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## Little Egbert Multi-Benefit Project Biological Resources

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## Acronyms and Abbreviations

Acronym/Abbreviation	Definition
CDFW	California Department of Fish and Wildlife
CESA	California Endangered Species Act
CNDDDB	California Natural Diversity Database
CNPS	California Native Plant Society
CVRWQCB	Central Valley Regional Water Quality Control Board
CVFPB	Central Valley Flood Protection Board
CWA	Clean Water Act
FESA	Federal Endangered Species Act
LET	Little Egbert Tract
MBTA	Migratory Bird Treaty Act
NAVD	North American Vertical Datum
NRCS	Natural Resources Conservation Service
RD	Reclamation District
SAFCA	Sacramento Area Flood Control Agency
SPFC	State Plan of Flood Control
SRFCP	Sacramento River Flood Control Project
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service

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# CHAPTER 1

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## Introduction

### 1.1 Background

This report provides biological resources information for the proposed Little Egbert Multi-Benefit Project (Project). This report evaluates the special-status wildlife, plants, and other sensitive biological resources that potentially occur on the Little Egbert Tract, the former Powell property and vicinity, referred to collectively as the Study Area<sup>1</sup>. The evaluation is based on background data review as well as reconnaissance surveys conducted by Environmental Science Associates (ESA) in September 2019. The purpose was to characterize these biological resources in support of obtaining permits for geotechnical investigations, which were conducted in 2020 and 2021. Additional information on wildlife occurrence and habitat use is provided from surveys conducted in 2020, 2021 and 2022 for purposes of a wildlife hazard analysis (ESA 2023), which is provided as Exhibit B of this Appendix.

### 1.2 Study Area Description

The Study Area is located just south of the lower reach of the Yolo Bypass, immediately north of the City of Rio Vista in Solano County (**Figure 1-1**). The Study Area encompasses approximately 3,480 acres of land and includes approximately 470 geotechnical exploration points within the Little Egbert Tract and the Powell Property, as well as levees surrounding Little Egbert Tract and Powell Property (**Figure 1-2**). Figure 1-2 depicts the general locations of those geotechnical exploration points that are not on the levees.

The Powell Property is located immediately south of Little Egbert Tract and separated by Watson Hollow Slough. The Study Area is generally bounded on the north by Lindsey Slough, on the west by the Reclamation District 536 (RD 536) federal Project Levee, Solano County Levee 44 and Mellin Levee Extension, and on the south by the Central Valley Flood Protection Board (CVFPB) Mellin Levee (also a federal Project levee), and on the east by Solano County Levee 28, a restricted-height levee along Cache Slough and the Sacramento Deep Water Ship Channel (**Figure 1-3**). State Route 84 is located along the southeastern portion of the site and, when open, provides access, via ferry, to Ryer Island to the east. The Little Egbert Tract property is immediately south of Liberty Island, a formerly leveed tract that has remained permanently inundated after the Project Levee failure in 1997 during a significant flood event.

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<sup>1</sup> This document was prepared in 2019 when the proposed Project encompassed both the Little Egbert Tract and the Powell Property. In 2020, the Little Egbert Multi-Benefit Project was developed, which only covers the Little Egbert Tract. The Cache Slough Mitigation Bank is being developed separately on the Powell Property. The findings from 2019 are still generally applicable to the biological resources of the LEMBP.

The Study Area is located downstream of the confluence of several watercourses including Lindsey Slough, Prospect Slough, Cache Slough, and the Sacramento River Deep Water Ship Channel. The Little Egbert Tract property is currently managed for production of approximately 2,600 acres of forage crops such as alfalfa, winter wheat, and silage corn. Additionally, the Powell Property consists of approximately 370 acres of pasture lands (SAFCA, 2018). The Study Area includes a levee along the west bank of Cache Slough and a State Plan of Flood Control (SPFC) levee that serves as the western levee of the Yolo Bypass. The Little Egbert Tract is generally flat with a gentle slope downward to the north and east.

## **Figure 1-1    Regional Setting**

## Figure 1-2 Study Area



## **Figure 1-3 Study Area Features**

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# CHAPTER 2

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## Methods

### 2.1 Review of Background Information

Prior to performing reconnaissance biological surveys, ESA reviewed publicly available data, subscription-based biological resource data, and Study Area-specific information. Data sources that assisted in this analysis include:

- Topographic maps (Rio Vista and surrounding 8 quadrangles)
- Historic and current aerial imagery
- The CDFW California Natural Diversity Database (CNDDB)
- The National Wetlands Inventory (USFWS 2019a)
- The California Native Plant Society (CNPS) online database
- Soil maps from the Natural Resources Conservation Service (NRCS)
- 2018 NRCS Producer Farm Data Report for Little Egbert Tract farm fields
- 2018 Little Egbert Tract Feasibility Study

