occidentalis*) (OBL) along the edges where the water is less than 3.5 feet in depth (Photograph 10 in Appendix B). The banks of the slough support a scrubby riparian habitat dominated by Himalayan berry (*Rubus armeniacus*) (FAC) with scattered patches of sandbar willow (*Salix exigua*) (FACW). A few large Fremont cottonwoods (*Populus fremontii*) (FAC) and willow (*Salix* ssp.) (FACW) trees occur sporadically. Because the Watson Hollow Slough levees are only 1.5 to 3 feet higher than the mean high water (MHW) elevation, during above-average rainfall years (e.g., 2016/2017) most of the Bank can become inundated.

According to the *National Wetlands Inventory* (USFWS 2022b), the majority of the Bank is mapped as Other (Figure 7). Watson Hollow Slough, the Sacramento River, Cache Slough, and the ditches onsite are mapped as Riverine. The riparian vegetated edges of Watson Hollow Slough, the Sacramento River, and Cache Slough are mapped as Freshwater Forested/Shrub Wetland.

Figure 5. Soils

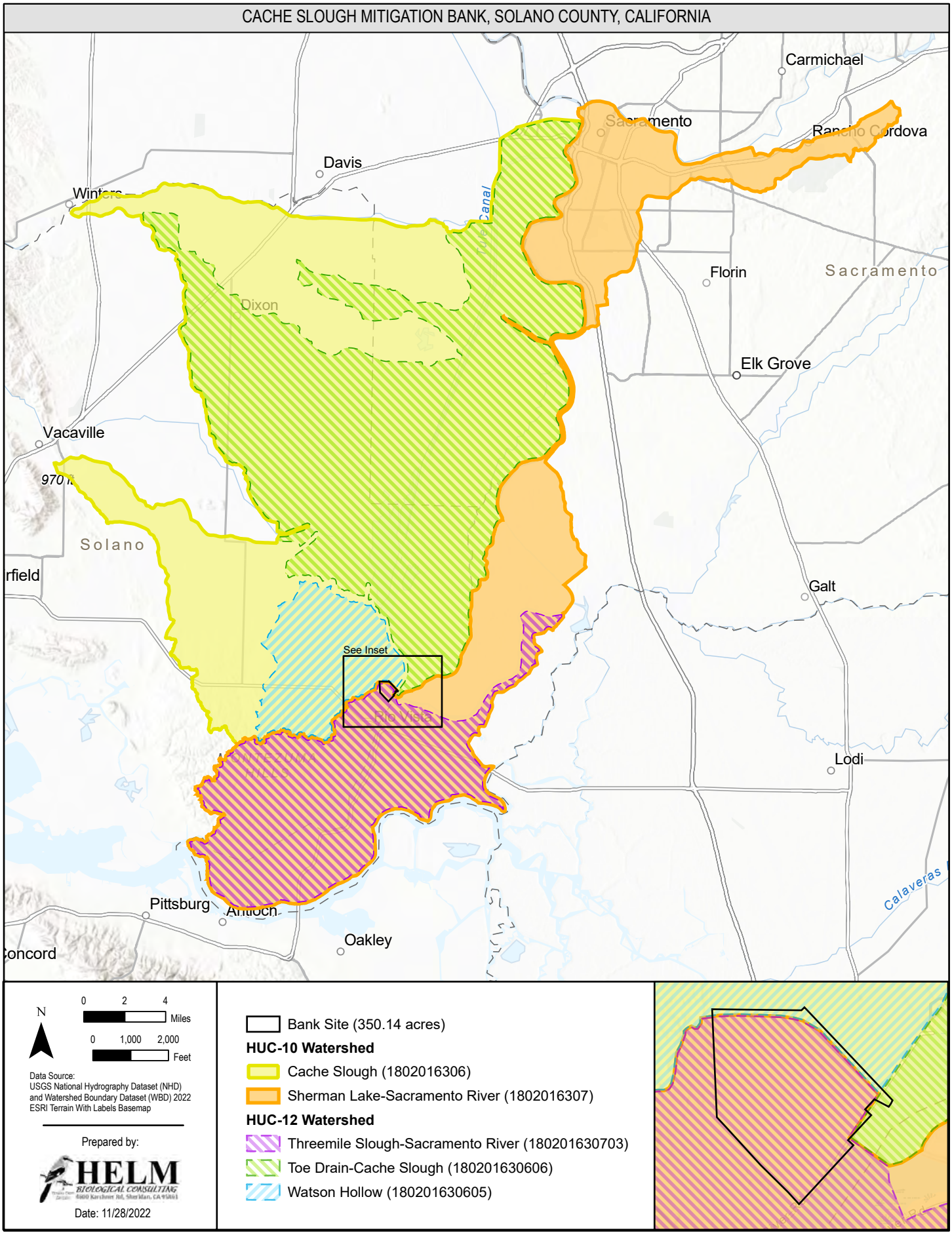


Figure 6. Watershed

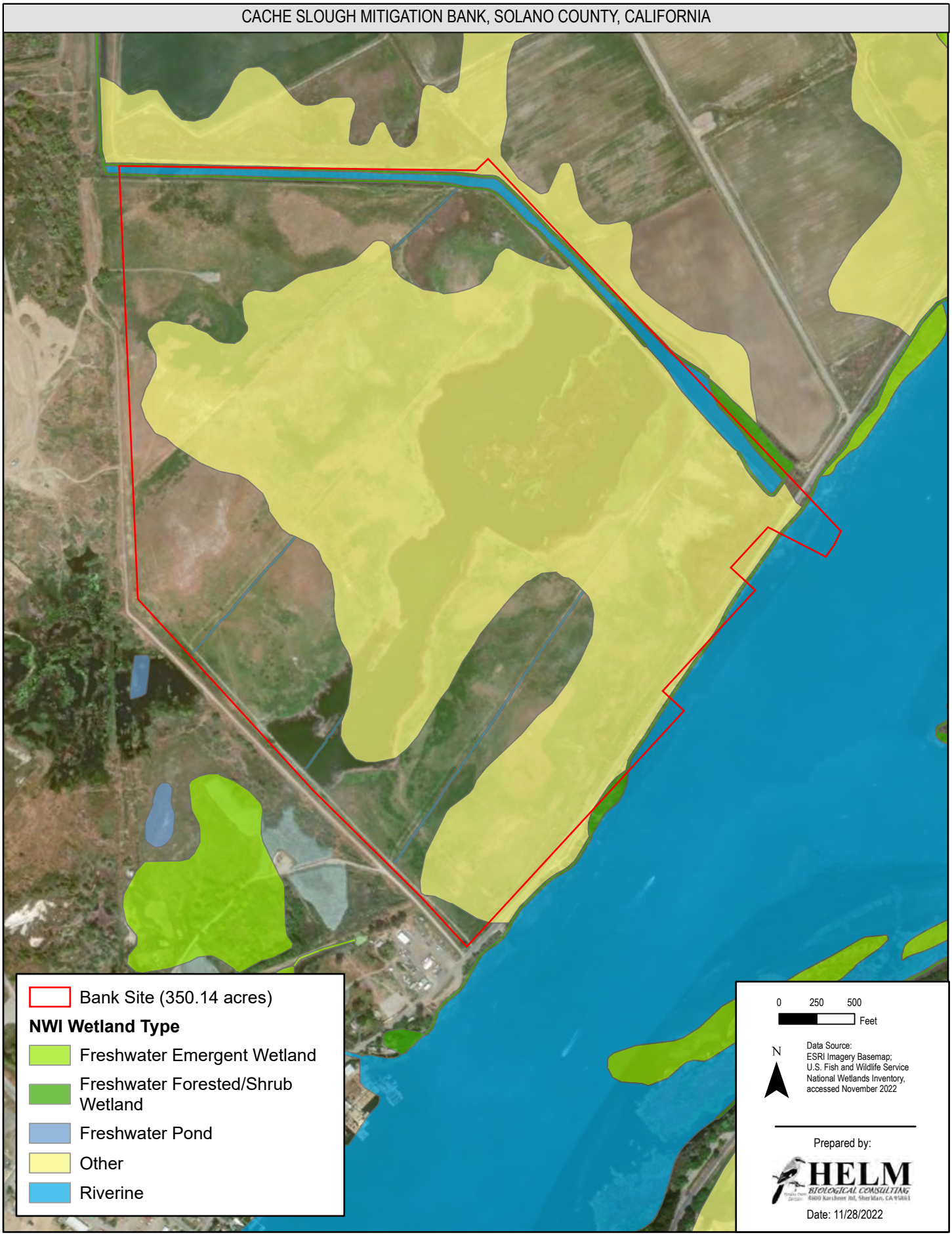


Figure 7. NWI Wetlands

4.2.4 VEGETATION COMMUNITIES

The combination of the Bank's climate, hydrology, soils, and disturbance regime supports 10 community/habitat types typical of this area within the Central Valley Delta Ecoregion (see Appendices C and D).

1. Developed
2. Ruderal
3. Grassland
4. Open water
5. Emergent marsh
6. Ditch
7. Seasonal wetland
8. Clay flat
9. Seep
10. Riparian

All of the habitat types are described below, including their composition of plants and wildlife.

Developed

Developed habitats at the Bank consisted mainly of anthropogenic structures, including roads (dirt, gravel, or paved [e.g., SR 84, aka River Road]), electrical power and telephone poles and lines, culverts and canal gates, and an inactive natural gas well (part of the Cache Slough Gas Field) (Sheet A1 in Appendix C).

Vegetation. Vegetation was largely absent from the developed areas. When present, vegetation generally occurred along the edges of roads and consisted of a prevalence of non-hydrophytes including weedy grasses and forbs that are capable of surviving herbicides and human and vehicle traffic. This vegetation was mapped and classified as ruderal habitat (see below).

Wildlife. Wildlife utilizing the developed habitat is the same as that described below for the ruderal habitat.

Ruderal

Ruderal habitats are characterized by areas that are sparsely vegetated with weedy plant species adapted to routine human disturbances (e.g., herbicide spraying, disking, mowing, and vehicular traffic). Ruderal habitat within the Bank generally occurs along levees or the edges of elevated berms of irrigation ditches and edges of roads (Appendix C). This habitat is routinely cleared of vegetation by herbicides and used by the Reclamation District and agricultural vehicles, mostly

during the dry season. Many of the dirt roads, which were less traveled, were classified and mapped as ruderal habitat since they supported weedy vegetation.

Vegetation. Species composition within ruderal habitat was dependent on the frequency and type of disturbance and adjacent habitat types. The vegetation in the ruderal habitat was characterized by a sparse assemblage of agricultural weeds and a few weedy natives dominated by non-hydrophytes, including yellow star-thistle (*Centaurea solstitialis*) (not listed [NL]), bull thistle (*Cirsium vulgare*) (FACU), short podded mustard (*Hirschfeldia incana*) (NL), pigweed amaranth (*Amaranthus albus*) (FACU), wild radish (*Raphanus sativus*) (UPL), prickly wild lettuce (*Lactuca serriola*) (FACU), dove weed (*Croton setiger*) (NL), Bermuda grass (*Cynodon dactylon*) (FACU), and Johnsongrass (*Sorghum halepense*) (FACU). Other less dominant species included stinkwort (*Dittrichia graveolens*) (NL) and milk thistle (*Silybum marianum*) (NL).

Wildlife. Wildlife associated with ruderal habitat are generally those that have accepted nonnative and highly manipulated vegetation. These species are usually generalists that are tolerant of constant human disturbances, including mowing, herbicide spraying, and foot and vehicle traffic. Power poles and lines are often perched upon by various bird species. Wildlife species observed in this habitat include American crow (*Corvus brachyrhynchos*), black phoebe (*Sayornis nigricans*), Brewer's blackbird (*Euphagus cyanocephalus*), European starling (*Sturnus vulgaris*), house finch (*Carpodacus mexicanus*), house sparrow (*Passer domesticus*), mourning dove (*Zenaida macroura*), Eurasian collared-dove (*Streptopelia decaocto*), European starling (*Sturnus vulgaris*), California scrub-jay (*Aphelocoma californica*), and wild turkey (*Meleagris gallopavo*).

The black-tailed jackrabbit (*Lepus californicus)* and desert cottontail (*Sylvilagus audubonii*) are abundant in this habitat, with the hares generally foraging during the day and the rabbits foraging mostly at night. The house mouse (*Mus musculus*) and black rat (*Rattus rattus*) also probably forage in this habitat.

Grassland

Grassland habitats are characterized by a relatively tree-less or shrubless terrain, dominated by grass species. Grasslands within the Bank consisted of a Bermuda grass grassland (Appendix C).

Vegetation. Bermuda grass grasslands were dominated by Bermuda grass (*Cynodon dactylon*) (FACU), with birds' foot trefoil (*Lotus corniculatus*) (FAC), bur clover (*Medicago polymorpha*) (FACU), sand spikerush (*Eleocharis montevidensi*) (FACW), and annual sunflower (*Helianthus annuus*) (FACU) as subdominants.

Wildlife. Although grasslands generally provide breeding habitat for a variety of wildlife, due to the thick mat of Bermuda grass that dominates the grasslands at the Bank, the number of wildlife utilizing this habitat is much reduced. The perennial nature of this grass does not allow much foraging access for typical grassland birds that feed on seeds or invertebrates (e.g., insects,

worms, and spiders) on or in the soil. Birds observed during field surveys included western meadowlark (*Sturnella neglecta*) and lark sparrow (*Chondestes grammacus*). The areas with heavy Bermuda grass were generally avoided by most of the wildlife onsite, except for a few trails used to traverse the habitat.

Raptors, including red-tailed hawk (*Buteo jamaicensis*), Swainson's hawk (*Buteo swainsoni*), white-tailed kite (*Elanus leucurus*), and Cooper's hawk (*Accipiter cooperii*), forage over the Bermuda grass fields for prey (e.g., rodents and small birds).

Open Water

Open water habitat is characterized by areas of open water that are generally void or sparsely vegetated due to consistent deep-water depth (> 3.5 feet). The largest areas of open water habitat at the Bank consist of Watson Hollow Slough, Cache Slough, and the Sacramento River (Appendices C and D).

Although open water habitat occurs within numerous ditches within the Bank, it is mapped and classified separately under *Ditch* habitat described below.

Vegetation. The open water habitat of Cache Slough and the Sacramento River were general devoid of vegetation. During low tides, large areas near the shoreline of Solano County Levee 28 were dominated by Brazilian water weed (*Egeria densa*) (OBL). Although patches of tules (*Schoenoplectus acutus* var. *occidentalis)* (OBL) and California bull rush (*Schoenoplectus californicus*) (OBL) were present along the shores, these clumps were classified and mapped as emergent marsh habitat. discussed below under *Emergent Marsh* habitat. Although large portions of Watson Hollow Slough supported dense mats of common water hyacinth (*Eichornia crassipes*) (OBL), the slough was mapped as open water habitat since water hyacinth is not rooted in the soil and floats on the surface similar to smaller duckweed (*Lemna minor*) (OBL) or mosquito fern (*Azolla filiculoides*) (OBL), and the hyacinth is occasionally removed.

Wildlife. Open water portions of Cache Slough, the Sacramento River, and Watson Hollow Slough were utilized by a wide variety of wildlife and provide excellent habitat for insects, fish, birds, reptiles, and several mammals. Aquatic invertebrates (e.g., water fleas [Cladocera]; copepods [Copepoda]; and larvae of mayflies [Ephemeroptera], dragonflies [Anisoptera] and damselflies [Zygoptera]) provide excellent forage for a variety of fish species. The emerging insects provide forage for swallows (i.e., tree swallow [*Tachycineta bicolor*], violet-green swallow [*Tachycineta thalassina*], northern rough-winged swallow [*Stelgidopteryx serripennis*], barn swallow [*Hirundo rustica*], and cliff swallow [*Petrochelidon pyrrhonota*]), flycatchers (e.g., western kingbird [*Tyrannus verticalis*], and black phoebe [*Sayornis nigricans*]), as well as bats.

The numerous partially submerged logs and other woody debris provide excellent escape and ambush cover for smallmouth bass (*Micropterus dolomieu*) and other Centrarchid fish. Northwestern pond

turtles (*Actinemys marmorata*) and various wading birds (e.g., great blue heron [*Ardea herodias*], great egret [*Ardea alba*], snowy egret [*Egretta thula*], and green heron [*Butorides virescens*]) utilize these emergent logs for basking and foraging, respectively. Pied-billed grebe (*Podilymbus podiceps*), double-crested cormorant (*Phalacrocorax auritus*), and belted kingfisher (*Megaceryle alcyon*) forage on small fish; and American coot (*Fulica americana*), wood duck (*Aix sponsa*), and mallard (*Anas platyrhynchos)* forage through the smaller duckweed (*Lemna minor*), mosquito fern (*Azolla filiculoides*), and algae for food items. American mink (*Neovison vison*) and North American river otter (*Lontra canadensis*) forage on fish and crayfish within the waters. Even the occasional California sea lion (*Eumetopias jubatus*) travels up the Sacramento River and Cache Slough, foraging on fish.

Emergent Marsh

Emergent marsh habitats in the Bank are considered wetlands and are characterized by a prevalence of perennial monocots that are rooted in soil and emerge from semi-permanent to permanent flooded or ponded water. Emergent marsh habitat is scattered throughout the Bank (Appendices C and D).

Vegetation. Emergent marsh within the deeper (2.0 – 3.5 feet) water generally supported pure stands of tules (*Schoenoplectus acutus* var. *occidentalis*) (OBL), California bull rush (*Schoenoplectus californicus*) (OBL), or cattails (*Typha* spp.) (OBL), or a mixture of tules and cattails. In the areas that are managed for waterfowl or are less than two feet in depth, emergent marsh habitat comprised a mosaic of patches of tules and cattails. Shallower areas were dominated by herbaceous hydrophytes, including Pacific rush (*Juncus effusus* var. *pacificus*) (FACW), tapertip flatsedge (*Cyperus acuminatus*) (OBL), Baltic rush (*Juncus balticus*) (FACW), common spikerush (*Eleocharis macrostachya*) (OBL), marsh purslane (*Ludwigia palustris*) (OBL), and common smartweed (*Persicaria hydropiper*) (OBL). Other species present included Bermuda grass (*Cynodon dactylon*) (FACU), curly dock (*Rumex crispus*) (FACW), smaller duckweed (*Lemna minor*) (OBL), hyssop loosestrife (*Lythrum hyssopifolia*) (OBL), mosquito fern (*Azolla filiculoides*) (OBL), water starwort (*Callitriche* sp.) (OBL), and cursed buttercup (*Ranunculus sceleratus*) (OBL). Often cocklebur (*Xanthium strumarium*) (FAC), Dallis grass (*Paspalum dilatatum*) (FAC), and perennial pepperweed (*Lepidium latifolium*) (FAC) occurred at the fringes of emergent marsh habitat. Although Bermuda grass is considered a facultative upland plant (FACU), it often occurred as a subdominant of plants within the emergent marsh habitat at the Bank.