### 2.2 Survey Dates and Surveying Personnel

Biological reconnaissance surveys of the Study Area were conducted by ESA Biologists Rachel Brownsey, Joseph Huang, Chuck Hughes, and Christina January on September 9, 2019, and by Rachel Brownsey, Kelly Bayne, Joseph Huang, and Laura Dodson on September 13, 2019. Surveys were conducted to observe and characterize vegetation communities in the Study Area and to assess habitat quality and potential for common and special-status wildlife species to occur within the Study Area or the vicinity. All levees surrounding Little Egbert Tract and the Powell Property, and much of their interior, were surveyed for habitat types, elderberry (*Sambucus* sp.) shrubs, and aquatic resources (**Figure 1-2**).

Additional wildlife surveys were conducted during 2020-2022 as part of a wildlife hazard analysis to assess potential bird strike risk for the nearby Rio Vista Municipal Airport (ESA 2023). These surveys were conducted during the spring-summer 2020 (twice a month, 11 collection days, April 22 to August 6, 2020) and during fall 2021-winter 2022 (once a month, 7 collection days, September 16, 2021 to March 30, 2022).

## 2.3 Regulatory Context

Biological resources in the Study Area may fall under the jurisdiction of various regulatory agencies and be subject to their regulations. In general, the greatest legal protections are provided for plant and wildlife species that are formally listed by the federal or state government. The following regulations and agencies are commonly associated with projects that have the potential to affect biological resources:

- Federal Endangered Species Act (FESA)
- Migratory Bird Treaty Act (MBTA)
- Bald and Golden Eagle Protection Act
- Clean Water Act, Section 404 (CWA)
- California Endangered Species Act (CESA)
- Fish and Game Code Section 3503, 3503.5, and 3511
- Native Plant Protection Act
- Lake or Streambed Alteration Program
- Porter Cologne Water Quality Act
- CEQA Guidelines Section 15380

These regulations are presented and discussed in **Appendix A** of this Exhibit, *Regulatory Context*.

# CHAPTER 3

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## Environmental Setting

This chapter provides the environmental baseline for soils, vegetation communities and habitats, and special-status plant and wildlife species in the Study Area.

### 3.1 Soils

The NRCS is a branch of the U.S. Department of Agriculture whose National Cooperative Soil Survey program produces soil data and provides information to the general public. NRCS has soil maps and data for approximately 95 percent of the nation's counties, including Solano County. Their reference materials include soil surveys, maps, reports and inventories, scientific and research reports and data, forestry, range, and wildlife inventories and studies, and official soil series and soil interpretations.

Soils were analyzed using NRCS and it was determined that 11 soil unit occurs within the Study Area, as shown in **Table 3-1** and **Figure 3-1**.

**TABLE 3-1**  
**MAP GEOLOGICAL UNIT NAMES**

Map Unit Symbol	Map Unit Name	Acres in Study Area	Percent of Study Area
CeA	Clear Lake clay, 0 to 2 percent slopes, Major Land Resource Area (MLRA) 17	48.5	1.4%
DaC	Diablo-Ayar clyas, 2 to 9 percent slopes	210.6	6.0%
Eb	Egbert silty clay loam, partially drained, 0 to 2 percent slopes, MLRA 16	2,060.1	58.6%
On	Omni silty clay	5.6	0.2%
Pc	Pescadero silty clay loam, 0 percent slopes, MLRA 17	209.4	6.0%
Pe	Pescadero clay, 0 percent slopes, MLRA 17	7.6	0.2%
Sd	Sacramento clay, 0 to 2 percent slopes, MLRA 16	130.4	3.7%
Tu	Tujunga fine sand	34.7	1.0%
Va	Valdez silt loam, drained, 0 to 2 percent slopes, MLRA 16	557.1	15.9%
W	Water	9.4	0.3%
Wc	Willows clay, 0 percent slopes, MLRA 17	240.7	6.9%
Total for Study Area		3,513.9	100.0%

SOURCE: USDA, 2019

## **Figure 3-1    Soils**

The surface geology of the Little Egbert Tract Property consists predominantly of clay and clay loams. The Powell Property is geologically more homogeneous and consists primarily of Valdez silt loam. The majority of the soils within the Study Area are formed in alluvium derived from sedimentary rock. The silt loams and clays that make up the majority of the Study Area are primarily poorly drained with runoff ranging from very high to low.

## 3.2 Hydrology

Due to its location in the Sacramento River Flood Control Project (SRFCP), the Study Area plays a key role in influencing conveyance for the Sacramento River System. The system of levees surrounding the Study Area dictates the hydrology both within the Study Area and surrounding it. The Study Area has a recorded flood conveyance easement. In extreme flood events (roughly greater than or equal to a 25-year runoff event), the northern segment of the restricted-height levee along Lindsey Slough and Cache Slough overtops consistent with the flood conveyance easement, resulting in flooding of the Study Area. However, this restricted-height levee separating the Study Area from Cache Slough limits the flood-carrying capacity of the Yolo Bypass for more frequent and less extreme flooding events, resulting in increased water surface elevation immediately upstream due to the narrowness of the slough ('hour-glass effect').

The Study Area slopes gently downward from the south to the north and east, with lowest elevations in the northeast corner of the Study Area (**Figure 3-2**). Elevations in the Study Area range from +10 to -8 feet (North American Vertical Datum [NAVD] 1988); with most of the site at or below zero feet. Drainage of the Little Egbert Tract occurs at the scale of individual agricultural fields through the field contouring and drainage to adjacent agricultural ditches. During the winter, precipitation runs off the individual fields and into the center drainage ditch then is pumped into Cache Slough. Pumping water out of the agricultural ditch system is necessary to keep the agricultural fields dry enough to farm. During the irrigation season (spring through fall), crops are flood- or furrow-irrigated using water pumped from the internal agricultural ditches.

The Powell Property is used for livestock grazing instead of row crops, and retains more of the natural topography, hydrology, and vegetation than Little Egbert Tract despite being leveled in the past for flood irrigation. The highest elevations on the Powell Property are upland grassland areas that receive only natural precipitation. The lower elevations and channels collect water during the winter and spring, then are supplemented with water from the agricultural canal to the north during spring and summer high tides. The livestock operator purposely floods the low areas of this property, through the manual operation of passive flap gates, to provide a water source for the livestock and forage plants throughout the summer and fall. During the flood season there is occasional flooding from the agricultural canal to the north, which flows into this property from the northwest corner and floods the northwest portion of the property. In the winter, the Powell Property is used for waterfowl hunting.

## Figure 3-2 Topographic Map



### 3.3 Biological Communities and Wildlife Habitats

Biological communities within the Study Area could provide potential habitat for special-status species. Upland biological communities within the Study Area include a variety of agriculture crops, ruderal, mixed riparian scrub, and grassland (**Figure 3-3**). Plant communities and habitats associated with aquatic settings within the Study Area include seasonal wetland, freshwater emergent wetland, and drainage ditches and irrigation canals. The boundaries of these wetland and aquatic habitats serve the purposes of defining wildlife habitats and areas for avoidance during geotechnical explorations, and do not represent a formal delineation of aquatic resources. Sensitive natural communities, such as those with a State rarity ranking of S1, S2, or S3, are identified within the descriptions below.

#### 3.3.1 Agriculture

The Study Area is comprised mainly of agricultural land, cultivated and managed to produce a variety of crops. In general, agricultural land within the Study Area has been leveled and undergoes frequent, generally seasonal cycles of tillage, seedbed preparation, seeding, crop growth, and harvesting, along with applications of irrigation water, fertilizers, and pesticides. Study Area crop types fall into three main categories described below.

In general, croplands support relatively low species diversity, but the value of agricultural lands for special-status and common fish and wildlife species varies greatly among crop types and agricultural practices. Agricultural lands close to natural land cover can provide functions that complement and increase the habitat value of the natural land cover. For example, some raptors nest in valley foothill riparian habitat but forage in nearby croplands.

##### Irrigated Agriculture

Irrigated crops at the Little Egbert Tract include alfalfa and silage corn. During the September 2019 reconnaissance survey both crops were present in approximately equal abundance, and in a patchwork distribution across the landscape. In general, the agricultural fields in the Study Area are kept extremely clean with very few weeds at the field margins, healthy crops, well-maintained roads, and properly functioning drainage and irrigation systems.

##### Dry-Farmed Agriculture

Winter wheat is planted and harvested in the narrow fields alongside the RD 536 Levee between the levee toe and the agricultural ditch. Based on winter conditions it is also planted in the fields used for silage corn in the summer. Winter wheat is harvested in the late spring, then the soil is disked or tilled. Along the levee toes, this land remains fallow through the summer and fall (Photo 1).

##### Irrigated Pasture

Irrigated pastures are located on the Powell Property and also to the west of the Little Egbert Tract property, but within the Study Area, along the western edge. These fields support a mix of pasture grasses and broadleaf plants that are flood irrigated during the summer and fall to feed beef cattle.