Wildlife. The emergent marsh habitat supports the largest biomass of wildlife compared to other habitats at the Bank. Thousands of waterfowl, including greater white-fronted geese (*Anser albifrons*), Canada geese (*Branta canadensis*), mallards (*Anas platyrhynchos*), gadwall (*Marceca strepera*), American widgeon (*Marceca americana*), northern shovelers (*Spatula clypeata*), green-winged teal (*Anas crecca*), cinnamon teal (*Spatula cyanoptera*), and the occasional blue-winged teal (*Spatula discors*), forage on aquatic invertebrates and seeds during winter months.

A variety of wading birds (e.g., great blue heron [*Ardea herodias*], great egret [*Ardea alba*], snowy egret [*Egretta thula*], cattle egret [*Bubulcus ibis*], and green heron [*Butorides virescens*]) and shorebirds (e.g., dunlin [*Calidris alpina*], greater yellow legs [*Tringa melanoleuca*]) are some of the bird species that were observed onsite or are known to forage locally in this habitat type. A variety of other bird species forage at the edge of this habitat, including various blackbirds (i.e., Brewer's blackbird [*Euphagus cyanocephalus*], red-winged blackbird [*Agelaius phoeniceus*], and tricolored blackbird [*Agelaius tricolor*]).

The small patches of freshwater marsh could support song sparrows (*Melospiza melodia*). Muskrat (*Ondatra zibethicus*) could forage on the abundant broadleaf cattails (*Typha latifolia*) that are present. The thick emergent tule (*Schoenoplectus acutus* var. *occidentalis*) patches support nesting marsh wren (*Cistothorus palustris*) and red-winged blackbirds (*Agelaius phoeniceus*).

The wildlife value of the emergent marsh habitat is enhanced by the interspersion of different habitat types (riparian and open water) in a mosaic with these wetlands.

Ditch

Agricultural ditch habitat in the Bank was characterized by a u-shaped (in cross-section) human-excavated ditch for conveyance of irrigation water or collection of tail water for agricultural purposes. Most of this habitat was uniform in dimensions (2.5 feet in width and from 1 to 2 feet in depth) (Appendix C).

Vegetation. Vegetation within the agricultural ditches was dependent on the hydrologic regime and maintenance routine and varied from hydrophyte-lacking ruderal vegetation to dense clumps of tules (*Schoenoplectus acutus* var. *occidentatlis*) (OBL) and cattails (*Typha* spp.) (OBL) that were mapped as emergent marsh. However, most of the ditches that were abandoned (not currently used for irrigation) were dominated by non-hydrophytes.

The largest ditch onsite – Watson Hollow Slough – is occasionally cleared of vegetation and generally supports large expanses of open water that is deeper than 3.5 feet.

Ditches dominated by hydrophytes supported an assemblage of the following species: watergrass (*Echinochloa crusgalli*) (FACW), rabbitsfoot grass (*Polypogon monspeliensis*) (FACW), yellow bristlegrass (*Setaria pumila*) (FAC), perennial pepperweed (*Lepidium latifolium*) (FAC), Dallis grass (*Paspalum dilatatum*) (FAC), tall annual willow herb (*Epilobium brachycarpum*) (FAC), Italian ryegrass (*Festuca perennis*) (FAC), curly dock (*Rumex crispus*) (FAC), and fiddle dock (*Rumex pulcher*) (FAC).

Ditches with a semi-perennial to perennial hydrologic regime supported tapertip flatsedge (*Cyperus acuminatus*) (OBL), sprangletop (*Leptochloa* sp.) (FACW), watergrass (*Echinochloa*

crus-galli) (FACW), water speedwell (*Veronica anagallis-aquatica*) (OBL), hyssop loosestrife (*Lythrum hyssopifolia*) (FACW), and neckweed (*Veronica peregrina*) (FAC).

In the open water portions, with minimum flows and wind, these ditches supported smaller duckweed (*Lemna minor*) (OBL) and mosquito fern (*Azolla filiculoides*) (OBL), with common water hyacinth (*Eichornia crassipes*) (OBL) occasionally dominating.

Except for the moderately large ditch along the southern edge, the abandoned ditches at the Bank supported the same vegetation as that growing in the adjacent habitat (e.g., Bermuda grass grassland habitat) such as Bermuda grass (*Cynodon dactylon*) (FACU). The edges and banks of some of the larger and/or more perennially inundated ditches supported riparian vegetation consisting mostly of Himalayan berry (*Rubus armeniacus*) (FAC) and willows (*Salix* spp.) (FACW). (See *Riparian* habitat below for more details on the vegetation.)

Wildlife. When inundated, agricultural ditch habitat is utilized by many of the same wildlife as those described for open water and emergent marsh habitats. Similarly, when dry, they are utilized by many of the same wildlife that use the Bermuda grass grasslands and ruderal habitats. However, due to the linear nature of this habitat, the species richness and numbers of individuals are much less than those using the emergent marsh/open water and ruderal/Bermuda grass grassland habitats.

Seasonal Wetland

Seasonal wetland habitats support hydrophytes that are adapted to a seasonally inundated hydrologic regime and are characterized by shallow (< 4 inches in depth) to deep (< 3.5 feet in depth) topographic depressions that are underlain by soils with slow water permeability which promote ponding or soil saturation during the wet season. Although seasonal wetlands can have inundation and saturated soil durations similar to emergent marsh, they are not dominated by "grass-like" plants such as rushes (*Juncus* spp., *Eleocharis* spp., *Schoenoplectus* ssp., and *Bolboschoenus* spp.) and cattails (*Typha* spp.). Seasonal wetlands at the Bank consist of two types: wetlands created by cattle and alkaline wetlands (Appendix C).

Vegetation. Seasonal wetlands support a number of plant species adapted to periodic inundation during the growing season. Although Bermuda grass is considered a facultative upland plant (FACU), it often occurred as a subdominant in seasonal wetlands. Other facultative upland plants generally occurred only at the edges and consisted of prickly wild lettuce (*Lactuca serriola*) (FACU) and Canadian horseweed (*Erigeron canadensis*) (FACU). Specific plant species composition within each seasonal wetland habitat type are discussed below.

Depending on the amount of cattle trampling, the seasonal wetlands created by cattle supported a sparse assemblage of hydrophytic grasses, including Mediterranean barley (*Hordeum marinum* subsp. *gussoneanum*) (FAC), rabbitsfoot grass (*Polypogon monspeliensis*) (FACW), Italian

ryegrass (*Festuca perennis*) (FAC), waxy mannagrass (*Glyceria declinata*) (FACW), and a few forbs such as common cocklebur (*Xanthium strumarium*) (FAC), curly dock (*Rumex crispus*) (FAC), and brass buttons (*Cotula coronopifolia*) (OBL).

Alkali seasonal wetlands differ from other seasonal wetlands in their vegetative composition and support wetland plant species that are tolerant of high salt concentrations (halophytes) in the soil. Typical alkali seasonal wetland plants include alkali heath (*Frankenia salina*) (FACW), net pepper grass (*Lepidium acutidens*) (FAC), brass buttons (*Cotula coronopifolia*) (OBL), and spike weed (*Centromadia pungens*) (FAC), in addition to swamp timothy (*Crypsis schoenoides*) (FACW), Oregon wooly marbles (*Psilocarphus oregonus*) (OBL), purple sandspurry (*Spergularia rubra*) (FAC), and Fremont's goldfields (*Lasthenia fremontii*) (OBL). Many of the alkaline seasonal wetlands supported almost pure stands of alkali heath (*Frankenia salina*) (FACW), with some Mediterranean barley (*Hordeum marinum* subsp. *gussoneanum*) (FAC).

Wildlife. Due to the extreme ephemeral nature of the seasonal wetland habitat onsite, these habitats were utilized the least by wildlife. When these habitats are inundated by adjacent ditch habitat, they are utilized by many of the same species. When inundated by direct inception of rainfall, however, they are utilized by killdeer (*Charadrius vociferus*) and greater yellow legs (*Tringa melanoleuca*) for aquatic invertebrates, especially the versatile fairy shrimp (*Branchinecta lindahli*). Similarly, during their dry season, they are used as foraging grounds by wildlife much like those associated with the ruderal or Bermuda grass grassland habitats.

Clay Flat

Clay flat habitats are relatively flat, with heavy clays that support a dominant or prevalence of hydrophytes. Four clay flat habitats are onsite (Sheets A1 and B1 in Appendix C). Three of the clay flats were created by historical land leveling for agricultural purposes. The fourth clay flat has more alkaline soils and is roughly 1–2 feet higher in elevation than the others. Except for some vehicular ruts and evidence of disking on historical aerial photographs, this alkaline clay flat seems to be a relict natural feature.

Vegetation. The alkali clay flat habitat supported stalked popcornflower (*Plagiobothrys stipitatus* var. *micranthus*) (FACW), Fremont's goldfields (*Lasthenia fremontii*) (OBL), Oregon wooly marbles (*Psilocarphus oregonus*) (OBL), common spikeweed (*Centramadia pungens*) (FAC), bur clover (*Medicago polymorpha*) (FACU), long leaf plantain (*Plantago elongata*) (FACW), and net peppergrass (*Lepidium acutidens*) (FAC).

The other clay flat habitats supported a dominance of hydrophytes, including stalked popcornflower (*Plagiobothrys stipitatus* var. *micranthus*) (FACW) and common spikeweed (*Centramadia pungens*) (FAC), with some coyote thistle (*Eryngium vaseyi*) (OBL) and bur clover (*Medicago polymorpha*) (FACU) as subdominants.

Wildlife. Clay flat habitats do not have any specialized wildlife that utilize them exclusively. Many of the same species using the ruderal and Bermuda grass grassland habitats also forage in the clay flat habitats. The sparse and low cover of vegetation would prohibit most birds from nesting; however, the killdeer (*Chanadrius vociferus*) has been known to nest in clay flat habitats.

Seep

Seeps occur in areas where groundwater is exposed at or near the soil surface. In these areas, groundwater issues from the soil surface, wetting the adjacent ground. Seep habitat at the Bank was characterized by areas supporting hydrophytes from water leaking through the levees. A single seep habitat onsite occurs along Mellin Levee (Sheet B1 in Appendix C).

Vegetation. The seep habitat at the Bank was dominated by common spike rush (*Eleocharis macrostachya*) (FACW), Baltic rush (*Juncus balticus*) (FACW), and Santa Barbara sedge (*Carex barbarae*) (FAC). Cocklebur *(Xanthium strumarium*) (FAC) occurred sporadically, and various grasses such as Bermuda grass (*Cynodon dactylon*) (FACU), Dallis grass (*Paspalum dilatatum*) (FAC), and Italian ryegrass (*Festuca perennis*) (FAC) grew at the margins.

Wildlife. Due to the small size of this habitat, it would be utilized by similar species as those using the ruderal and Bermuda grass grassland habitats onsite. However, because of the nearly semi-permanent nature of the adjacent wetland hydrologic regime that supports this habitat, the seep vegetation may grow later into the season, allowing some fresh forage for grazing wildlife.

Riparian

Riparian habitats are those floodplain, bottomland, and streambank communities that occur along inland waterways. Riparian communities occur in transition zones between aquatic and upland communities. In their undisturbed condition, they are characterized by dominant vegetation types that are tolerant of, and adapted to, relatively high soil moisture content. Riparian communities occur entirely within the 100-year floodplain of streams and rivers. However, most riparian plant species require flooding more frequently than once every 100 years. Undisturbed riparian woodlands can be thought of as having three somewhat distinct layers: overstory, midstory, and understory.

Riparian habitats within the Bank are routinely disturbed by herbicide application, levee stabilization (riprap), mechanical vegetation removal, cattle grazing, and human disturbances (e.g., vehicular traffic, firewood harvesting, fire pits, trash, and fishing trails). As such, most of the riparian habitat is missing one or more of the distinct vegetative layers listed above. The majority of riparian habitat onsite occurs along the waterside of Solano County Levee 28 and along Watson Hollow Slough (Appendices C and D).

Vegetation. The riparian habitats within the Bank are characterized by a dominance of woody arborescent (tree-like) vegetation growing within or adjacent to seasonal to perennial waterbodies (sloughs, rivers, and some ditches). Most of this habitat was dominated by a midstory of sandbar willow (*Salix exigua*) (FACW), with a sparse overstory of arroyo willow (*Salix lasiolepis*) (FACW) and the occasional Fremont's cottonwood (*Populus fremontii*) (FAC), and Himalayan berry (*Rubus armeniacus*) (FAC) as a vine layer and ruderal herbaceous layer. Other willows occasionally occurring included Goodding's black willow (*Salix gooddingii*) (FACW) and Pacific willow (*Salix lasiandra*) (FACW).

The riparian habitat along Solano County Levee 28 supported a diverse assemblage of woody species, including box elder (*Acer negundo*) (FACW), Oregon ash (*Fraxinus latifolia*) (FACW), western sycamore (*Platanus racemosa*) (FACW), white alder (*Alnus rhombifolia*) (FACW), valley oak (*Quercus lobata*) (FACU), black and English walnut (*Juglans hindsii* [FAC] and *J. regia* [NL]), black locust (*Robinia pseudoacacia*) (FACU), interior live oak (*Quercus wislizenii* var. *wislizenii*) (UPL), California rose (*Rosa californica*) (FAC), California blackberry (*Rubus ursinus*) (FAC), and rattlebox (*Sesbania punicea*) (FACW).

The herbaceous understory composition is dependent on elevation and ranges from species described in the emergent marsh habitats at low elevations and species associated with ruderal habitat at higher elevations. The elevations in between were dominated by a mix of hydrophytes and non-hydrophytes, including California mugwort (*Artemisia douglasiana*) (FAC), knot grass (*Paspalum distichum*) (FACW), Santa Barbara sedge (*Carex barbarae*) (FAC), creeping wild rye (*Elymus triticoides*) (FAC), Italian rye grass (*Festuca perennis*) (FAC), poison hemlock (*Conium maculatum*) (FACW), Baltic rush (*Juncus balticus*) (FACW), common horsetail (*Equisetum arvense*) (FAC), Bermuda grass (*Cynodon dactylon*) (FACU), ripgut brome (*Bromus diandrus*) (NL), Uruguayan pampas grass (*Cortaderia selloana*) (FACU), California brome (*Bromus carinatus* var. *carinatus*) (NL), Dallis grass (*Paspalum dilatatum*) (FAC), slender oats (*Avena barbata*) (NL), and bull thistle (*Cirsium vulgare*) (FACU).

Wildlife. Riparian habitats in general are valuable resources for wildlife, providing foraging, nesting, and roosting habitat and migration corridors for a variety of species. However, the riparian habitat at the Bank is narrow, generally sparsely vegetated, and lacks the overstory of mature trees and California grape vines (*Vitis californicus*) that are typical of this habitat in less disturbed conditions throughout the Central Valley. Nonetheless, this habitat supports a diverse assemblage of wildlife species. For some species, all their life requirements are met in this habitat. Many bird species nest in the woody vegetation within the riparian habitat and forage in the open grasslands and ruderal habitats. The acorn crops from valley oak trees (*Quercus lobata*) (FACU) are important food sources for a variety of birds and mammals, including Columbian black-tail deer (*Odocoileus hemionus columbianus*), western gray squirrel (*Sciurus griseus*), California quail (*Callipepla californica*), acorn woodpecker (*Melamnerpes formicivorus*), wild turkey (*Meleagris gallopavo*), American crow (*Corvus brachyrhynchos*), desert cottontail (*Sylvilagus audubonii*),

wood duck (*Aix sponsa*), racoon (*Procyon lotor*), Virginia opossum (*Didelphis virginiana*), and deer mouse (*Peromyscus maniculatus*).

The Fremont's cottonwood (*Populus fremonti*), oaks (*Quercus lobata* and *Q. wizlizenii*), willows (*Salix* spp.), and white alder (*Alnus rhombifolia*) of the riparian corridor are known to support nesting Swainson's hawk (*Buteo swainsoni*) (a state-listed as threatened species) and red-shouldered hawk (*Buteo lineatus*) and could support nesting Cooper's hawk (*Accipiter cooperi*), barn owl (*Tyto alba*), great horned owl (*Bubo virginianus*), violet-green swallow (*Tachycineta thalassina*), Nuttall's woodpecker (*Picoides nuttallii*), California scrub-jay (*Aphelocoma californica*), Bullock's oriole (*Icterus bullockii*), and many other birds. The numerous snags (dead and standing trees) provide foraging opportunities for woodpeckers and their kin (downy woodpecker [*Dryobates pubescens*], Nuttall's woodpecker [*Dryobates nuttallii*], northern flicker [*Colaptes auratus*]), as well as cavity nests for western bluebird (*Sialia mexicana*), European starling (*Sturnus vulgaris*), and American kestrel (*Falco sparverius*). Turkey vulture (*Cathartes aura*) and other raptors (birds-of-prey) and a variety of other birds utilize these snags for perches.

Many wildlife species take cover under the riparian canopy for shade, cool temperatures, and water. The impenetrable thickets of Himalayan berry (*Rubus armeniacus*) (FAC) and California rose (*Rosa californica*) (FAC) provide cover, forage, and nesting habitat for a variety of wildlife species. The berry and rose provide excellent escape cover for species such as black-tailed jackrabbit (*Lepus californicus*), California quail (*Callipepla californica*), white-crowned and golden-crowned sparrow (*Zonotrichia leucophrys* and *Z. atricapilla*), and hermit thrush (*Catharus guttatus*). California scrub jay (*Aphelocoma coerulescens*), California quail (*Callipepla californica*), wrentit (*Chamaea fasciata*), and spotted towhee (*Pipilo maculatus*) typically nest in these thickets. Dusky-footed woodrat (*Neotoma fuscipes*), deer mouse (*Peromyscus maniculatus*), and gray fox (*Urocyon cinereoargenteus*) may also reside here. In addition, the berries and rose hips are important wildlife food sources.

As previously mentioned, riparian habitats provide an important movement corridor and connections with other waterways for Columbian black-tail deer (*Odocoileus hemionus columbianus*), coyote (*Canis latrans*), gray fox (*Urocyon cinereoargenteus*), and other wide-ranging animals.

The wildlife value of the riparian habitat is enhanced by its proximity to the open water of the Sacramento River, Cache Slough, and Watson Hollow Slough.

Representative photographs of the habitats occurring at the Bank are provided in Appendix B.

4.3 SENSITIVE COMMUNITIES/HABITATS

4.3.1 POTENTIAL WATERS OF THE U.S. AND STATE, INCLUDING WETLANDS

According to the Aquatic Resources Delineation performed at the Bank (HBC 2023), none of the habitats within the landside of the levees would be considered under the jurisdiction of the USACE and RWQCB (Appendix C). However, the habitats occurring below the annual high tide on the waterside of the levees would be under the jurisdiction of USACE and possibly RWQCB. Additionally, the habitat occurring below the top-of-bank or edge of riparian canopy would be under the jurisdiction of CDFW.