**Photo 1. Fallow field with ruderal levee slope. September 9, 2019.**

## Farmed Wetlands

Wetland areas within farm fields are classified as “farmed wetlands.” These are typically low points within the farm field where natural precipitation or irrigation water collects and ponds such that it is not able to drain off the site and creates localized anaerobic conditions. Farmed wetlands may also have an underlying restrictive layer either from soil compaction or from a natural impermeable layer that creates a perched water table thereby preventing percolation to deeper soil layers. Indicators used to identify farmed wetlands in the field and looking at aerial images are topographic depressions, areas of poor crop health, and/or areas excluded from farming because equipment access is not feasible. Within the Study Area few potential farmed wetlands were mapped, largely because most farm fields are extremely uniform in topography—a result of their many years of crop production that have sloped the fields for flood irrigation—and have moderately to well drained soils (Photo 2). Farmed wetland areas supported watergrass (*Echinochloa crus-galli*), sprangletop (*Leptochloa* sp.) velvetleaf (*Abutilon theophrasti*), and western sea purslane (*Sesuvium verrucosum*).

### 3.3.2 Disturbed/Ruderal

Disturbed/ruderal areas include dirt and gravel roads throughout the Study Area along with roadsides and levee slopes. These areas are either unvegetated with heavily compacted substrate or are sparsely to densely vegetated with weeds. Common plant species in this habitat type include short-pod mustard (*Hirschfeldia incana*), yellow star thistle (*Centaurea solstitialis*), milk thistle (*Silybum maritimum*), Italian thistle (*Carduus pycnocephalus*), perennial pepperweed (*Lepidium latifolium*), and poison hemlock (*Conium maculatum*).

**Figure 3-3      Biological Communities within the Little Egbert Tract Study Area**

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**Photo 2. Potential farmed wetland. September 13, 2019.**

At the time of the reconnaissance survey in September 2019, some of the RD 536 Levee slopes had been mowed, while other areas remained unmowed. No burrows or ground squirrel activity were observed on these levees; one vacant bird nest was observed in a senescent stand of black mustard (*Brassica nigra*), likely from a red-winged blackbird (*Agelaius phoeniceus*). The Cache Slough restricted-height levee supports extremely sparse vegetation on the landward-side of the levee.

### 3.3.3 Mixed Riparian Scrub

Mixed riparian scrub is a community of riparian trees and shrubs that form a dense canopy from ground level up to around 15–30 feet. Dominant species are sandbar willow (*Salix exigua*), arroyo willow (*Salix lasiolepis*), Goodding’s black willow (*Salix gooddingii*), Oregon ash (*Fraxinus latifolia*), black walnut (*Juglans hindsii*), and Himalayan blackberry (*Rubus armeniacus*). Mixed riparian scrub is found along the west side of Highway 84 and on properties to the south and west of the Powell Property. Sandy dredge spoils along with mining operations to the south and west of the Powell Property support suitable recruitment conditions for mixed riparian scrub species, sandbar and arroyo willow in particular (Photo 3).





**Photo 3. Mixed Riparian Scrub. September 13, 2019**

### **Giant Reed (*Arundo donax*)**

Several stands of giant reed (*Arundo donax*) are present near the west end of Watson Hollow Slough along the Mellin Levee Extension and Solano County Levee 44, and along portions of Cache Slough. Giant reed is also a minor component of mixed riparian scrub at other locations within the Study Area.

### **3.3.4 Grassland**

Grassland habitat dominates the upland areas of the Powell Property and a few isolated locations alongside the RD 536 Levee. At the time of the survey in September 2019, the dominant plants included Bermuda grass (*Cynodon dactylon*), common spikeweed (*Centromadia pungens*) sunflower (*Helianthus annuus*), and yellow star thistle (Photo 4). The majority of grasslands in the Study Area are actively grazed by cattle for most of the year, which results in little accumulated biomass from year to year and low-stature plants.

### **Alkali Grassland**

Alkali grassland is found in two small areas just west of the RD 536 Project Levee toe. The plant community is comprised of species tolerant of alkali conditions and includes Fitch's tarweed (*Centromadia fitchii*), sickle grass (*Parapholis incurva*), and Mediterranean barley (*Hordeum marinum*). These areas appear to be included in the narrow dry farmed field at the toe of the levee, though it is unlikely that wheat production is successful in these small areas due to the alkaline soil chemistry.



**Photo 4. Grassland. September 13, 2019.**

### 3.3.5 Freshwater Emergent Wetland

Freshwater emergent wetlands typically occur in low-lying sites with soils that are semi-permanently flooded or saturated with fresh water. Within the Study Area, freshwater emergent wetlands occur in association with a few of the canals on the west side of the RD 536 Levee, in one location in the southwest corner of Little Egbert Tract, one large depression south of the Powell Property and two areas just north of Watson Hollow Slough where it meets Cache Slough. All of these areas remain perennially inundated or saturated either because of their landscape position and topography, or summer irrigation water, or both. These freshwater emergent wetlands have sparse to dense cover of tule (*Schoenoplectus acutus*); some also have emergent cattails (*Typha* sp.) (Photo 5).

### 3.3.6 Seasonal Wetlands and Swales

Seasonal wetlands are ephemeral wetlands characterized by shallow depressions that pond water for short durations in the winter and spring due to landscape position, a restrictive soil layer that acts as a barrier preventing water percolation to deeper soil layers, or both. Swales are linear features that are vegetated with wetland plants, and often connect other wetland features. Seasonal wetlands and swales are dominated by plants that tolerate inundation during part of the growing season. Within the Study Area, seasonal wetlands and swales are found mainly on the Powell Property. As described above (Section 3.2 Hydrology), the lowest elevation portions of the Powell Property inundate during the flood season from upstream sources and are also artificially flooded via flap gates in the summer. Common plants in seasonal wetlands include: spikerush (*Eleocharis macrostachya*), nutsedge (*Cyperus odoratus*), watergrass (*Echinochloa crus-galli*), and rabbit's foot grass (*Polypogon monspeliensis*).





**Photo 5. Freshwater Emergent Wetland. September 9, 2019.**

The seasonal wetland located at the south end of the RD 536 Levee appears to be more alkaline than those on the Powell Property, with the dominant species consisting of saltgrass (*Distichlis spicata*), Fitch's tarweed, and rabbit's foot grass (Photo 6). The soil at this location is very heavy clay, as evidenced by deep hoofprints from past cattle grazing in this area.



**Photo 6. Seasonal Wetland with Mixed Riparian Scrub on left. September 13, 2019.**



### 3.3.7 Agricultural Ditches and Canals

Agricultural ditches and canals are found throughout the Study Area and serve the functions of draining the agricultural fields during the wet season and delivering irrigation water in the dry season. Ditches within the interior of Little Egbert Tract have little vegetation; however, floating and submerged aquatic vegetation is present in some channels closer to the periphery, typically in shallower water. Common emergent and aquatic plants include tule, cattail, nonnative water hyacinth (*Eichhornia crassipes*), nonnative water primrose (*Ludwigia* spp.), and duckweed (*Lemna* spp.). Nonnative aquatic vegetation can form dense mats or columns of vegetation that clog waterways and eliminate open water habitat. This was evident in Watson Hollow Slough at the time of the reconnaissance survey in September 2019 (Photo 7).



**Photo 7. Canal with water hyacinth (*Eichhornia crassipes*). September 9, 2019.**

## 3.4 Aquatic Resources

Although a delineation of aquatic resources has not been conducted in the Study Area, aquatic features such as agricultural ditches and canals, freshwater emergent wetlands, and seasonal wetlands throughout the Study Area likely meet the definitions of waters of the U.S. and/or State. These water bodies are potentially subject to regulation by the U.S. Army Corps of Engineers (USACE) under Section 404 of the Clean Water Act and/or by the Central Valley Regional Water Quality Control Board (CVRWQCB) under Section 401 of the Clean Water Act and Porter-Cologne Act.

As part of the reconnaissance survey effort, ESA surveyed all of the levees and visited 55 of the proposed geotechnical exploration locations within the interior of the Study Area. The survey

along the levees covered 300 feet from either side of the levees, excluding the channel area to the east of the site, to confirm through visual survey, and in some cases through data collection, that aquatic resources are absent from the locations of the proposed exploration work area (25 square feet). Aquatic resources within the levee portion of the Study Area were mapped at a preliminary level, and these areas were intended to be avoided by geotechnical exploration work wherever feasible.

## 3.5 Special-Status Species

Several species known to occur on or in the vicinity of the Study Area are protected pursuant to federal and/or State endangered species laws or have been designated as Species of Special Concern by CDFW. In addition, Section 15380(b) of the *CEQA Guidelines* provides a definition of rare, endangered, or threatened species that are not included in any listing.<sup>2</sup> Species recognized under these terms are collectively referred to as “special-status species.”

A list of special-status species with potential to occur on or in the vicinity of the Study Area was compiled from a nine-quad search of the California Natural Diversity Database (CNDDDB) (CDFW 2019), a nine-quad search on the California Native Plant Society’s (CNPS) Rare Plant Inventory (CNPS 2019), a nine-quad search from the U.S. Fish and Wildlife Service (USFWS) endangered species database (USFWS 2019b), and biological literature on the region for the following 7.5-minute USGS topographic quadrangles: Rio Vista, Dozier, Liberty Island, Courtland, Birds Landing, Isleton, Antioch North, Jersey Island, Bouldin Island.