Riparian habitat, Open Water habitat, and Emergent Marsh habitat was identified at the Bank as potential waters of the U.S. and State based on the presence of an annual high tide and MHW line and could be under USACE and RWQCB jurisdiction. Additionally, riparian habitat that extends beyond the annual high tide and MHW line is potentially under CDFW jurisdiction based on top-of-bank and canopy of riparian vegetation (Appendix C).

Riparian, open water, and emergent marsh habitats occurring along the waterside of the Sacramento River below the annual high tide line would be subject to regulation under Section 404 of the CWA and Section 10 of the Rivers and Harbors Act (Appendix C). No attempt was made to separate wetlands from other waters below the annual high tide. Riparian habitats above the annual high tide would not likely be subject to Section 404 jurisdiction since they lacked hydrophytes—one of the three indicators (hydrophytes, wetland hydrology, and hydric soils) qualifying as "wetland."

Development of wetlands, including restoration activities requiring the discharge of dredge or fill into jurisdictional waters of the U.S. or state, is subject to CWA permit provisions. Similarly, activities within the riparian habitat above the annual high tide line, including restoration, may require an SAA from CDFW.

The habitats within the landside of the levees are human-made (developed) or influenced from artificial hydrology (open water, ditch, emergent marsh, riparian, Bermuda grass grassland) or maintenance regimes (ruderal) (Appendix C). Therefore, only the habitats on the waterside of the levees at the Bank are considered natural; these include riparian, emergent marsh, and open water as described below.

In general, riparian habitats occurring on the waterside levees at the Bank are considered sensitive habitats. The equivalent to riparian habitat onsite would be Sawyer et al. (2009) *Quercus lobata* Tree Alliance (Valley oak woodland), which has a global and state rarity ranking of 3 (G3 and S3) and therefore is considered a sensitive natural community. Some associates of this alliance would be ranked G1 and S1 or G2 and S2, depending on the extent of viable occurrences. Furthermore, several other alliances (Sawyer et al. 2009) could also be considered equivalent to the riparian

habitat (e.g., *Acer negundo, Fraxinus latifolia, Populus fremontii, Salix goodingii, Alnus rhombifolia, Rosa californa,* and *Salix exigua*) onsite.

In addition, several alliances are equivalent to the open water and emergent marsh habitats. The *Azolla* (*filiculoides, mexicana*) Herbaceous Alliance (mosquito fern mats) with a global and state ranking of 5 and *Lemna* (*minor*) and Relatives Provisional Herbaceous Alliance (duckweed blooms) ranked as G5 and S4? for the open water habitat; and the *Schoenoplectus (acutus, californicus)* Herbaceous Alliance (hardstem bullrush marsh) is ranked as GNR and S3S4 for the emergent marsh habitat. Accordingly, the emergent marsh would also be considered a sensitive natural community.

4.4 SPECIAL-STATUS SPECIES

A CNDDB records search revealed occurrences of 25 special-status species known to occur within a 5-mile radius of the Bank, of which only one, the Suisun Marsh aster (*Symphyotrichum lentum)*, has an occurrence mapped onsite (see Figure 8 and Tables 4 and 5 in Appendix D); the special-status species are described below under appropriate plant and wildlife headers.

4.4.1 SPECIAL-STATUS PLANTS

The search of the CNNDB and CNPS On-Line Inventory of Rare and Endangered Plants revealed a total of nine special-status plants that are known to occur within a five-mile radius of the Bank (Figure 8).

Of these nine special-status plants, two species were observed onsite (Delta tule pea and Suisun Marsh aster), four species have potential to occur onsite and the remaining three species are considered “not probable” to occur on site based negative survey results and/or lack of suitable habitat communities (i.e., inland dunes and vernal pools) (Table 4 in Appendix D). The special-status plants known to occur or with moderate to high potential to occur onsite are:

- Delta tule pea *(Lathyrus jepsonii* var. *jepsonii)*
- Suisun Marsh aster *(Symphyotrichum lentum)*
- Sanford's arrowhead *(Sagittaria sanfordii)*
- Woolly rose-mallow (Hibiscus lasiocarpos var. occidentalis)

These species, their habitat requirements, and potential to occur at the Bank are discussed in greater detail below.

Delta Tule Pea

The Delta tule pea (*Lathyrus jepsonii* var. *jepsonii*) is a CNPS 1B.2 rare plant. The Delta tule pea is a perennial herb in the pea family (*Fabaceae*) with a vine-like habit. It relies on a cycle of flooded and drought periods in freshwater or brackish wetlands. It tends to grow along the edges of riparian wetlands, sloughs, marshes, and swamps. It blooms violet/pink flowers from May through July and, in some years, as late as September. (The Natomas Basin Conservancy 2023a.)

According to the CNDDB, the Delta tule pea occurs at the mouth of Steamboat Slough on the opposite side of the Sacramento River from the Bank (Figure 8). The Delta tule pea was observed onsite in abundance during 2021 and 2022 surveys, along the Sacramento River and Cache Slough from the southeastern corner to the northeastern corner of the Bank (Sheets A2 and B2 in Appendix C). This species generally occurred just above the MHW line.

Suisun Marsh Aster

Suisun Marsh aster (*Symphyotrichum lentum*) is a CNPS 1B.2 rare plant. This perennial plant has one to five erect stems and is endemic to California. It has thin glabrous leaves and violet corollas that bloom from July through August in riparian zones, mainly salt marshes and wet grasslands. (Brouillet et al. 2006.)

According to the CNDDB, the Suisun Marsh aster occurs within the Bank along the Sacramento River and Cache Slough (Figure 8). Similar to the Delta tule pea, the Suisun Marsh aster was observed in abundance along the Sacramento River and Cache Slough during 2021 and 2022 surveys, from the southeastern corner to the northeastern corner of the Bank (Sheets A2 and B2 in Appendix C). Unlike the Delta tule pea, the Suisun Marsh aster occurred just below or at the MHW line.

Sanford's Arrowhead

Sanford's arrowhead (*Sagittaria sanfordii*) is a CNPS 1B.2 rare plant. This aquatic flowering plant in the water plantain family (*Alismataceae*) is endemic to California. This plant has narrow leaves that grow from a submerged stem and white petals with light green centers arranged in whorls that rise above the water's surface. Sanford's arrowhead occurs in freshwater marshes, generally below elevations of 2,100 feet. This species blooms from May through October. (The Natomas Basin Conservancy 2023b.)

The Sanford's arrowhead was observed on adjacent WES-owned property (Little Egbert Tract) during the 2021 surveys, near the northeastern corner of the Bank along the west side of Cache Slough.

Legend

5-mile Buffer

Project Area

Project Area

Topo Map Boundaries

County Boundaries

CNDDB Occurrences

EO Symbology

Specific

Nonspecific

Circular

Sensitive EO's

Taxon Group

Plants

Birds

Fish

Invertebrates

Mammals

Reptiles

Plants

1 - *Extriplex joaquinana* (San Joaquin spearscale)

2 - *Hibiscus lasiocarpos* var. *occidentalis* (Woolly rose-mallow)

3 - *Lathyrus jepsonii* var. *jepsonii* (Delta tule pea)

4 - *Lilaeopsis masonii* (Mason's lilaeopsis)

5 - *Limosella australis* (Delta mudwort)

6 - *Oenothera deltoides* subsp. *howellii* (Antioch Dunes evening-primrose)

7 - *Plagiobothrys hystriculus* (Bearded popcornflower)

8 - *Sagittaria sanfordii* (Sanford's arrowhead)

9 - *Symphyotrichum lentum* (Suisun Marsh aster)

Birds

10 - American peregrine falcon (*Falco peregrinus anatum*)

11 - Bank swallow (*Riparia riparia*)

12 - Burrowing owl (*Athene cunicularia*)

13 - Mountain plover (*Charadrius montanus*)

14 - Song sparrow ("Modesto" population) (*Melospiza melodia* pop. 1)

15 - Swainson's hawk (*Buteo swainsoni*)

Fish

16 - Delta smelt (*Hypomesus transpacificus*)

17 - Green sturgeon - southern Distinct Population Segment (*Acipenser medirostris* pop. 1)

18 - Longfin smelt (*Spirinchus thaleichthys*)

19 - Steelhead - Central Valley Distinct Population Segment (*Oncorhynchus mykiss irideus* pop. 11)

Invertebrates

20 - Antioch Dunes anthicid beetle (*Anthicus antiochensis*)

21 - Sacramento anthicid beetle (*Anthicus sacramento*)

22 - California linderiella (*Linderiella occidentalis*)

Mammals

23 - Hoary bat (*Lasiurus cinereus*)

24 - Western red bat (*Lasiurus blossevillii*)

Reptiles

25 - Western pond turtle (*Emys marmorata*)

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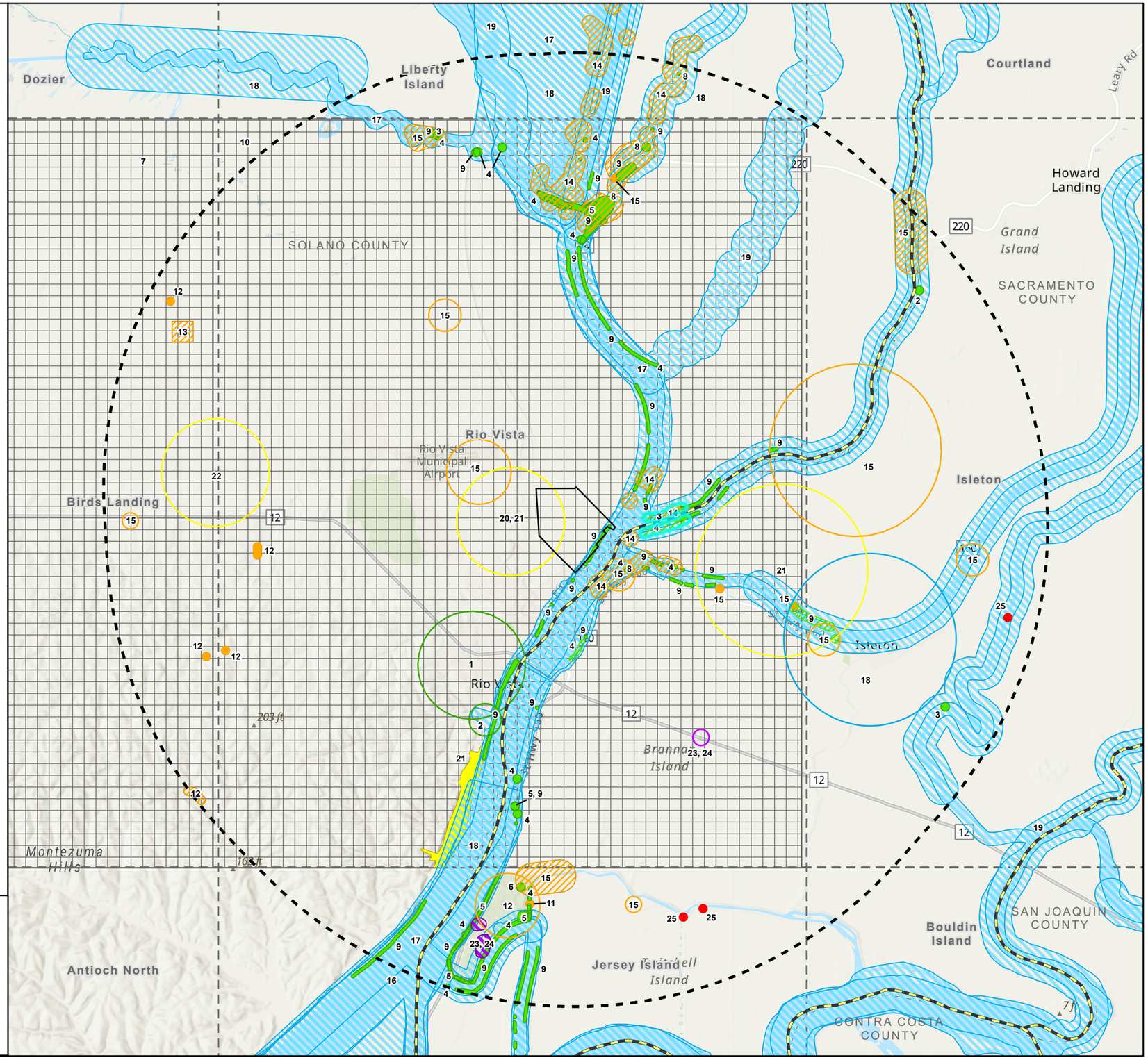
Figure 10. CNDDB Map

Cache Slough Mitigation Bank
Solano County, California

Source: CNDDB updated Jul 2022; CAL FIRE California County Boundaries; USGS TNM 2021; ESRI Light Grey Basemap

0 0.5 1 2 Miles



Woolly Rose-Mallow

Woolly rose-mallow (*Hibiscus lasiocarpos* var. *occidentalis*) is a CNPS 1B.2 rare plant. The woolly rose-mallow has many hairy erect stems that grow to a height of five feet. Its flowers are generally large and a bright white color with a singular red "eye" in the center; they blossom typically in April through September. The woolly rose-mallow usually grows along edges of wetlands. (MDWFP 2023.)

According to the CNDDB, the woolly rose-mallow occurrence nearest to the Bank is located just south of the City of Rio Vista on the west side of the Sacramento River (Figure 8). Although the woolly rose-mallow was not observed at the Bank, it is considered to have moderate probability for occurrence due to the habitat quality along the Sacramento River and Cache Slough and the known CNDDB occurrences in the Bank's vicinity.

4.4.2 Special-Status Wildlife

The search of the CNNDB records revealed that a total of 16 special-status wildlife species are known to occur within a five-mile radius of the site (Figure 8). Four of these species are fish that are known to occur in the Sacramento River and Cache Slough within the vicinity of the Bank. A separate assessment of special-status fish species has been conducted for the Bank (ESA 2023); therefore, special-status fish are not addressed further in this report.

In addition to the 12 non-fish species reported by the CNDDB, another 17 special-status wildlife species were evaluated for their potential to occur on the Bank based on the presence of suitable habitat, for a total of 29 species (Table 5 in Appendix D). Of these 29 species, two species are known to occur onsite, 18 species have potential to occur onsite based on the presence of suitable habitat, and 9 species are not expected to occur onsite because they inhabit habitat communities (i.e., vernal pools) that are not present on the Bank (Appendices C and D).

As mentioned in the methods section, HBC conducted a habitat assessment including USFWS protocol-level dry-season sampling for federally listed large branchiopods in 2022 (HBC 2022). Dry-sampling was followed by USFWS protocol wet-sampling in 2023 (HBC 2023). No evidence of federally-listed large branchiopods were observed during these surveys and it was concluded that habitat existing onsite is very poor quality (support large branchiopod predators including fish and crawfish) to support these species (Table 5 in Appendix D).

The special-status wildlife species known to occur onsite or with a moderate to high probability of occurrence are:

- Swainson's hawk (*Buteo swainsoni*)
- Western pond turtle *(Actinemys marmorata)*
- Giant garter snake *(Thamnophis gigas)*
- Northern harrier *(Circus hudsonius)*
- Song sparrow, "Modesto" population *(Melospiza melodia)*

These species, their habitat requirements, and potential to occur at the Bank are discussed in greater detail below.

Swainson's Hawk

The Swainson's hawk (*Buteo swainsoni*) is listed as threatened under CESA. This species was named after William Swainson, a British naturalist (USFWS 2023a). Like other buteos, Swainson's hawks are large with fairly broad wings and short tails. However, they are generally slimmer and longer-winged than other buteos (such as the very common red-tailed hawk [*Buteo jamaicensis*]) and soar with their wings typically held in a slight dihedral (v- shape) tipping back and forth. Although variable, most Swainson's hawks are light-bellied birds with a dark or reddish-brown chest and brown or gray upperparts. They have distinctive underwings with white wing linings that contrast strongly with blackish flight feathers. Most males have gray heads; females tend to have brown heads. Dark individuals also occur; these vary from reddish to nearly all black, with reduced contrast on the underwings. (All about Birds 2023a.)

This species is a long-distance migrant, wintering in Argentina; it has been recorded as a vagrant in neighboring Chile, in the island countries of the Dominican Republic, Trinidad and Tobago, and in Norway (Bird Life International 2016). These hawks spend summers in the wide-open spaces of the American West. In the Central Valley of California, Swainson's hawks often nest in peripheral to riparian systems, in lone trees in agricultural fields and pastures, and in roadside trees when available and adjacent to suitable foraging habitat. (All about Birds 2023a.)

Although adapted to the open grasslands, Swainson's hawks have become increasingly dependent on agriculture, especially alfalfa crops, as native communities are converted to agricultural lands. The diet of the Swainson's hawk in California is varied but mainly consists of small rodents called voles; however, other small mammals, birds, and insects are also taken. (USFW 2023.)

According to the CNDDB two occurrences of nesting Swainson's hawk are close to the Bank, located one mile to the northwest and one and a half miles to the east (Figure 8). During 2022 surveys, a pair of Swainson's hawks was observed nesting immediately north of the Bank within

a mature Fremont's cottonwood (*Populus fremontii*) tree along the northern bank of Watson Hollow Slough (Sheet A1 in Appendix C).

Western Pond Turtle

The western pond turtle is designated as a species of special concern by CDFW. It is a medium-sized turtle, usually dark brown or dull olive in color, with or without darker reticulations or streaking. The plastron (bottom shell) is yellowish, sometimes with dark blotches in the centers of the scutes (scales on the shell). The carapace (top shell) is low and broad, usually widest behind the middle, and in adults is smooth, lacking a keel or serrations. Western pond turtle adults are sexually dimorphic, with males having light or pale yellow throat coloring.

Western pond turtles are found in the western coast of the United States and Mexico, ranging from western Washington state to northern Baja California. They live in marshes, streams, rivers, ponds, and lakes.

Western pond turtles are generally solitary semi-aquatic creatures. They spend most of their lives in water; however, they require terrestrial habitats for nesting. These turtles favor habitats with large numbers of emergent logs or boulders, where they aggregate to bask. They also bask on top of aquatic vegetation. Since many ponds can dry up during summer and fall months along the West Coast, especially during times of drought, western pond turtles can spend upwards of 200 days out of water. Many turtles overwinter outside of the water, during which time they often create their nests for the year. In some areas, western pond turtles brumate (a hibernation-like state) during the winter months. During brumation, they burrow into the mud above or below the water and remain inactive until it gets warm again. Western pond turtles are diurnal and usually hunt late in the day. They are very shy and when sensing danger, will dive into the water. To protect themselves, they quickly hide their head and legs into their hard shell (Holland 1994; Rhodin *et al.* 2010).

The open water habitats within the Bank offer great habitat for foraging western pond turtles and the sandy soils located in the northwest corner of the Bank offer good nesting habitat for them. Numerous western pond turtles were observed during 2021 and 2022 surveys within the open water habitats of Watson Hollow Slough and the Sacramento River and Cache Slough (Sheet A2 in Appendix C).