From the full list of species, each was then individually assessed based on habitat requirements and distribution relative to vegetation communities and habitat features that occur in and around the Study Area. A comprehensive list of special-status species that were considered in the analysis is provided in **Appendix B** of this Exhibit, *Special-Status Species Considered in the Study Area*.

Additional information on wildlife species occurrence and habitat use was provided from wildlife hazard surveys conducted in 2020 through 2022 (ESA 2023).

### 3.5.1 Special-Status Plants

No federal or state-listed plants (or any other special-status plant species) were identified during the September 9 or 13, 2019, biological reconnaissance surveys of the Study Area. Both woolly rose mallow (*Hibiscus lasiocarpus* var. *occidentalis*) and Suisun Marsh aster (*Symphyotrichum lentum*) were anecdotally observed outside of the Study Area along the rock slope of the Cache Slough levee north of the Study Area.

Since most of the Study Area is used for crop production, it does not support much suitable habitat for special-status plants. One exception to this is the alkali grassland patches along the western toe of the RD 536 Levee which could support alkali milk-vetch (*Astragalus tener* var.

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<sup>2</sup> For example, vascular plants listed as rare or endangered or as List 1 or 2 by the California Native Plant Society (CNPS) are considered to meet Section 15380(b) requirements.

tener), saline clover (*Trifolium hydrophilum*), and possibly others that would not have been identifiable during the September 2019 reconnaissance survey. Freshwater emergent wetland and seasonal wetlands could also support special-status plants.

### 3.5.2 Special-Status Wildlife Species

A variety of special-status wildlife species have potential to occur in the Study Area (**Appendix B** of this Exhibit). Below is a brief description of the potential for each special-status wildlife species with a moderate or higher potential to occur or special circumstances meriting their brief mention.

#### **Valley Elderberry Longhorn Beetle**

Federal-threatened valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*) (VELB) utilizes elderberry shrubs (*Sambucus mexicanus*) for all portions of its life cycle. No elderberry shrubs were observed in the Action Area for the geotechnical surveys, but a complete survey was not done. It is possible that some elderberry shrubs occur, although elderberry shrubs do not tolerate flooding well and there may be none in the Action Area. If there are no elderberry shrubs, then the project will have no potential impacts on VELB.

#### **Vernal Pool Invertebrates**

Vernal pool fairy shrimp (*Branchinecta lynchi*) occur in a variety of vernal pool habitats, ranging from small, clear, pools in sandstone rock formations, to large, turbid pools in annual grasslands. Although the species has been collected from large vernal pools, it is most frequently collected from smaller pools. Most commonly, pools occur in grass- or mud-bottomed swales, or basalt flow depression pools in unplowed grasslands (USFWS 2019). This species is typically associated with smaller and shallower vernal pools with relatively short periods of inundation (USFWS 2007). Populations exist within and are defined by entire vernal pool complexes, rather than individual vernal pools (USFWS 2005b).

Vernal pool tadpole shrimp (*Lepidurus packardii*) have occurred in vernal pools ranging from 2 to 356,253 square meters (6.5 square feet to 88 acres) in surface area. Occurrence in small features is usually within a larger vernal pool complex. Populations exist within and are defined by entire vernal pool complexes, rather than individual vernal pools (USFWS 2005b). They have been found in pools with water temperatures ranging from 10 to 29 degrees Celsius (50 to 84°F). Although VPTS have been found on a variety of geologic formations and soil types, there is some indication that they are more likely to occur on High Terrace landforms and Redding and Corning soils, and on the Riverbank formation (USFWS 2005b).

There are no vernal pools in the Action Area. The seasonal wetlands that occur in the agricultural fields dry up and then are farmed every harvest season. Some seasonal wetlands occur on the Powell property to the south that have a hydroperiod similar to vernal pools, at least for part of the year, and some vernal pool vegetation is present.

### **Western Pond Turtle**

Western pond turtle (WPT) (*Actinemys marmorata*) has widespread distribution in California and possibly occurs in larger ditches in the Action Area seasonally. Western pond turtle has been observed in the action area along the irrigation canal along the western edge previously. The Action Area generally provides poor nesting habitat due to flooding potential.

### **Giant Garter Snake (GGS)**

Giant garter snakes (*Thamnophis gigas*) are endemic to California's Central Valley where they inhabit marshes, sloughs, ponds, small lakes, low gradient streams and other waterways and agricultural wetlands. The species' current range is believed to extend from Chico in Butte County and southward to the Mendota Wildlife Area in Fresno County. Although a large portion of the Delta has not been comprehensively surveyed for the giant garter snake, suitable habitat exists throughout the Delta Basin, which includes portions of Sacramento, Yolo, Solano, Contra Costa and San Joaquin Counties.