Giant Garter Snake

The giant garter snake (*Thamnophis gigas*) is listed as threatened under CESA and ESA. This is one of the largest garter snakes, reaching a length of 63.7 inches (162 centimeters). The snake is olive to brown with a cream, yellow, or orange stripe running down its back, and two light-colored stripes running along each side. (USFWS 2023b.)

Historically, giant garter snakes were found along the edges of large flood basins, freshwater marshes, and tributaries in California's Central Valley from Butte County in the north to Kern County in the south. Today, their range extends from Butte and Glenn Counties in the north to Fresno County in the south, where they are known to live in a variety of agricultural, managed, and natural wetlands. Giant garter snakes inhabit natural wetlands like marshes, sloughs, ponds, small lakes, and small streams. These snakes also live in artificial waterways and agricultural wetlands (e.g., irrigation and drainage canals and rice fields) and the adjacent uplands. Only about 5% of its historical wetland habitat acreage remains. (USFWS 2023b.)

The open water and emergent marsh habitats within the ditches and sloughs at the Bank offer excellent foraging and basking habitats, as well as movement corridors for the giant garter snake. With the exception of the elevated levees, the upland habitats at the Bank are not good over wintering habitat for the giant garter snake brumation due to the frequent flooding.

Although the giant garter snake was not recorded within a five-mile radius of the Bank (Figure 7), there are recorded occurrences to the north and south, within 6 to 7 miles of the Bank, at Liberty Island, Decker Island, and Twitchell Island (CNDDB 2023). Additionally, an adult giant garter snake was observed along a levee road 0.6 mile northeast of the Bank in 2019 (Lagneaux pers. comm. 2023).

Northern Harrier

Northern harrier (*Circus hudsonius*) is designated as a species of special concern by CDFW. Northern harriers are slender, medium-sized raptors with long, fairly broad wings and a long, rounded tail. They have a flat, owl-like face and a small, sharply hooked bill. Harriers often fly with their wings held in a dihedral or V-shape above the horizontal. (All about Birds 2023b.)

All northern harriers have a white rump patch that is obvious in flight. Males are gray above and whitish below with black wingtips, a dark trailing edge to the wing, and a black-banded tail. Females and immatures are brown, with black bands on the tail. Adult females have whitish undersides with brown streaks, whereas immatures are buffy, with less streaking. (All about Birds 2023b.)

Northern harriers fly low over the ground when hunting, weaving back and forth over fields and marshes as they watch and listen for small animals. They eat on the ground, and they perch on low posts or trees. On the breeding grounds, males perform elaborate flying barrel rolls to court females. (All about Birds 2023b.)

Northern harriers breed in wide-open habitats ranging from Arctic tundra to prairie grasslands to fields and marshes. Their nests are concealed on the ground in grasses or wetland vegetation. In migration and winter, harriers typically move south away from areas that receive heavy snow cover, ending up in open habitats similar to those in which they breed. (All about Birds 2023b.)

Northern harriers have been observed foraging at the Bank on numerous occasions and have nested in the adjacent property (Little Egbert Tract) just northeast of the Bank.

Song Sparrow

The "Modesto Population" (Population 1) of the song sparrow is designated as a species of special concern by CDFW. Scientists recognize 24 subspecies of song sparrows and have described some 52 forms: they are one of the most regionally variable birds in North America. They are highly variable in size across numerous subspecies. Song sparrows are medium-sized sparrows, with a bulky body, short-stout bill, and fairly rounded head. Their wings are broad and their tails long and rounded. Song sparrows are light below and slate gray above, with red-brown streaks throughout— although these shades, as well as the amount of streaking, vary extensively across North America. (All about Birds 2023d.)

The Modesto song sparrow has a year-round range that is restricted to the Sacramento Valley, Sacramento–San Joaquin River Delta, and northern San Joaquin Valley of California (Shuford and Gardali 2008). Grinnell and Miller (1994) noted this population's affinity for emergent freshwater marshes dominated by tules (*Scirpus* spp.) and cattails (*Typha* spp.) as well as riparian willow (*Salix* spp.) thickets. These song sparrows also nest in riparian forests of valley oak (*Quercus lobata*) with a sufficient understory of blackberry (*Rubus* spp.), along vegetated irrigation canals and levees, and in recently planted valley oak restoration sites (DiGaudio and Geupel 1998). The lack of early successional habitats and wetlands may be limiting this species (Shuford and Gardali 2008).

Song sparrows forage on the ground, in shrubs, or in very shallow water. They mainly eat insects and seeds. They nest either in a sheltered location on the ground or in trees or shrubs. (All about Birds 2023d.)

Although this species was not observed nesting at the Bank, suitable nesting habitat is present onsite, and several CNDDB occurrences of the species are located across from the Bank on the east side of the Sacramento River and Cache Slough (Figure 8).

5.0 DISCUSSION

No special-status species would be negatively affected by implementation of the proposed restoration, since all special-status species at the Bank occur along the waterside of the levee system, except for nesting birds. Restoring tidal influences would greatly improve existing habitats for common and special-status species, allowing an improved conduit of phyto- and zooplankton, aquatic macroinvertebrates, and fish that in turn would offer superior foraging habitat for numerous wildlife, including the special-status western pond turtle (*Actinemys marmorata*) and several special-status fish species.

The proposed recontouring will increase the surface area and gentle the slopes for establishment of numerous riparian and marsh plant species. The proposed contouring will allow greater areas for establishment of several special-status plants, including woolly rose-mallow (*Hibiscus lasiocarpos* var. *occidentalis*), Delta tule pea (*Lathyrus jepsonii* var. *jepsonii*), Mason's lilaeopsis (*Lilaeopsis masonii*), Sanford's arrowhead (*Sagittaria sanfordii*), and Suisun Marsh aster (*Symphyotrichum lentum*). Most of these special-status plants occur along the gentle slopes of tidal waterways at elevations between the mean low tide and mean high tide or just above mean tidal influences.

The proposed restoration will greatly enhance the existing riparian habitat by increasing the acreage and width, and adding structural diversity (distinct layers of vines, overstory, midstory, and understory); riparian habitat presently consists of a thin band along ditches and open water composed of a few large mature trees or shrubby willows or bramble. These improvements to the existing meager riparian habitat would transform it into a riparian forest with potential to support a far greater number of wildlife and plant species, including many riparian-dependent special-status species such as the western yellow-billed cuckoo (*Coccyzus americanus occidentalis*), song sparrow (*Melospiza melodia*), Swainson's hawk (*Buteo swainsoni*), osprey (*Pandion haliaetus*), and white-tailed kite (*Elanus leucurus*), in addition to rookeries for double-crested cormorant (*Phalacrocorax auratus*) and various herons and egrets. Even the valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*) could become established if its host plant (elderberry [*Sambucus* spp.]) was planted.

Similar to the riparian habitat, emergent marsh habitat would expand and improve with the restoration design, offering enhanced habitat for several special-status wildlife species, including the tricolored blackbird (*Agelaius tricolor*), giant garter snake (*Thamnophis gigas*), western pond turtle (*Emys marmorata*), and California black rail (*Laterallus jamaicensis coturniculus*). Especially since the hydrology of this restored emergent marsh will be natural and not manipulated and managed (dry-downs and flood-ups) for waterfowl purposes.

Moreover, the conversion of grassland and ruderal habitats to open water, marshes, and riparian would not be a significant loss. The grasslands onsite are dominated by a thick mat of Bermuda grass (*Cynodon dactylon*) that offers little habitat to grassland-dependent wildlife. A small amount

of ruderal habitat acreage would be lost, and the wildlife and plant species that utilize this habitat are locally and regionally abundant.

In summary, the proposed restoration of the Bank would greatly improve existing habitats and allow for reestablishment of historically occurring habitats, including riparian forests and marshlands and their dependent common and special-status species that were lost from the exploitation of early European immigrants.

5.1 SUGGESTIONS

Although probably already incorporated into the restoration plan, we suggest the following items to improve wildlife habitats.

- Installation and maintenance of nest boxes within the riparian habitats, which are a limited resource for the following bird species: barn owl (*Tyto alba*), western screech owl (*Megascops kennicottii*), American kestrel (*Falco sparverius*), wood duck (*Aix sponsa*), western blue bird (*Sialia mexicana*), wrens (e.g., house [*Troglodytes aedon*]), and swallows (violet-green [*Tachycineta thalassina*] and tree [*Tachycineta bicolor*]).

- Installation of dead trees or very large branches as snags for foraging, cavity nesting, and acorn caches.

- Maintain gradual slopes of any islands and levees constructed or enhanced to allow more areas for establishment of wetland and upland plants, especially those dependent special-status species.

- Create deep channels that slope to permanent waterbodies (e.g., Cache Slough/Sacramento River) within shallow open water and emergent marsh habitats to discourage stranding of fish during low tides.

- Discourage construction of isolated basins or pools that would encourage mosquito establishment and instead allow water to circulate throughout the open water and wetland habitats, encouraging increased dissolved oxygen concentrations and cooler water temperatures.

- Add trenches or deep areas below water lines at the bottom of slopes to discourage mammalian predators from wading across shallow water to bird nesting islands.

6.0 LITERATURE CITED

All about Birds. 2023a. Swainson's Hawk. Available: www.allaboutbirds.org/guide/Swainsons_Hawk/id. Accessed March 2023.

All About Birds. 2023b. Northern Harrier. Available: www.allaboutbirds.org/guide/Northern_Harrier/id. Accessed March 2023.

All about Birds. 2023c. Cooper's Hawk. Available: www.allaboutbirds.org/guide/coopers_hawk/id. Accessed March 2023.

All About Birds. 2023d. Song Sparrow. Available: www.allaboutbirds.org/guide/Song_Sparrow/id. Accessed March 2023.

Audubon. 2023. Guide to North American Birds. Cooper's hawk. Available: www.audubon.org/fieldguide/bird/coopers-hawk. Accessed March 2023.

Baldwin, B. G, D. H. Goldman, D. J. Keil, R, Patterson, T. J. Rosatti, and D. H. Wilken. (eds.) 2012. The Jepson Manual, Vascular Plants of California (2nd edition). University of California Press, Berkeley, California. 1,568 pp.

Bird Life International. 2016. Buteo swainsoni. IUCN Red List of Threatened Species. 2016: e.T22695903A93533217. doi:10.2305/IUCN.UK.2016-3.RLTS.T22695903A93533217 .en. Retrieved January 2023.

Brouillet, L., Semple, J.C., Allen, G.A., Chambers K., and Sundburg, S. 2006. *Symphoyotrichum* Nees. Flora of North America. Vol. 20, pp. 465-539, Oxford University Press, New York.

The Calflora Database [a non-profit organization] (CalFlora). 2023. Information on California Plants for Education, Research and Conservation, with Data Contributed by Public and Private Institutions and Individuals. [web application]. Berkeley, California: Available: https://www.calflora.org/. Accessed October 2022.

California Department of Fish and Wildlife. 2018. Protocols for Surveying and Evaluating Impacts to Special-Status Native Plants Populations and Sensitive Natural Communities. State of California, California Natural Resources Agency. Accessed March 2023. 12 pp.

California Department of Fish and Wildlife. 2022a. Natural Communities. Available: https://wildlife.ca.gov/Data/VegCAMP/Natural-Communities. Accessed November 2022.

California Department of Fish and Wildlife. 2022b. California Natural Diversity Data Base. RareFind 5. Available: https://wildlife.ca.gov/Data/CNDDB/Maps-and-Data. Accessed October 2022.

California Department of Fish and Wildlife and California Native Plant Society 2023. CDFW-CNPS Protocol for the Combined Vegetation Rapid Assessment and Relevé Field Form. 10 pp.

California Herps. 2023. A Guide to the Amphibians and Reptiles of California. Available: https://californiaherps.com/. Accessed March 2023.

California Invasive Plant Council (Cal-IPC). The Cal-IPC Inventory. 2022. Available: https://www.cal-ipc.org/plants/inventory. Accessed October 2022.

California Native Plant Society (CNPS). 2022. Inventory of Rare and Endangered Vascular Plants of California. Available: https://rareplants.cnps.org/. Accessed June 2022.

Cowardin, L. M., V. Carter, F. C. Golet, and E.T. LaRoe. 1979. Classification of Wetlands and Deepwater Habitats of the United States. (FWS/OBS79/31.) U.S. Fish and Wildlife Service, Office of Biological Services, Washington, D.C.

DiGaudio, R., & Geupel, G. R. 1998. Songbird monitoring on the Cosumnes River Preserve: progress report of the 1998 field season. Final report of Point Reyes Bird Observatory, 4990.

ESA. 2023. Cache Slough Mitigation Bank Fish Assessment. Sacramento, California. August.

Google Earth©. 2022. V 7.3.2.5776. Available: http://www.earth.google.com. Accessed October 2023.

Grinnell, J., and Miller, H.A. 1994. The Distribution of the Birds of California. Cooper Ornithological Club, Pacific Coast Avifauna, number 27, University of California Berkeley.

Gross, J., K. Will, and D. Rubinoff. 2020. A Field Guide to California Insects. Second Edition. (California Natural History Guides). University of California Press. October 30. 536 pp.

Helm Biological Consulting. 2022. Revised Habitat Suitability Assessment, Including Dry-season Sampling and Cyst Culturing to Determine the Presence of Federally-listed Large Branchiopods at the Little Egbert Tract, Solano County, California. November 2022. 40 pp.

Helm Biological Consulting. 2023. 2022/2023 Wet-season Sampling for Large Branchiopods at the Cache Slough Mitigation Bank, Solano County, California. July 2023.

Holland, Dan C., PhD. 1994. The Western Pond Turtle: Habitat and History, Final Report. U.S. Department of Energy, Bonneville Power Administration, Division of Fish and Wildlife; Wildlife Diversity Program, Oregon Department of Fish and Wildlife. August.

Holland, R. F. 1986. Preliminary Descriptions of the Terrestrial Natural Communities of California. The Resource Agency Non-Game Heritage Program, Department of Fish and Game, Sacramento, California. 163 pp.

Jennings, C. W., R. G. Strand, and T. H. Rogers. 1977, Geologic Map of California: California Division of Mines and Geology, scale 1:750,000.

Lichvar, R. W., M. Butterwick, N. C. Melvin, and W. N. Kirchner. 2016. The National Wetland Plant List: 2016 Wetland Ratings. Phytoneuron. 2016-30: 1–17.

Mississippi Department of Wildlife, Fisheries, & Parks. 2023. North MS Fish Hatchery-Mississippi Native: Woolly Rose Mallow (*Hibiscus lasiocarpos*). Available: https://www.mdwfp.com/nmfh/native-habitat/woolly-rose-mallow/. Accessed March 2023.

Nafis, G. 2020. California Herps – A Guide to the Amphibians and Reptiles of California. Available: http://www.californiaherps.com/. Accessed March 17, 2023.

Natural Resources Conservation Service (NRCS). 2022a. Web Soil Survey. Available: http://websoilsurvey.nrcs.usda.gov/app/. Accessed October 2022.

Natural Resources Conservation Service (NRCS). 2020b. Hydric Soils List: Solano County, California. Available: http:// www. nrcs.usda.gov/publications/query-by-ssa.html. Accessed October 2022.

Peterson, R. T. 2020. Peterson Field Guide to Birds of North America. Fourth Edition (Peterson Field Guides). Mariner Books. Illustrated. April 7. 520 pp.

Reid, F. A. 2006. Mammals of North America. Fourth Edition (Peterson Field Guides). Mariner Books. Illustrated. November. 608 pp.

Rhodin, Anders G. J., Peter Paul van Dijk, John B. Iverson, and H. Bradley Shaffer. 2010. Turtles of the World 2010 Update: Annotated Checklist of Taxonomy, Synonymy, Distribution and Conservation Status (PDF). Archived (PDF) from the original (2010-12-14) on 2011-07-17. Retrieved March 17, 2023.

Sawyer, J. O., T. Keeler-Wolf, and J. M. Evens. 2009. A Manual of California Vegetation. Second Edition. California Native Plant Society, Sacramento. 1,300 pp.

Shuford, W.D., Gardali, T., editors. 2008. California Bird Species of Special Concern: A ranked assessment of species, subspecies, and distinct populations of birds of immediate conservation concern in California. Studies of Western Birds 1. Western Field Ornithologists, Camarillo, California, and California Department of Fish and Game, Sacramento.

Stebbins, R. C. 2018. A Peterson Field Guide to Western Reptiles and Amphibians. Fourth Edition (Peterson Field Guides). Mariner Books. Illustrated. October. 576 pp.

The Natomas Basin Conservancy. 2023a. Delta Tule Pea. Available: natomasbasin.org/education/the-nbhcp-species/delta-tule-pea/. Accessed March 16, 2023.

The Natomas Basin Conservancy. 2023b. Stanford's Arrowhead. Available: natomasbasin.org/education/the-nbhcp-species/sanfords-arrowhead/. Accessed March 16, 2023.

University of California, Berkeley. Jepson Flora Project. 2022. Jepson eFlora. Available: https://ucjeps.berkeley.edu/eflora/. Accessed October 2022.

U.S. Fish and Wildlife Service (USFWS). 2022a. Environmental Conservation Online System. Available: https://ecos.fws.gov/ecp/. Accessed June 2022.

U.S. Fish and Wildlife Service (USFWS). 2022b. National Wetlands Inventory. Available: http://www.fws.gov/nwi/. Accessed June 2022.

U.S. Fish and Wildlife Service (USFWS). 2023a. Swainson's Hawk. Available: www.fws.gov/story/2022-12/Swainsons-hawk. Accessed March 2023.

U.S. Fish and Wildlife Service (USFWS). 2023b. Giant Garter Snake. Available: www.fws.gov/species/giant-garter-snake-thamnophis-gigas. Accessed March 2023.

U.S. Fish and Wildlife Service (USFWS). 2023c. Cooper's Hawk. Available: www.fws.gov/story/2022-12/coopers-hawk. Accessed March 2023.

U.S. Geological Survey (USGS). 2020. National Geologic Map Database. TopoView. Available: https://ngmdb.usgs.gov/topoview/viewer/#4/39.98/-100.06. Accessed October 2022.

Western Regional Climate Center (WRCC). 2023. Antioch Pump PLT 3, California (040232). Available: https://wrcc.dri.edu/cgi-bin/cliMAIN.pl?ca0232. Accessed October 2022.

Whipple, A., Grossinger, R.M., Rankin, D., Stanford, B., and Askevold, R.A. 2012. Sacramento-San Joaquin Delta Historical Ecology Investigation: Exploring Pattern and Process. SFEI Contribution No. 672.

Whittaker, R. H. 1975. Communities and Ecosystems. 2nd Edition. New York: Macmillan.

APPENDIX A.
HISTORICAL CONDITIONS WITHIN THE BANK PROPERTY

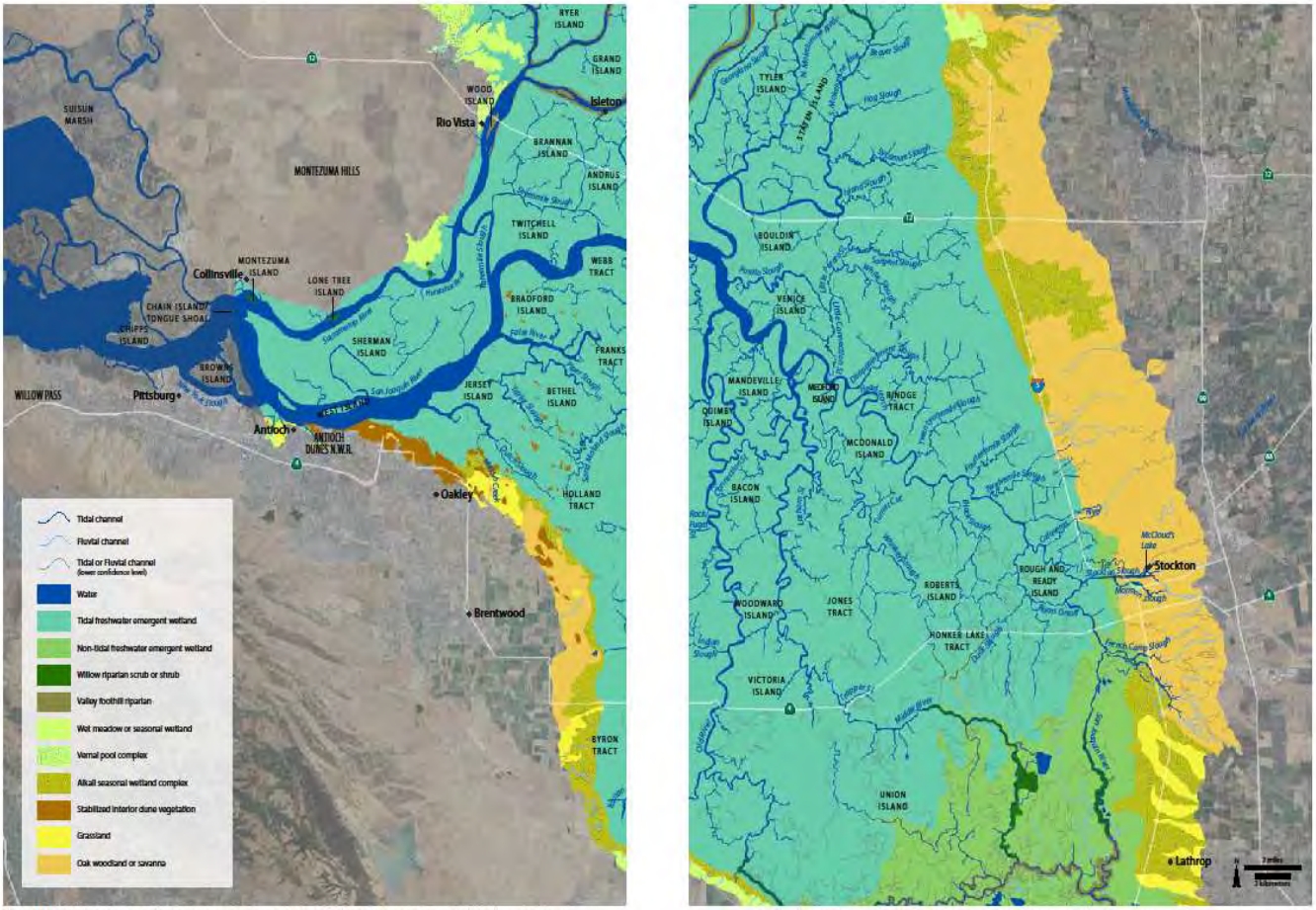


Exhibit 1. In the early 1800's, prior to major European influence, the Bank would have supported natural habitats associated with the central Sacramento-San Joaquin Delta. More specifically, the Bank was mostly tidal freshwater emergent wetlands (light green) that transitioned into wet meadow and seasonal wetlands along the upper edge (yellow-green) (Whipple et. al. 2012).

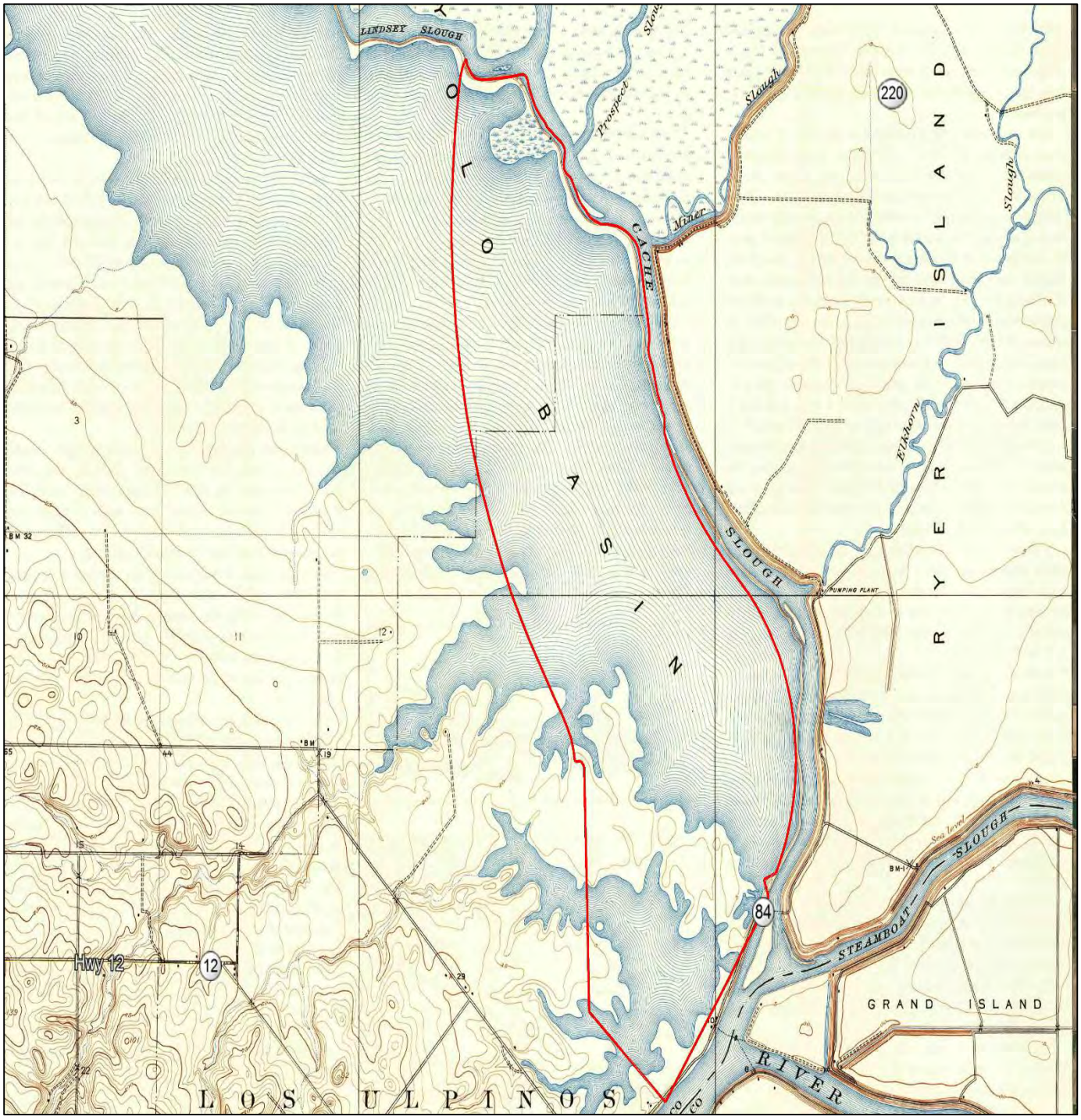


Exhibit 2. USGS topographic map (1910). The red outline shows the current Little Egbert Tract boundary. The majority of the Little Egbert Tract is mapped as aquatic habitat (i.e., part of the Yolo Basin), except for relatively small areas of higher elevation surrounding the Bank (USGS 2020).

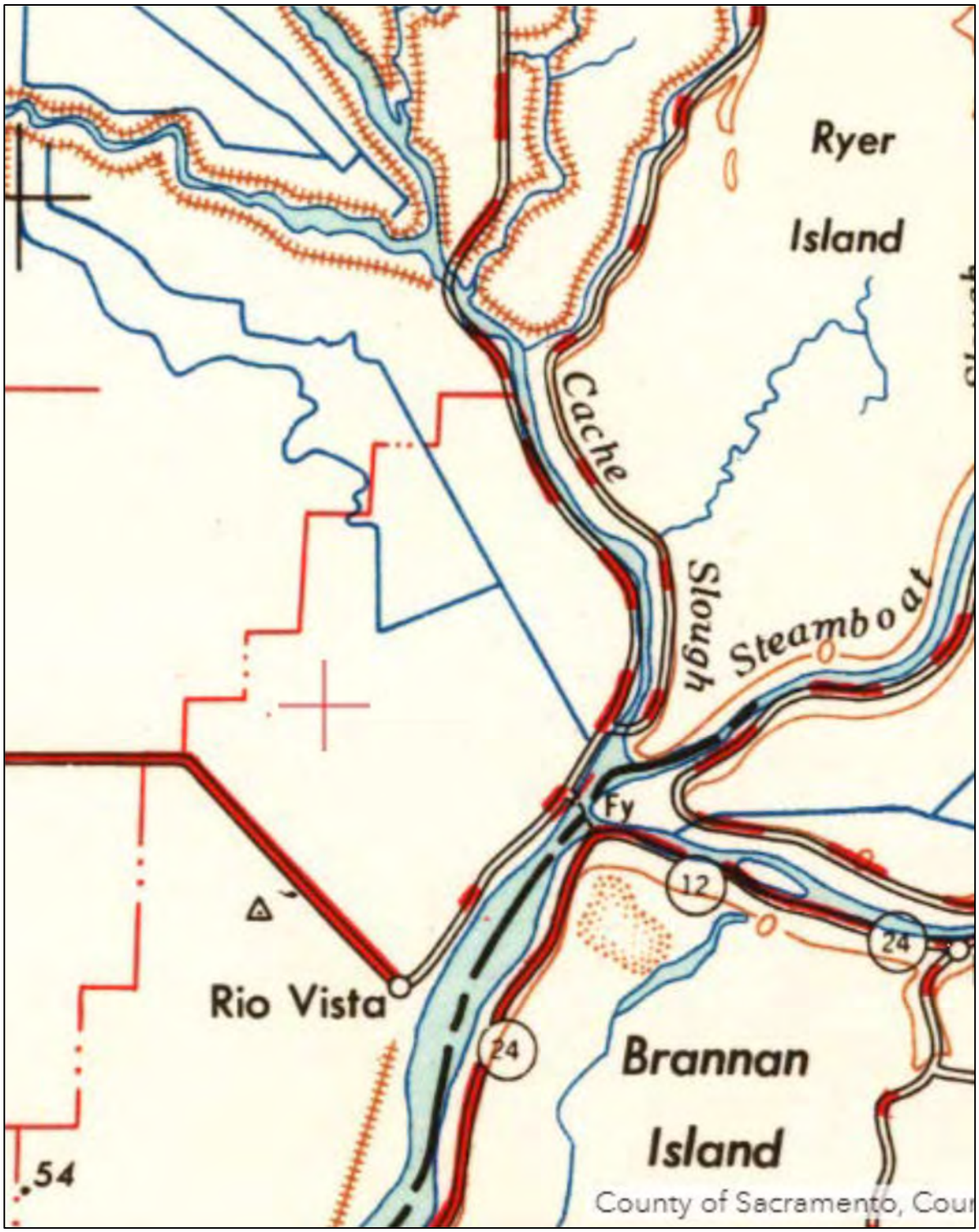


Exhibit 3. USGS map from 1947 shows that the former Yolo Basin was drained, likely for flood control and agricultural purposes.

APPENDIX B.
REPRESENTATIVE PHOTOGRAPHS

Photograph 1. A commercial ship moving up the Sacramento River through Cache Slough to the Sacramento Deep Water Ship Channel to the Port of Sacramento.

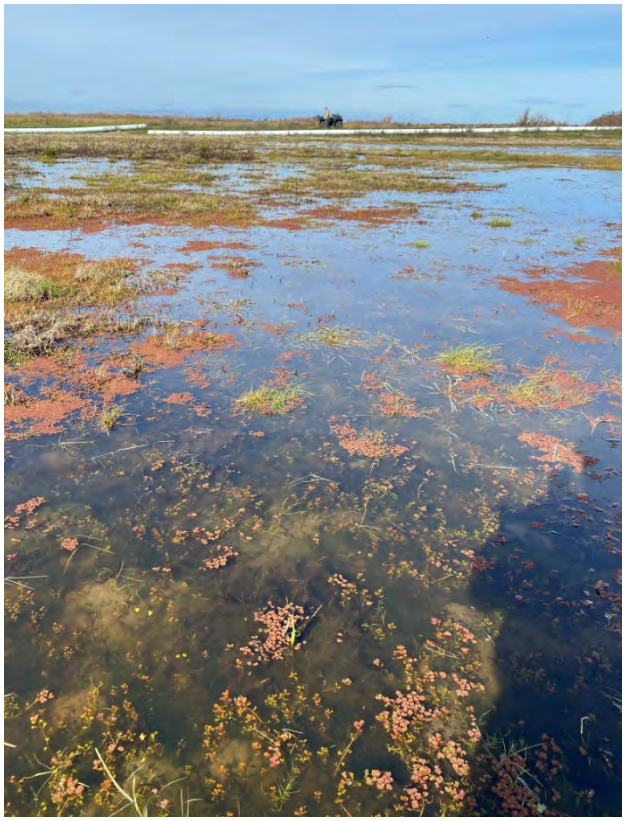
Photograph (aerial) 2. Note the white PVC irrigation pipe within Field 4.

Photograph 3. One of numerous small alkaline seasonal wetlands occurring within the southeast corner of Field 2.

Photograph 4. Water spills from the central portion of the degraded berm to the northwest creating a human-made and managed emergent marsh and seasonal wetland.

Photograph 5. The out fall culvert from Watson Hollow Slough and in-fall culvert to the wide ditch have gate valves which are operable and are located at the north end of the ditch.

Photograph 6. Ditch located in the northeast corner of Field 4 which supplies water to the large managed seasonal wetland at the Bank.



Photograph 7. Representative managed seasonal wetland habitat occurring in the northeast corner of the Field 4 at the Bank.

Photograph 8. Open water within ditch located at the northeast corner of the Field 4 at the Bank.

Photograph 9. Riparian scrub habitat occurring along the eastern edge of the Field 4 at the Bank.

Photograph 10. Water hyacinth “choking” the open water portion of Watson Hollow Slough. Taken facing north from south levee of Watson Hallow Slough near northern corner of the Bank.

Representative managed emergent marsh habitat occurring in the northeast corner of Field 3 of the Bank.

Representative isolated seasonal wetland habitat created by cattle trampling around power pole in Field 4 at the Bank.

Isolated seasonal wetland (108.1) located in the southern edge of Field 3 at the Bank.

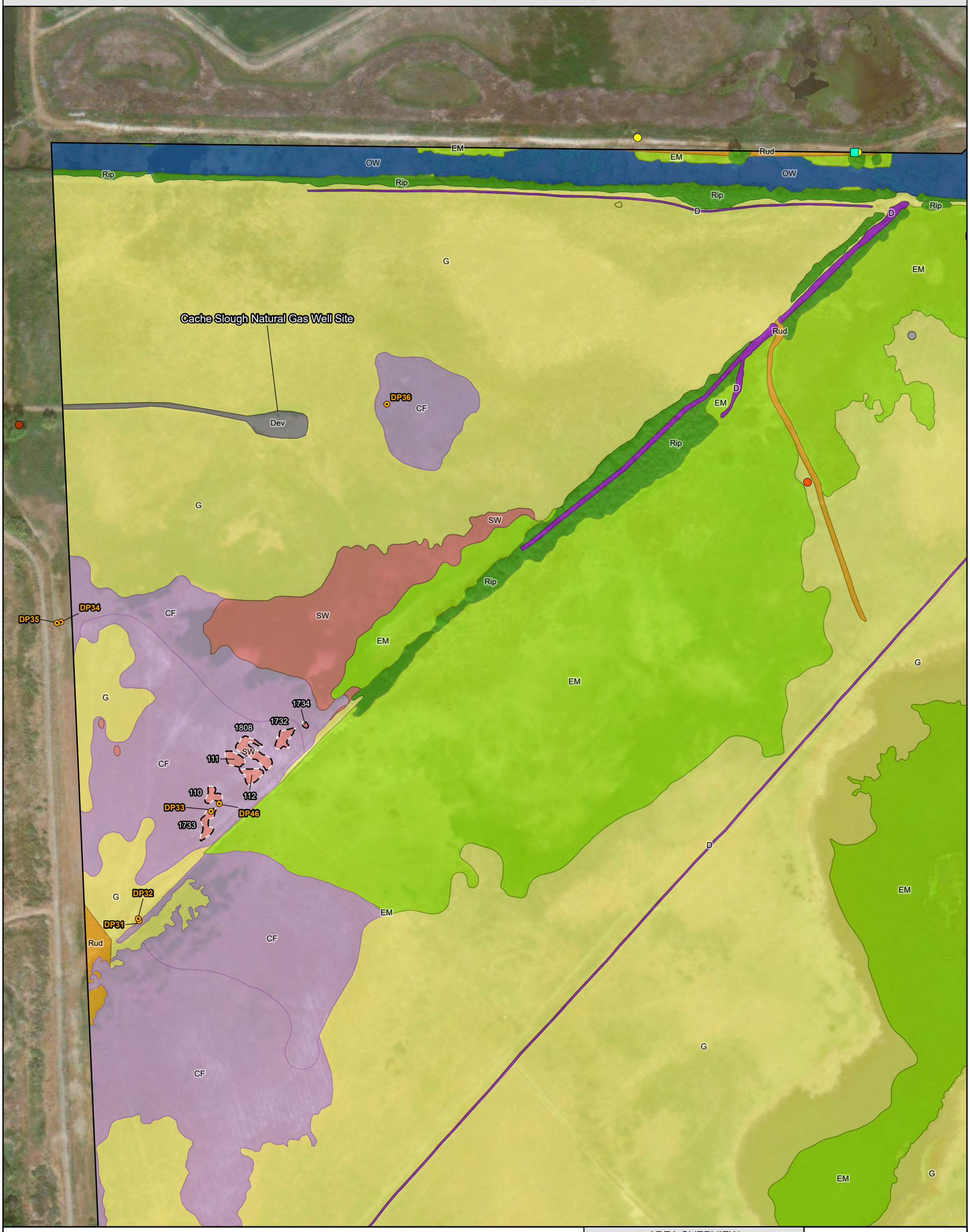
Tules, open water, and un-vegetated sand along Cache Slough.

Representative managed emergent marsh habitat occurring in the northeast corner of Field 3 at the Bank.