There are no CNDDDB occurrence records of giant garter snake within the Action Area. There are only five CNDDDB occurrence records within Solano County. There is one occurrence record within 5 miles of the Action Area. The record is located 3.3 miles to the north of the Project location in the vicinity of Shag Slough along the levee road west of Liberty Island, where one snake was collected in 2017 (CDFW 2019a).

Site visits on September 9 and 13, 2019, by ESA biologist Joseph Huang, who holds a USFWS 10(a)(1)(A) recovery permit for giant garter snake, confirmed that the Action Area did not contain the requisite upland habitat components for this species. The few soil cracks observed at the levee toe on the west side were not very deep and formed as a result of occasional flooding at the toe. Some of the canals and ditches located on the west side of the Action Area could provide aquatic habitat for this species because they contain emergent vegetation and vegetated banks. While the Center Drain and Thousand Slough within the interior of Little Egbert Tract have little vegetation, some of the ditches contain floating and submerged aquatic vegetation, which provide suitable cover for giant garter snake. No giant garter snake was detected at these sites during either site visit or other surveys conducted at the site in 2020 to 2022. Cache Slough is not considered suitable aquatic habitat for giant garter snake because it is too fast-flowing.

### **Swainson's Hawk**

Most of the trees in the Action Area are too small to provide potential nesting habitat for state-threatened Swainson's hawk (*Buteo swainsoni*). The grass and herb dominated biological communities (irrigated pasture, grassland, and alkali grassland) provide foraging habitat for Swainson's hawk. Dozens of Swainson's hawks have been observed foraging in the Action area in the spring and summer months, especially when tractors are harvesting. Swainson's hawks were also widely observed by the wildlife hazard surveys during spring and summer (ESA 2023). Some hawks were present during the October 13, 2021 survey, but none were observed during winter surveys (November 17, 2021-February 17, 2022).

### **Tricolored Blackbird**

The Action Area is within the yearlong range of the tricolored blackbird. The mixed riparian scrub provides potential nesting habitat for state-threatened tricolored blackbird (*Agelaius tricolor*); however, the mixed riparian scrub habitat in the Action Area is limited. Thus, it is unlikely to have a large tricolored blackbird colony nest in the mixed riparian scrub habitat. The silage corn and winter wheat may provide potential nesting habitat for tricolored blackbirds, but the silage corn and wheat fields are in a patchwork throughout the Tract. Also, the crop fields are well maintained for weed management and the frequent disturbance from regular maintenance activities likely deters nesting. The freshwater emergent wetland vegetation present in the Action Area is limited and insufficient to provide suitable nesting habitat for tricolored blackbird colonies. No tricolored blackbird colonies were observed nesting in the Action Area between 2020 and 2022. Nearly the entire Action Area provides potential foraging habitat.

During the wildlife hazard surveys (19 survey days across all seasons), tricolored blackbirds were observed only one day, in large foraging flocks on October 13, 2021 (ESA 2023).

### **California clapper rail**

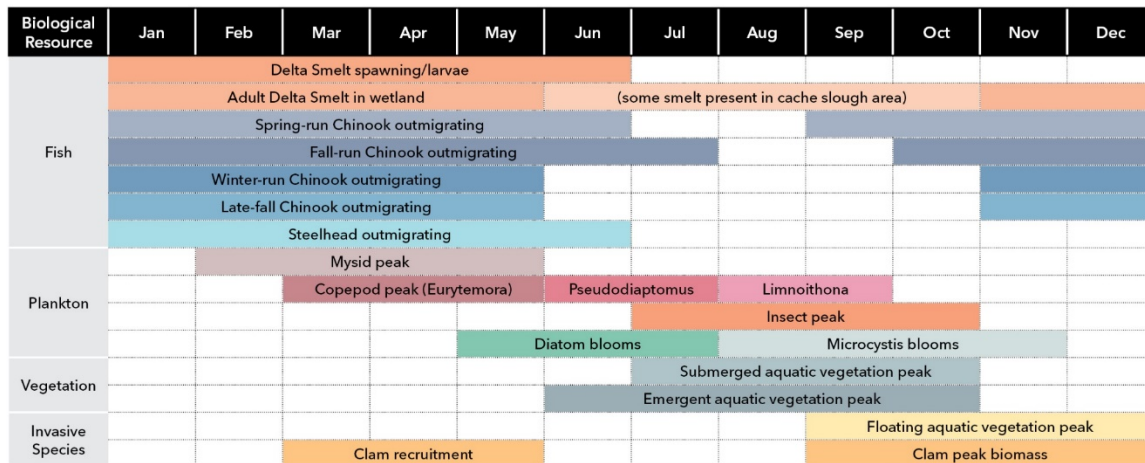
There is no suitable habitat in the Action Area. California clapper rail (*Rallus longirostris obsoletus*) prefers brackish emergent wetland dominated by pickleweed and cordgrass (CDFW 2019b).