Ephemerally inundated Ditch (107.1) located in the southern edge of Field 3 at the Bank.

APPENDIX C.
BIOLOGICAL RESOURCES AND OTHER FEATURES OCCURRING AT OR ADJACENT TO THE BANK PROPERTY

CACHE SLOUGH MITIGATION BANK, SOLANO COUNTY, CALIFORNIA



Bank Site (350.14 acres)

Habitats

- Ruderal (Rud) - 10.64 acres
- Grassland (G) - 204.64 acres
- Developed (Dev) - 1.83 acres
- Open Water (OW) - 13.6016 acres
- Ditch (D) - 3.17 acres
- Emergent Marsh (EM) - 86.41 acres
- Riparian (Rip) - 8.28 acres
- Clay Flat (CF) - 17.68 acres
- Seasonal Wetland (SW) - 3.87 acres
- Large Branchiopod Habitats (labeled by Feature ID)
- Data Points (DP)

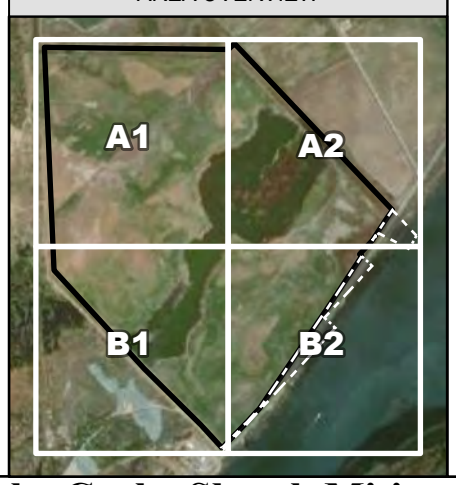
Nesting Birds

- Northern Mockingbird (Mimus polyglottos)
- Western Meadowlark (Sturnella neglecta)
- Red-tailed Hawk (Buteo jamaicensis)
- Unknown passerine bird nest

Special Status Wildlife

- Swainson's Hawk (Buteo swainsonii) Nest

AREA OVERVIEW



0 250 500 Feet

N

1 inch equals 250 feet

Map Credits:
Habitat Mapping, Botanical & Wildlife Surveys by Brent Helm. Map by Rachel Powell.
Projection: California Teale Albers, NAD 1983.

Data Source: ESRI Aerial Imagery (Maxar, 2021) accessed 2022; Helm Biological Consulting 2020-2021.

Prepared by:

HELM BIOLOGICAL CONSULTING

Date: 11/28/2022

Appendix C. Biological Resources Occurring at or Adjacent to the Cache Slough Mitigation Bank, Solano County, California - A1 (Page 1 of 4)

CACHE SLOUGH MITIGATION BANK, SOLANO COUNTY, CALIFORNIA

Bank Site (350.14 acres)

Habitats

- Ruderal (Rud) - 10.64 acres
- Grassland (G) - 204.64 acres
- Developed (Dev) - 1.83 acres
- Open Water (OW) - 13.6016 acres
- Ditch (D) - 3.17 acres
- Emergent Marsh (EM) - 86.41 acres
- Riparian (Rip) - 8.28 acres
- Seasonal Wetland (SW) - 3.87 acres

Large Branchiopod Habitats (labeled by Feature ID)

Data Points (DP)

Nesting Birds

- Great-tailed Grackle (Quiscalus mexicanus)
- Unknown passerine bird nest

Special Status Wildlife

- Western Pond Turtle (Actinemys marmorata)

Invasive Plants

- Six petal water primrose (Ludwigia hexapetala)
- Black locust (Robinia pseudoacacia)
- Giant reed (Arundo donax)

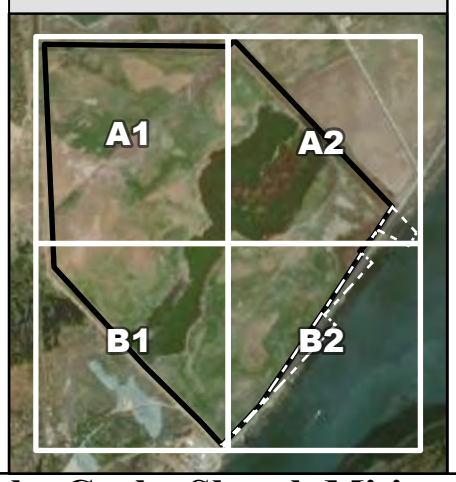
Special Status Plant Points

- Delta Tule Pea (Lathyrus jepsonii var. jepsonii)
- Suisun Marsh Aster (Symphyotrichum lentum)

Special Status Plant Polygons

- Suisun Marsh Aster (Symphyotrichum lentum)

AREA OVERVIEW



0 250 500 Feet

N

1 inch equals 250 feet

Map Credits:
Habitat Mapping, Botanical & Wildlife Surveys by Brent Helm. Map by Rachel Powell.
Projection: California Teale Albers, NAD 1983.

Data Source: ESRI Aerial Imagery (Maxar, 2021) accessed 2022; Helm Biological Consulting 2020-2021.

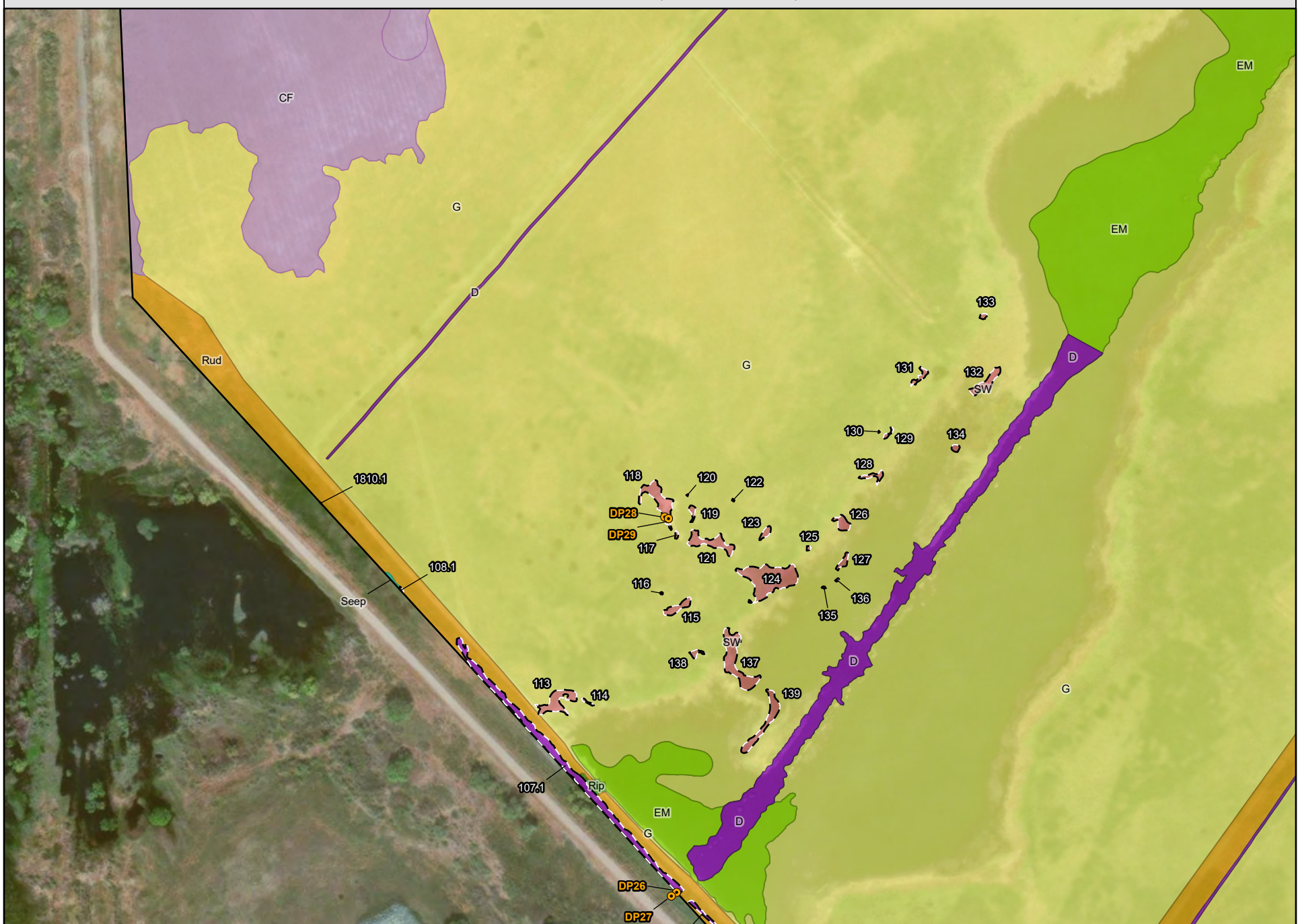
Prepared by:

HELM BIOLOGICAL CONSULTING

Date: 11/28/2022

Appendix C. Biological Resources Occurring at or Adjacent to the Cache Slough Mitigation Bank, Solano County, California - A2 (Page 2 of 4)

CACHE SLOUGH MITIGATION BANK, SOLANO COUNTY, CALIFORNIA



- Bank Site (350.14 acres)

Habitats

- Ruderal (Rud) - 10.64 acres
- Grassland (G) - 204.64 acres
- Developed (Dev) - 1.83 acres
- Ditch (D) - 3.17 acres
- Emergent Marsh (EM) - 86.41 acres
- Riparian (Rip) - 8.28 acres
- Seep (S) - 0.0042 acres
- Clay Flat (CF) - 17.68 acres
- Seasonal Wetland (SW) - 3.87 acres
- Large Branchiopod Habitats (labeled by Feature ID)
- Data Points (DP)

Nesting Birds

- Unknown passerine bird nest

Invasive Plants

- Giant reed (Arundo donax)

Special Status Plant Points

- Suisun Marsh Aster (Symphyotrichum lentum)

AREA OVERVIEW

0 250 500 Feet

N

1 inch equals 250 feet

Map Credits:
Habitat Mapping, Botanical & Wildlife Surveys by Brent Helm. Map by Rachel Powell.
Projection: California Teale Albers, NAD 1983.

Data Source: ESRI Aerial Imagery (Maxar, 2021) accessed 2022; Helm Biological Consulting 2020-2021.

Prepared by:

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Date: 11/28/2022

Appendix C. Biological Resources Occurring at or Adjacent to the Cache Slough Mitigation Bank, Solano County, California - B1 (Page 3 of 4)

CACHE SLOUGH MITIGATION BANK, SOLANO COUNTY, CALIFORNIA

Bank Site (350.14 acres)

Habitats

- Ruderal (Rud) - 10.64 acres
- Grassland (G) - 204.64 acres
- Developed (Dev) - 1.83 acres
- Open Water (OW) - 13.6016 acres
- Ditch (D) - 3.17 acres
- Emergent Marsh (EM) - 86.41 acres
- Riparian (Rip) - 8.28 acres
- Seasonal Wetland (SW) - 3.87 acres
- Large Branchiopod Habitats (labeled by Feature ID)
- Data Points (DP)

Elderberry

- Blue Elderberry (Sambucus nigra ssp. caerulea)

Nesting Birds

- Northern Mockingbird (Mimus polyglottos)
- Western Kingbird (Tyrannus verticalis)
- California Scrub Jay (Aphelocoma californica)
- Unknown passerine bird nest

Special Status Wildlife

- Western Pond Turtle (Actinemys marmorata)

Invasive Plants

- Black locust (Robinia pseudoacacia)
- Chinese pistache (Pistacia chinensis)
- Giant reed (Arundo donax)
- Oleander (Nerium oleander)

Special Status Plant Points

- Delta Tule Pea (Lathyrus jepsonii var. jepsonii)
- Suisun Marsh Aster (Symphyotrichum lentum)

Special Status Plant Polygons

- Delta Tule Pea (Lathyrus jepsonii var. jepsonii)
- Suisun Marsh Aster (Symphyotrichum lentum)

AREA OVERVIEW

0 250 500 Feet

N

1 inch equals 250 feet

Map Credits:
Habitat Mapping, Botanical & Wildlife Surveys by Brent Helm. Map by Rachel Powell.
Projection: California Teale Albers, NAD 1983.

Data Source: ESRI Aerial Imagery (Maxar, 2021) accessed 2022; Helm Biological Consulting 2020-2021.

Prepared by:

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4600 Karshner Rd, Sheridan, CA 95681

Date: 11/28/2022

Appendix C. Biological Resources Occurring at or Adjacent to the Cache Slough Mitigation Bank, Solano County, California - B2 (Page 4 of 4)

APPENDIX D.
SPECIAL-STATUS SPECIES
TABLES 4 AND 5

Table 4. Special-Status Plant Species with Potential to Occur Within or in the Vicinity of the Study Area of the Cache Slough Mitigation Site, Sacramento County, California□

Common and Scientific Name	Plant Family	Lifeform	Blooming Period	Special-Status Listings and Ranks					General Habitat	Potential To Occur Onsite
				Fed List	State List	Global Rank	State Rank	Ca Rare Plant Rank		
San Joaquin spearscale (*Extriplex joaquiniana*)	Chenopodiaceae	annual herb	Apr-Oct	-	-	G2	S2	1B.2	Chenopod scrub, alkaline meadows and seeps, playas, valley and foothill grassland.	**Not Probable.** Although suitable habitat occurs within the alkali clay flat soil located in the southern edge of the Site, this species, if present, would have been identified during surveys.
Woolly rose-mallow (*Hibiscus lasiocarpos* var. *occidentalis*)	Malvaceae	perennial rhizomatous herb (emergent)	Jun-Sep	-	-	G5T3	S3	1B.2	Freshwater marshes and swamps. Often in riprap on sides of levees.	**Moderate.** Although this species was not observed during surveys, suitable habitat occurs along Cache Slough and Watson Hollow Slough.
Delta tule pea (*Lathyrus jepsonii* var. *jepsonii*)	Fabaceae	perennial herb	May-Jul(Aug-Sep)	-	-	G5T2	S2	1B.2	Brackish and freshwater marshes and swamps.	**Present.** This species was abundantly observed during 2021 and 2022 surveys along Cache Slough and Sacramento River; and similar habitat occurs along Watson Hollow Slough.
Mason's lilaeopsis (*Lilaeopsis masonii*)	Apiaceae	perennial rhizomatous herb	Apr-Nov	-	SR	G2	S2	1B.1	Brackish and freshwater marshes and swamps, riparian scrub.	**Low.** Although this species was observed offsite along Cache Slough, suitable habitat (mud flats exposed by highly fluctuating tidal waters) are lacking onsite in Watson Hollow Slough.
Delta mudwort (*Limosella australis*)	Scrophulariaceae	perennial stoloniferous herb	May-Aug	-	-	G4G5	S2	2B.1	Brackish and freshwater marshes and swamps, riparian scrub.	**Low.** This species was not observed onsite during surveys nor was it observed offsite.
Antioch Dunes evening-primrose (*Oenothera deltoides* var. *howelii*)	Onagraceae	perennial herb	Mar-Sep	FE	SE	G5T1	S1	1B.1	Inland dunes	**Not Probable.** Suitable habitat (inland dunes) does not occur onsite.
Bearded popcornflower *(Plagiobothrys hystriculus)*	Boraginaceae	annual herb	Apr-May	-	-	G2	S2	1B.1	Valley and foothill grassland, margins of vernal pools, often vernal swales	**Not Probable.** Suitable habitat (vernal pools and swales) do not occur onsite.
Sanford's arrowhead (*Sagittaria sanfordii*)	Alismataceae	perennial rhizomatous herb (emergent)	May-Oct(Nov)	-	-	G3	S3	1B.2	Shallow freshwater marshes and swamps.	**Moderate.** Suitable habitat occurs onsite (Watson Hollow Slough). Although this species was not observed onsite, it was observed offsite along Cache Slough.
Suisun Marsh aster (*Symphyotrichum lentum*)	Asteraceae	perennial rhizomatous herb	(Apr)May-Nov	-	-	G2	S2	1B.2	Brackish and freshwater marshes and swamps.	**Present.** This species was abundantly observed during 2021 and 2022 surveys along Cache Slough and Sacramento River, as well as some at the eastern end of Watson Hollow Slough.

Definitions

Federal

FE = Federally Endangered (listed as Endangered under Federal Endangered Species Act [ESA])

State

SE = Listed as endangered under California Endangered Species Act (CESA)

SR = Listed as rare under the CESA

Global Rank

G1 = Critically Imperiled — At very high risk of extinction due to extreme rarity (often 5 or fewer populations), very steep declines, or other factors.

G2 = Imperiled — At high risk of extinction due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors.

G3 = Vulnerable — At moderate risk of extinction or elimination due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors.

G5 = Secure — Common; widespread and abundant.

GU = Unrankable — Currently unrankable due to a lack of information or due to substantially conflicting information about status or trends.

G#G# = Range Rank — A numeric range rank (e.g., G2G3) is used to indicate the range of uncertainty about the exact status of a taxon or community.

G#T# = Infraspecific Taxon — The status of infraspecific taxa (subspecies or varieties) are indicated by a "T-rank" following the species' Global Rank. Rules for assigning T-ranks follow the same principles as those for Global Ranks. However, a T-rank cannot imply the subspecies or variety is more abundant than the species. With the subspecies, the G-rank reflects the condition of the entire species, whereas the T-rank reflects the global situation of just the subspecies or variety.

? = Qualifier: Inexact Numeric Rank — A question mark represents a rank qualifier, denoting an inexact or uncertain numeric rank.

Q = Qualifier: Questionable Taxonomy — The distinctiveness of this entity as a taxon or community at the current level is questionable; resolution of this uncertainty may result in change from a species to a subspecies or hybrid, or inclusion of this taxon or type in another taxon or type, with the resulting taxon having a lower-priority (numerically higher) conservation status rank.

State Rank

S1 = Critically Imperiled — Critically imperiled in the state because of extreme rarity (often 5 or fewer occurrences) or because of some factor(s) such as very steep declines making it especially vulnerable to extirpation from the state.

S2 = Imperiled — Imperiled in the state because of rarity due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors making it very vulnerable to extirpation from the nation or state.

S3 = Vulnerable — Vulnerable in the state due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors making it vulnerable to extirpation.

S#S# = Range Rank — A numeric range rank (e.g., S2S3) is used to indicate any range of uncertainty about the status of the species or community.

? = Qualifier: Inexact or Uncertain — A question mark represents a rank qualifier, denoting an inexact or uncertain numeric rank.

California Rare Plant Rank

1B.1 = Plants rare, threatened, or endangered in California and elsewhere; seriously threatened in California

1B.2 = Plants rare, threatened, or endangered in California and elsewhere; fairly threatened in California

2B.2 = Plants rare, threatened, or endangered in California, but more common elsewhere; fairly threatened in California

3.2 = Plants about which we need more information; fairly threatened in California

Table 5. Special-Status Wildlife Species with Potential to Occur Within or in the Vicinity of the Study Area of the Cache Slough Mitigation Site, Sacramento County, California

Common Name (Scientific Name)	Special-Status Listings and Ranks						Range	General Habitat	Potential To Occur Onsite
	Comments	Fed List	State List	Global Rank	State Rank	Other Status			
Birds									
American peregrine falcon (*Falco peregrinus anatum*)	Nesting	-	-	G4T4	S3S4	CDF-Sensitive, CDFW-FP	Permanent resident on the north and south Coast Ranges; may summer on the Cascade and Klamath Ranges south through the Sierra Nevada to Madera County; winters in the Central Valley south through the Transverse and Peninsular Ranges and the plains east of the Cascade Range.	Nests and roosts on protected ledges of high cliffs, usually adjacent to lakes, rivers, or marshes that support large populations of other bird species.	**None for nesting**. No nesting habitat (cliffs) occurs onsite. However, the species probably utilizes the site for foraging during the winter.
Bank swallow (*Riparia riparia*)	Nesting	-	ST	G5	S2	BLM-Sensitive	Summer migrant in riparian and lowland habitats, most commonly along Sacramento and Feather rivers in northern Central Valley. Also found along central coast and northeastern California, rarely wintering in Southern California.	Riparian scrub and woodland. Colonial nester. Requires vertical banks/cliffs with fine-textured/sandy soils near streams, rivers, lakes, ocean to dig nesting hole.	**None for nesting.** No nesting habitat (sandy vertical banks) occurs onsite.
Burrowing owl (*Athene cunicularia*)	Burrow sites & some wintering sites	-	-	G4	S3	BLM-Sensitive, CDFW-SSC, USFWS-BCC	Lowlands throughout California, including the Central Valley, northeastern plateau, southeastern deserts, and coastal areas; rare along south coast.	Open, dry annual or perennial grasslands, deserts, and scrublands characterized by low-growing vegetation. Subterranean nester, dependent upon burrowing mammals, most notably, the California ground squirrel.	**Low.** Suitable burrows are generally absent onsite and California ground squirrels do not occur onsite.
California black rail (*Laterallus jamaicensis coturniculus*)		-	ST	G3T1	S1	BLM-Sensitive, CDFW-FP	Most (>90 percent) species are found in the tidal salt marshes of the northern San Francisco Bay region (primarily San Pablo and Suisun Bays). Smaller populations occur in San Francisco Bay, the Outer Coast of Marin County, freshwater marshes in the foothills of the Sierra Nevada, and in the Colorado River Area.	Inhabits freshwater marshes, wet meadows and shallow margins of saltwater marshes bordering larger bays. Needs water depths of about 1 inch that do not fluctuate during the year and dense vegetation for nesting habitat.	**Low.** Suitable habitat (non fluctuating waters less than 1 inch depth) are absent onsite.
Cooper's hawk (*Accipiter cooperii*)	Nesting	-	-	G5	S4	CDFW-WL, IUCN-LC	Common across the state, including Southern California.	Year-round resident in forested areas including live oak woodlands, deciduous riparian areas. Usually nests near streams or open water. Forages in patchy woodland and habitat edges.	**Moderate for Nesting.** Although a few trees are located onsite, no nests of this species have been located. However, this species has been detecting foraging onsite and on the adjacent properties.
Great blue heron (*Ardea herodias*)	Nesting colony	-		G5	S4	CDF:S, IUCN-LC	Most commonly nests in the Central Valley, followed by coastal areas, and less commonly in the Great Basin, Cascade Ranges, Sierra Nevada, and southern deserts.	Colonial nester in tall trees, cliffsides, and sequestered spots on marshes. Rookery sites in close proximity to foraging areas: marshes, lake margins, tide-flats, rivers and streams, wet meadows.	**None.** No heron or egret nesting colonies occur onsite.
Great egret (*Ardea alba*)	Nesting colony	-	-	G5	S4	CDF:S, IUCN-LC	Most commonly nests in the Central Valley, followed by coastal areas, and less commonly in the Great Basin, Cascade Ranges, Sierra Nevada, and southern deserts.	Colonial nester in large trees. Rookery sites located near marshes, tide-flats, irrigated pastures, and margins of rivers and lakes.	**None.** No heron or egret nesting colonies occur onsite.

Table 5. Special-Status Wildlife Species with Potential to Occur Within or in the Vicinity of the Study Area of the Cache Slough Mitigation Site, Sacramento County, California

Common Name (Scientific Name)	Special-Status Listings and Ranks						Range	General Habitat	Potential To Occur Onsite
	Comments	Fed List	State List	Global Rank	State Rank	Other Status			
Loggerhead shrike (*Lanius ludovicianus*)	Nesting	-	-	G4	S4	CDFW-SSC, IUCN-LC	Common across the state; Open lowlands of the Southern Coast	Prefers open habitats for foraging with scattered shrubs, trees, posts, fences, utility lines, or other perches. Nests are always built in trees or shrubs three feet or more off the ground.	**Low.** Marginal nesting habitat and foraging habitat occurs onsite.
Mountain plover (*Charadrius montanus*)	Wintering	-	-	G3	S2S3	BLM-Sensitive, CDFW-SSC, USFWS-BCC	Wintering in Central Valley from Sutter and Yuba Co. south, as well as in Imperial Valley, the Colorado River valley, and in Los Angeles and San Bernardino counties.	Found on short grasslands and plowed fields with little vegetation. Forages for large insects on ground.	**Not Probable.** Preferred habitat (short grasslands and plowed fields) do not occur onsite. This species would have been observed onsite during surveys, if present.
Northern harrier (*Circus hudsonius*)	Nesting	-	-	G5	S4	CDFW-SSC, USFWS-BCC	Common across the state, including Southern California	Found most commonly in meadows, grasslands, open rangelands, desert sinks, fresh and saltwater emergent wetlands. Nest in tall grass or grasslike vegetation.	**Moderate for Nesting.** The tall ungrazed condition of the site provides suitable habitat for nesting of this species. This species was detected on the adjacent property nesting in similar habitat to those occurring onsite.
Osprey (*Pandion haliaetus*)	Nesting	-	-	G5	S4	CDFW-WL, CDF:S,	Breeds in northern California around inland lakes, reservoirs, and river systems. Migrates along coast and western slope of Sierra Nevada to Central and South America.	Nests high in large snags and open branched trees near large bodies of water. Forages over open, clear water for fish.	**Not Probable for Nesting.** This species' nest would have been observed during surveys, if present. However, this species is known to forage in the adjacent Cache Slough.
Song Sparrow ("Modesto" population) (*Melospiza melodia* pop. 1)		-	-	G5T3?Q	S3?	CDFW-SSC	Sacramento Valley (particularly Butte Sink area), Sacramento-San Joaquin River Delta, and northern San Joaquin Valley.	Affinity for emergent freshwater marshes dominated by tules, cattails, and riparian willow thickets. Will nest in riparian forests of valley oaks with an understory of blackberry, along vegetated irrigation canals and levees.	**Moderate for Nesting.** Suitable nesting and foraging habitat occurs onsite and several unidentified passerine nests have been observed onsite. However, this species has not been observed.
Swainson's hawk (*Buteo swainsoni*)	Nesting	-	ST	G5	S3	BLM-Sensitive	Lower Sacramento and San Joaquin Valleys, the Klamath Basin, and Butte Valley; the states highest nesting densities occur near Davis and Woodland, Yolo County.	Nests in oaks or cottonwoods in or near riparian habitats; forages in grasslands, irrigated pastures, and grain fields.	**Present.** This species was observed nesting adjacent to the Watson Hollow Slough during 2022.
Tricolored blackbird (*Agelaius tricolor*)		-	ST	G1G2	S1S2	BLM-Sensitive, CDFW-SSC, USFWS-BCC	Largely endemic to California; permanent residents in the Central Valley from Butte County to Kern County; at scattered coastal locations from Marin County south to San Diego County; breeds at scattered locations in Lake, Sonoma, and Solano Counties; rare nester in Siskiyou, Modoc, and Lassen Counties.	Nests in dense colonies in emergent marsh vegetation, such as tules and cattails, or upland sites with blackberries, nettles, thistles, and grainfields; nesting habitat must be large enough to support 50 pairs; probably requires water at or near the nesting colony; requires large foraging areas, including marshes, pastures, agricultural wetlands, dairies, and feedlots, where insect prey is abundant.	**Low.** Although suitable nesting habitat exists onsite, this species was not observed nesting onsite. However, this species is known to forage onsite and in the adjacent properties to the north.

Table 5. Special-Status Wildlife Species with Potential to Occur Within or in the Vicinity of the Study Area of the Cache Slough Mitigation Site, Sacramento County, California

Common Name (Scientific Name)	Special-Status Listings and Ranks						Range	General Habitat	Potential To Occur Onsite
	Comments	Fed List	State List	Global Rank	State Rank	Other Status			
Western yellow-billed cuckoo (*Coccyzus americanus occidentalis*)	Nesting	FT	SE	G5T2T3	S1	BLM-Sensitive, USFS-Sensitive	The breeding range of the yellow-billed cuckoo formerly included most of North America from southern Canada to the Greater Antilles and northern Mexico. In recent years, the species' distribution in the west has contracted. The northern limit of breeding in the coastal states is now in Sacramento Valley (primarily breeding in riprian habitats along the Sacramento River from City of Colusa to City of Red Bluff). The species overwinters from Columbia and Venezuela, south to northern Argentina.	Riparian forest nester, along the broad, lower flood-bottoms of larger river systems. Nests in riparian jungles of willow, often mixed with cottonwoods, with lower story of blackberry, nettles, or wild grape.	**Not Probable.** The current habitat occurring onsite in not sufficient size and width to support nesting habitat for this species.
White-tailed kite (*Elanus leucurus*)	Nesting	-	-	G5	S3S4	BLM-Sensitive, CDFW-FP	Lowland areas west of Sierra Nevada from head of Sacramento Valley south, including coastal valleys and foothills to western San Diego County at the Mexico border.	Low foothills or valley areas with valley or live oaks, riparian areas, and marshes near open grasslands for foraging.	**Low.** Although suitable nesting habitat does exist onsite, this species was not observed nesting.
Invertebrates									
Antioch Dunes anthicid beetle (*Anthicus antiochensis*)		-	-	G1	S3		Occurring along Sacramento and Feather Rivers in Glenn, Tehama, Shasta, Solano, and Sutter Counties. Extirpated from type locality at Antioch Dunes.	Interior sand dunes and sand bars. Scavenges at night; burrows in sand during the day. Most commonly collected in June and July.	**None.** Suitable habitat (Sand dunes and Sand Bars) are lacking onsite.
Delta green ground beetle (*Elaphrus viridis*)		FT	-	G1	S1		Found in the greater Jepson Prairie area in south-central Solano County, California.	Grassland interspersed with vernal pools including several larger vernal pools (sometimes called playa pools or vernal lakes), such as Olcott Lake. Such playa pools typically hold water for longer durations than smaller vernal pools, from the onset of the rainy season through mid-summer. In south-central Solano County where the species is found, these playa pools contain former marine or lacustrine clays, as classified in the Pescadero soil series.	**None.** Suitable habitat (large vernal pools or playa pools) do not occur onsite.
Monarch butterfly *(Danaus plexippus)*		FC	-	G4	-		Across North America wherever suitable feeding, breeding, and overwintering habitat exists. The eastern and western populations are separated by the Rocky Mountains. Overwinter in central to south California coastal region and Mexico.	California overwintering habitat including eucalyptus, Monterey pines, and Monterey cypresses. Milkweed is the sole food source for larvae.	**None.** Suitable nesting and foraging habitat (eucalyptus and pines and milkweed [Asclepias ssp.]) do not occur onsite.
Sacramento anthicid beetle *(Anthicus sacramento)*		-	-	G1	S4		Along Sacramento and San Joaquin rivers from Shasta Co. to San Joaquin Co. as well as along Feather River near Nicolaus.	Interior sand dunes and sand bars, as well as in dredge spoil heaps. Most commonly collected in June-August. Generally found in sandy areas with some vegetative cover (e.g. Arundo or Salix spp)	**None.** Suitable habitat (Sand dunes and sand bars) are lacking onsite.

Table 5. Special-Status Wildlife Species with Potential to Occur Within or in the Vicinity of the Study Area of the Cache Slough Mitigation Site, Sacramento County, California

Common Name (Scientific Name)	Special-Status Listings and Ranks						Range	General Habitat	Potential To Occur Onsite
	Comments	Fed List	State List	Global Rank	State Rank	Other Status			
Valley elderberry longhorn beetle *(Desmocerus californicus dimorphus)*		FT	-	G3T2	S3		Streamside habitats below 3,000 feet through the Central Valley of California.	Riparian and oak savanna habitats with elderberry shrubs; elderberries are host plant.	**Not Probable.** Although two elderberry [*Sambucus* ssp.]) occur onsite, their stems are less than 1 inch in diameter and therefore do not offer suitable habitat.
California linderiella *(Linderiella occidentalis)*		-	-	G2G3	S2S3		Endemic to the grasslands of the Central Valley and Central Coast mountains.	Seasonal pools in unplowed grasslands with old alluvial soils underlain by hardpan or in sandstone depressions. Water in the pools has very low alkalinity, conductivity, and total dissolved solids.	**Not Probable.** Suitable habitat (vernal pools and seasonal wetlands that do not receive summer water) are lacking onsite. In addition, this species' eggs (cyst) would have been identified during dry-season sampling efforts, if occurring onsite.
Conservancy fairy shrimp (*Branchinecta conservatio*)		FE	-	G2	S2		Occurs in the Central Valley from Merced County north to Tehama County and one isolated population in Ventura County.	Occurs in large turbid vernal pools, or playa pools.	**None.** Suitable habitat (large turbid vernal or playa pools) does not occur onsite.
Vernal pool fairy shrimp (*Branchinecta lynchi*)		FT	-	G3	S3		Endemic to the grasslands of the Central Valley, Central Coast mountains, and South Coast mountains	Inhabits small, clear-water sandstone depression pools and grassed swale, earth slump, or basalt-flow depression pools.	**Not Probable.** Marginal habitat occurs onsite and this species presence would have been detected during dry-season sampling cyst culturing efforts.
Vernal pool tadpole shrimp (*Lepidurus packardi*)		FE	-	G4	S3S4		Endemic to the Central Valley.	Inhabits vernal pools and swales containing clear to highly turbid water.	**Not Probable.** Suitable habitat (vernal pools and seasonal wetlands that do not recieve summer water) are lacking onsite. In addition, this species eggs (cyst) would have been identified during dry-season sampling efforts, if occurring onsite.
Mammals									
Hoary bat (*Lasiurus cinereus*)		-	-	G3G4	S4		Occurs statewide. Winters along coast and in southern California.	Roosts in dense foliage of medium to large trees. Prefers open habitat or habitat mosaics.	**Low.** Marginal roosting habitat occurs onsite. However, specific surveys for this species were not conducted.
Western red bat *(Lasiurus blossevillii)*		-	-	G4	S3	CDFW-SSC	Occurring from Shasta Co. to the Mexican border, west of the Sierra Nevada/Cascade crest and deserts. The winter range includes western lowlands and coastal regions south of San Francisco Bay.	Roosts primarily in trees, 2-40 ft above ground, from sea level up through mixed conifer forests. Prefers habitat edges and mosaics with trees that are protected from above and open below with open areas for foraging.	**Not Probable.** Suitable roosting habitat (mixed conifer forest) is lacking onsite.
Reptiles									
Giant garter snake *(Thamnophis gigas)*		FT	ST	G2	S2		Historically, this snake ranged from Kern County north along the Central Valley to Butte County, with a gap in the central part of the valley. Currently, ranges from Glenn County to the southern edge of the San Francisco Bay Delta, and from Merced County to northern Fresno County, apparently no longer occurring from south of northern Fresno County.	Found primarily in marshes, sloughs, drainage canals, and irrigation ditches, especially around rice fields, and occasionally in slow-moving creeks. Prefers locations with vegetation close to the water for basking.	**High.** Although this species was not detected during surveys, specific surveys for this species were not conducted. Nonetheless, suitable habitat occurs onsite.

Table 5. Special-Status Wildlife Species with Potential to Occur Within or in the Vicinity of the Study Area of the Cache Slough Mitigation Site, Sacramento County, California

Common Name (Scientific Name)	Special-Status Listings and Ranks						Range	General Habitat	Potential To Occur Onsite
	Comments	Fed List	State List	Global Rank	State Rank	Other Status			
Western pond turtle *(Emys marmorata)*		-	-	G3G4	S3	BLM-Sensitive, CDFW-SSC, USFS-Sensitive	In California, range extends from Oregon border of Del Norte and Siskiyou Counties south along coast to San Francisco Bay, inland through Sacramento Valley, and on the western slope of Sierra Nevada; range overlaps with that of southwestern pond turtle through the Delta and Central Valley to Tulare County.	Woodlands, grasslands, and open forests; occupies ponds, marshes, rivers, streams, and irrigation canals with muddy or rocky bottoms and with watercress, cattails, water lilies, or other aquatic vegetation.	**Present.** This species was observed at numerous locations within Watson Hollow Slough and Cache Slough during 2021 and 2022 surveys.

Definitions

Federal

FE = Federally Endangered (listed as Endangered under Federal Endangered Species Act [ESA])

FT = Threatened - listed (ESA) as likely to beome endangered within the foreseeable future.

State

SE = Endangered (listed unded California Endangered Species Act[CESA])

ST = Threatened(CESA) - listed as likely to beome endangered within the foreseeable future.

FP = Fully protected under the California Fish and Game Code

WL = Watch list - designated as a species in need of conservation help by California Department of Fish and Wildlife (CDFW)

SSC = Species of Special Concern - status for species with declining population levels, limited ranges and/or continuing threats that have mad

** = Listed on Special Animals List by California Natural Diversity Database (CNDDB).

-- = no listing

APPENDIX E.
SPECIES OBSERVATIONS
TABLES 6 AND 7

Vascular Plants Observed at the Cache Slough Mitigation Bank during 2020, 2021, and 2022

Scientific Name	Common Name	Wetland Indicator Status
Trees		
Acer negundo	Boxelder	FACW
Alnus rhombifolia	White alder	FACW
Fraxinus latifolia	Oregon ash	FACW
Juglans hindsii	Northern California black walnut	FAC
Juglans regia	English walnut	NL
*Pistacia chinensis**	Chinese pistace	NL
Platanus racemosa	Western sycamore	FAC
Quercus lobata	Valley oak	FACU
Quercus wislizeni var. *wislizeni*	Interior live oak	NL
*Robinia pseudoacacia**	Black locust	FACU
*Salix babylonica**	Weeping willow	FACW
Salix exigua	Sandbar willow	FACW
Salix gooddingii	Black willow	FACW
Salix lasiandra	Pacific willow	FACW
Salix lasiolepis	Arroyo willow	FACW
Salix sp.	Willow	FACW
Shrubs		
Baccharis pilularis ssp. consanguinea	Coyote brush	NL
Cephalanthus occidentalis	Button willow, Common buttonbrush	OBL
*Ligustrum sp.**	Privet	NL
*Nerium oleander**	Oleander	NL
Salix exigua	Sandbar willow	FACW
Sambucus nigra ssp. *caerulea*	Blue elderberry	FACU
*Sesbania punicea**	Rattlebox	FACW
Toxicodendron diversilobum	Poison oak	FACU
Vines		
Rosa californica	California rose	FAC
*Rubus armeniacus**	Himalayan berry	FAC
Rubus ursinus	California blackberry	FAC
Vitis californica	California wild grape	FACU
Ferns		
Azolla filiculoides	American water fern, mosquito fern	OBL
Equisetum arvense	Common horsetail	FAC
Grasses		
*Aira caryophyllea**	Silver hairgrass	FACU
Agrostis exarata	Spike redtop	FACW

Vascular Plants Observed at the Cache Slough Mitigation Bank during 2020, 2021, and 2022

Scientific Name	Common Name	Wetland Indicator Status
*Agrostis stolonifera**	Creeping bent grass	FACW
*Arundo donax**	Giant reed, Giant cane	FACW
*Avena fatua**	Wild oats	NL
Avena sp (A. fatua and A. barbata)*	Oats	NL
Bromus carinatus var. *carinatus*	California brome	NL
*Bromus diandrus**	Ripgut brome, Ripgut grass	NL
*Bromus hordeaceus**	Soft brome	FACU
*Cortaderia selloana**	Uruguayan pampas grass	FACU
*Crypsis schoenoides**	Swampgrass, swamp timothy	FACW
*Cynodon dactylon**	Bermuda grass	FACU
Deschampsia danthonioides	Annual hairgrass, silverhair grass	FACW
*Digitaria sanguinalis**	Hairy crabgrass	FACU
Distichlis spicata	Salt grass	FAC
*Echinochloa crus-galli**	Watergrass	FACW
*Elymus caput-medusae**	Medusa-head grass	NL
Elymus triticoides	Creeping wild rye, Beardless wild rye	FAC
*Festuca perennis**	Italian ryegrass	FAC
*Gastridium phleoides**	Nitgrass	FACU
*Glyceria declinata**	Waxy mannagrass	FACW
Hordeum marinum ssp. *gussoneanum**	Mediterranean barley	FAC
Hordeum murinum ssp. *leporinum**	Hare barley	FACU
Leptochloa sp.	Sprangletop	FACW
*Parapholis incurva**	Sicklegrass	FACU
*Paspalum dilatatum**	Dallis grass	FAC
Paspalum distichum	Knot grass	FACW
*Poa annua**	Annual bluegrass	FAC
*Polypogon australis**	Chilean rabbitsfoot grass	FACW
*Polypogon monspeliensis**	Rabbitsfoot grass	FACW
*Setaria pumila**	Yellow bristlegrass	FAC
*Setaria viridus**	Green bristlegrass	NL
*Sorghum halepense**	Johnsongrass	FACU
Grasslikes		
Bolboschoenus maritimus	Alkali bulrush	OBL
Carex barbarae	Santa Barbara sedge	FAC
Cyperus acuminatus	Tapertip flatsedge	OBL
Cyperus eragrostis	Tall flatsedge, Umbrella-sedge	FACW
Eleocharis macrostachya	Common spike rush	OBL
Eleocharis montevidensis	Montevideo spike rush, sand spikerush	FACW
Juncus balticus	Baltic rush	FACW
Juncus bufonius	Toad rush	FACW
Juncus effusus var. *pacificus*	Pacific rush	FACW
Juncus mexicanus	Mexican rush	FACW

Vascular Plants Observed at the Cache Slough Mitigation Bank during 2020, 2021, and 2022

Scientific Name	Common Name	Wetland Indicator Status
Juncus tenuis	Poverty rush, Slender rush	FACW
Juncus xiphioides	Iris leaved rush	OBL
Schoenoplectus acutus var. *occidentalis*	Tule	OBL
Schoenoplectus californicus	California bulrush	OBL
*Typha angustifolia**	Narrow leaf cattail	OBL
Typha latifolia	Broadleaf cattail	OBL
Herbs		
Abutilon theophrasti	Velvet leaf	UPL
Achyrachaena mollis	Blow-wives	FAC
Alisma triviale (*A. plantago-aquatica*)	Northern water plantain	OBL
*Amaranthus albus**	Pigweed amaranth	FACU
Artemisia douglasiana	California mugwort	FAC
*Atriplex hortensis**	Orache	FAC
Atriplex patula	Spear oracle	FACW
*Atriplex prostrata**	Fat-hen	FACW
Barbarea orthoceras	Winter cress	FACW
Blennosperma nanum	Common blennosperma	FACW
*Brassica nigra**	Black mustard	NL
*Brassica rapa**	Field mustard	FACU
Calandrinia menziesii	Red maids	FACU
Callitriche marginata	California water starwort	OBL
*Capsella bursa-pastoris**	Shepherd's purse	FACU
Cardamine oligosperma	Few-seeded bitter-cress	FAC
*Carduus pycnocephalus**	Italian thistle	NL
*Centaurea calcitrapa**	Purple star thistle	NL
*Centaurea solstitialis**	Yellow star-thistle	NL
Centromadia pungens	Common tarweed, common spikeweed	FAC
*Cerastium glomeratum**	Mouse-ear chick-weed	UPL
*Chenopodium album**	Goosefoot	FACU
Chenopodium berlandieri	Berlandier's goosefoot	NL
Chenopodium californicum	California goosefoot	NL
*Cichorium intybus**	Chicory	FACU
*Cirsium vulgare**	Bull thistle	FACU
*Convolvulus arvensis**	Field bindweed	NL
*Cotula coronopifolia**	Brass buttons	OBL
Crassula aquatica	Aquatic pygmy weed	OBL
Cressa truxillensis	Alkali weed	FACW
Croton setiger	Dove weed	NL
*Dittrichia graveolens**	Stinkwort	NL
*Echinochloa crus-galli**	Watergrass	FACW
*Egeria densa**	Brazilian waterweed	OBL

Vascular Plants Observed at the Cache Slough Mitigation Bank during 2020, 2021, and 2022

Scientific Name	Common Name	Wetland Indicator Status
*Eichhornia crassipes**	Common water hyacinth	OBL
Epilobium brachycarpum	Tall annual willow herb	FAC
Epilobium ciliatum	Slender willow herb	FACW
Erigeron canadensis	Canada horseweed	FACU
*Erodium botrys**	Broadleaf filaree	FACU
*Erodium cicutarium**	Red-stem filaree	NL
Eryngium vaseyi	Coyote thistle	FACW
Erythranthe guttata (aka. *Mimulus guttatus*)	Streamside monkey flower	OBL
*Euphorbia maculata**	Spotted spurge	UPL
*Euphorbia prostrata**	Prostarte sandmat	FACU
*Foeniculum vulgare**	Fennel	NL
Frankenia salina	Alkali heath	FACW
*Galium divaricatum**	Lamarck's bedstraw	FACU
*Galium murale**	Tiny bedstraw	NL
*Geranium dissectum**	Cut leaved geranium	NL
Gnaphalium palustre	Western marsh cudweed	FACW
Grindelia camporum	Great valley gumweed	FACW
Helianthus annus	Annual sunflower	FACU
Heliotropium curassavicum	Heliotrope	FACU
*Helminthotheca echioides**	Prickly ox-tounge	FAC
Heterotheca grandiflora	Telegraph weed	NL
*Hirschfeldia incana**	Short podded mustard	NL
Hydrocotyl verticillata	Whorled marsh pennywort	OBL
*Hypericum perforatum**	Klamath weed	FACU
*Iris pseudacoris**	Water iris	OBL
*Kickxia elatine**	Sharp point fluellin	UPL
*Lactuca serriola**	Prickly wild lettuce	FACU
Lasthenia fremontii	Fremont's goldfield	OBL
Lathyrus jepsonii var. jepsonii	Delta tule pea	OBL
Lemna minor	Smaller duckweed	OBL
*Leontodon saxatilis**	Hairy hawkbit	FACU
Lepidium acutidens	Net pepper grass	FAC
*Lepidium latifolium**	Perennial pepperweed	FAC
*Lotus corniculatus**	Birds' foot trefoil	FAC
Ludwigia palustris	Marsh purslane	OBL
*Ludwigia peploides**	Floating water primrose	OBL
*Lugwigia hexapetala**	Six petal water primrose	(OBL)
Lupinus bicolor	Miniature lupine	NL
Lycopus americanus	Bugleweed	OBL
*Lysimachia arvensis**	Scarlet pimpernel	FAC
*Lythrum hyssopifolia**	Hyssop loosestrife	OBL
*Malva neglecta**	Dwarf mallow	NL

Vascular Plants Observed at the Cache Slough Mitigation Bank during 2020, 2021, and 2022

Scientific Name	Common Name	Wetland Indicator Status
*Malva parviflora**	Cheeseweed mallow	NL
Malvella leprosa	Alkali mallow	FACU
*Medicago polymorpha**	Bur clover	FACU
*Melilotus albus**	White sweetclover	NL
*Melilotus indicus**	Sourclover	FACU
Mentha arvensis	American wild mint	FACW
Myosotis laxa	Bay forget me not	OBL
*Nasturtium officinale**	Watercress	OBL
Persicaria amphibia	Water smartweed	OBL
*Persicaria hydropiper**	Common smartweed	OBL
Persicaria laphathifolia	Common knotweed	FACW
*Persicaria maculosa**	Spotted lady's thumb	FACW
*Persicaria punctata**	Dotted smartweed	OBL
Phyla nodiflora	Common lippia	FACW
Pilularia americana	American pillwort	OBL
Plagiobothrys chorisianus	Choris's popcorn flower	OBL
Plagiobothrys stipitatus var. *micranthus*	Stalked popcornflower	FACW
*Plantago coronopus**	Cut leaf plantain	FAC
Plantago elongata	Long leaf plantain	FACW
*Plantago lanceolata**	Narrow leaf plantain	FAC
*Plantago major**	Common plantain	FAC
*Polygonum aviculare**	Common knotweed	FAC
*Pseudognaphalium luteoalbum**	Jersey cudweed	FAC
Psilocarphus oregonus	Oregon woolly marbles	OBL
Ranunculus sceleratus	Cursed buttercup	OBL
*Raphanus raphanistrum**	Jointed charlock	NL
*Raphanus sativus**	wild radish	NL
Rorippa curvisiliqua	Curvepod yellow cress	OBL
*Rumex acetosella**	Sheep sorrel	FACU
Rumex conglomeratus	Clustered dock	FACW
*Rumex crispus**	Curly dock	FAC
*Rumex pulcher**	Fiddle dock	FAC
*Rumex stenophyllus**	Narrowleaf dock	FACW
*Senecio vulgaris**	Common groundsel	FACU
*Silybum marianum**	Milk thistle	NL
Sisyrinchium bellum	Blue eyed grass	FACW
*Sonchus oleraceus**	Common sow thistle	UPL
*Spergularia rubra **	Purple sandspurry	FAC
Suaeda sp.	Seepweed	OBL
Symphyotrichum lentum	Suisun Marsh aster	OBL
*Trifolium campestre**	Hop clover	NL
*Trifolium dubium**	Shamrock	UPL

Vascular Plants Observed at the Cache Slough Mitigation Bank during 2020, 2021, and 2022

Scientific Name	Common Name	Wetland Indicator Status
*Trifolium hirtum**	Rose clover	NL
Triphysaria erianthus	Butter 'n' eggs	UPL
Triteleia hyacinthina	white brodiaea	FAC
Verbena lasiostachys	Western vervain	FAC
*Veronica anagallis-aquatica**	water speedwell	OBL
Veronica peregrina	Neckweed	FAC
Vicia sativa ssp. *nigra**	common vetch	FACU
Vicia sativa ssp. *sativa**	Sweet or spring vetch	FACU
*Vicia villosa**	Hairy or winter vetch	NL
Xanthium spinosum	Spiny cocklebur	FACU
Xanthium strumarium	Cocklebur	FAC
Zeltnera muehlenbergii	Muehlenberg's centaury	FAC

* = non native

Table 7. Wildlife Species Observed at the Cache Slough Mitigation Bank, Solano County, California.

Common name	Scientific name
Crustacea	
Red swamp crayfish	*Procambarus clarkii*
Versatile fairy shrimp	*Branchinecta lindhli*
Fishes (Pisces)	
Mosquitofish	*Gambusia affinis*
Sacramento pikeminnow	*Ptychocheilus grandis*
Small mouth bass	*Micropterus dolomieu*
Salamanders, Toads, and Frogs (Amphibia)	
Sierran treefrog	*Pseudacris sierra*
American bullfrog	*Lithobates catesbeianus*
California toad	*Anaxyrus boreas halophilus*
Turtles, Lizards, and Snakes (Reptilia)	
Common garter snake	*Thamnophis sirtalis*
Gopher snake	*Pituophis melanoleucus*
Northwestern pond turtle	*Actinemys marmorata*
Western fence lizard	*Sceloporus occidentalis*
Western yellow-bellied racer	*Coluber constrictor mormon*
Birds (Aves)	
American avocet	*Recurvirostra americana*
American coot	*Fulica americana*
American crow	*Corvus brachyrhynchos*
American goldfinch	*Carduelis tristis*
American kestrel	*Falco sparverius*
American robin	*Turdus migratorius*
American white pelican*	*Pelecanus erythrorhynchos*
American wigeon	*Mareca americana*
Anna's hummingbird	*Calypte anna*
Bald eagle*	*Haliaeetus leucocephalus*
Barn swallow*	*Hirundo rustica*
Belted kingfisher	*Megaceryle alcyon*
Black phoebe	*Sayornis nigricans*
Black-chinned hummingbird	*Archilochus alexandri*
Black-crowned night-heron	*Nycticorax nycticorax*
Black-necked stilt	*Himantopus mexicanus*
Blue-winged teal	*Spatula discors*
Brewer's blackbird	*Euphagus cyanocephalus*
Bufflehead	*Bucephala albeola*
California quail	*Callipepla californica*
California scrub-jay	*Aphelocoma californica*

Table 7. Wildlife Species Observed at the Cache Slough Mitigation Bank, Solano County, California.

California towhee	*Melozone crissalis*
Canada goose	*Branta canadensis*
Cattle egret	*Bubulcus ibis*
Cinnamon teal	*Spatula cyanoptera*
Cliff swallow*	*Petrochelidon pyrrhonota*
Common raven*	*Corvus corax*
Cooper's hawk	*Accipiter cooperii*
Dark-eyed junco	*Junco hyemalis*
Double-crested cormorant*	*Phalacrocorax auritus*
Dunlin	*Calidris alpina*
Eurasian collared-dove	*Streptopelia decaocto*
European starling	*Sturnus vulgaris*
Ferruginous hawk*	*Buteo regalis*
Gadwall	*Marceca strepera*
Golden eagle*	*Aquila chrysaetos*
Golden-crowned sparrow	*Zonotrichia atricapilla*
Great blue heron	*Ardea herodias*
Great egret	*Ardea alba*
Greater sandhill crane*	*Antigone canadensis tabida*
Greater white-fronted goose	*Anser albifrons*
Greater yellowlegs	*Tringa melanoleuca*
Great-tailed grackle	*Quiscalus mexicanus*
Green heron	*Butorides virescens*
Green-winged teal	*Anas crecca*
Hermit thrush	*Catharus guttatus*
Horned lark	*Eremophila alpestris*
House finch	*Haemorhous mexicanus*
House sparrow	*Passer domesticus*
House wren	*Troglodytes aedon*
Killdeer	*Chanadrius vociferus*
Lark sparrow	*Chondestes grammacus*
Least sandpiper	*Calidris minutilla*
Loggerhead shrike	*Lanius ludovicianus*
Long-billied curlew	*Numenius americanus*
Mallard	*Anas platyrhynchos*
Marsh wren	*Cistothorus palustris*
Mourning dove	*Zenaida macroura*
Northern flicker	*Colaptes auratus*
Northern harrier	*Circus hudsonius*
Northern mockingbird	*Mimus polyglottos*
Northern pintail	*Anas acuta*
Northern rough-winged swallow	*Stelgidopteryx serripennis*
Northern shoveler	*Spatula clypeata*
Nuttall's woodpecker	*Dryobates nuttallii*

Table 7. Wildlife Species Observed at the Cache Slough Mitigation Bank, Solano County, California.

Osprey*	*Pandion haliaetus*
Pied-billed grebe	*Podilymbus podiceps*
Red-shouldered hawk*	*Buteo lineatus*
Red-tailed hawk	*Buteo jamaicensis*
Red-winged blackbird	*Agelaius phoeniceus*
Ring-necked pheasant	*Phasianus colchicus*
Rock dove (Domestic pigeon)	*Columba livia*
Ruby-crowned kinglet	*Regulus calendula*
Savannah sparrow	*Passerculus sandwichensis*
Say's phoebe	*Sayornis saya*
Snow goose	*Anser caerulescens*
Snowy egret	*Egretta thula*
Song sparrow	*Melospiza melodia*
Spotted towhee	*Pipilo maculatus*
Swainson's hawk	*Buteo swainsoni*
Tree swallow	*Tachycineta bicolor*
Tricolored blackbird	*Agelaius tricolor*
Turkey vulture*	*Cathartes aura*
Violet-green swallow	*Tachycineta thalassina*
Water pipet	*Anthus spinoletta*
Western bluebird	*Sialia mexicana*
Western grebe	*Aechmophorus occidentalis*
Western gull*	*Larus occidentalis*
Western kingbird	*Tyrannus verticalis*
Western meadowlark	*Sturnella neglecta*
Western sandpiper	*Calidris mauri*
Western tanager	*Piranga ludoviciana*
White-crowned sparrow	*Zonotrichia leucophrys*
White-faced ibis	*Plegadis chihi*
White-tailed kite*	*Elanus leucurus*
Wild turkey	*Meleagris gallopavo*
Wilson's snipe	*Gallinago delicata*
Wood duck*	*Aix sponsa*
Wrentit	*Chamaea fasciata*
Yellow warbler	*Setophaga petechia*
Yellow-rumped warbler	*Setophaga coronata*

Mammals (Mammalia)

American mink	*Neovison vison*
Desert cottontail	*Sylvilagus audubonii*
Black-tailed jackrabbit	*Lepus californicus*
California sea lion	*Zalophus californianus*
Coyote*	*Canis latrans*

Table 7. Wildlife Species Observed at the Cache Slough Mitigation Bank, Solano County, California.

Deer mouse	*Peromyscus maniculatus*
Feral cat	*Felis catus*
Muskrat	*Ondatra zibethicus*
North American beaver	*Castor canadensis*
North American river otter**	*Lontra canadensis*
Raccoon**	*Procyon lotor*
Striped skunk**	*Mephitis mephitis*
Virginia opossum**	*Didelphis virginiana*

* Observed flying over Study Area

** Observed sign (e.g., scat, prints)