### **Other Special-status Birds**

The federal Migratory Bird Treaty Act and the California Fish and Game Code regulate take of most species of birds, including special-status mountain plover (*Charadrius montanus*) (wintering habitat), northern harrier (*Circus hudsonius*), white-tailed kite (*Elanus leucurus*), and Modesto song sparrow (*Melospiza melodia*) that have the potential to occur or nest in the Action Area.

## **3.5.3 Special-Status Fish Species**

Special-status fish species occur in the waterways surrounding the Study Area (Cache Slough, Sacramento River) but not within the area encompassed by levees. These species include delta smelt (*Hypomesus transpacificus*), longfin smelt (*Spirinchus thaleichthys*), Sacramento River winter-run Chinook salmon (*Oncorhynchus tshawytscha*), Central Valley spring-, fall- and late-fall run Chinook salmon, California Central Valley Distinct Population Segment (DPS) steelhead (*Oncorhynchus mykiss*) and Southern DPS (*Oncorhynchus mykiss*) North American green sturgeon (*Acipenser medirostris*). These species are all expected to occur in the area at various times throughout the year depending on life stage (**Figure 3-4**). The proposed Project is expected to provide additional open water, subtidal and tidal habitat for these fish species.



SOURCE:  
Sherman, S., R. Hartman and D. Contreras, editors. 2017. Effects of Tidal Wetland Restoration on Fish: A suite of Conceptual Models. Interagency Ecological Program Technical Report 91. Department of Water Resources, Sacramento, California.

**Figure 3-4**  
Seasonal Occurrence of Special-Status Fish Species and Aquatic Biota  
in the Sacramento-San Joaquin River Delta

### Delta Smelt

Delta smelt (*Hypomesus transpacificus*) is a state and federally listed species under both the California Endangered Species Act (CESA) and Federal Endangered Species Act (FESA) (59 FR 440). Critical habitat was designated in 1994 (USFWS 1994). The geographic area encompassed by the designation includes Suisun Bay, Suisun Marsh, and the contiguous waters of the legal Delta.

Delta smelt are generally considered a pelagic species that typically occupies open water associated with the freshwater edge of the salt-water/freshwater mixing zone (Moyle et al. 1992, Moyle 2002). Delta smelt are most frequently collected in water that is somewhat shallow (4-15 feet deep) where turbidity is often elevated and where tidal currents exist but are not excessive (Moyle et al. 1992). Delta smelt are thought to spawn over sandy substrates in unvegetated shallow shoal areas (Bennett 2005, Merz et al., 2011, Baxter et al. 2015). Sub-adult and adult delta smelt also use shoal and edge habitats as tidal current refuges (Bever et al. 2016), migratory corridors to spawning habitats (Bennett and Burau 2015), and foraging habitat (Hammock et al. 2019). Delta smelt feed on zooplankton such as calanoid copepods, cladocerans, mysids and amphipods (Feyrer et al. 2003). In the Cache Slough and Deep Water Ship Channel region, prey items transition to cyclopoid copepods and other calanoid copepods (Baxter et al. 2015). Tidal wetlands improve the foraging success of delta smelt (Hammock et al. 2019). The shift in the zooplankton community composition and invasion of overbite clam has contributed to reduced planktonic food resources for delta smelt (Baxter et al. 2015).

Delta smelt permanently occupy the Cache Slough Complex, including Liberty Island and the adjacent reach of the Sacramento Deepwater Shipping Channel (Sommer and Mejia 2013), as documented by the IEP Fall Mid-water Trawl Survey (Contreras et al. 2018). In recent years, however, the delta smelt population has been so small as to be almost undetectable (Börk et al. 2020, CDFW 2021). That said, in 2017 and 2019, the Deep Water Ship Channel (upstream of the

Study Area) was one of the few locations larval delta smelt were detected regularly and in quantity by the 20 mm survey (CDFW 2021).

### **Longfin Smelt**

Longfin smelt (*Spirinchus thaleichthys*) is a state threatened species under CESA. On October 7, 2022, the U.S. Fish and Wildlife Service proposed listing the San Francisco Bay-Delta DPS of longfin smelt as an endangered species under FESA (USFWS 2022). The longfin smelt is a small, planktivorous fish species. Longfin smelt can tolerate a broad range of salinity concentrations, ranging from fresh water to seawater. Adult longfin smelt are found mainly in Suisun, San Pablo, and San Francisco Bays, although their distribution is shifted upstream into the western Delta in years of low outflow (Baxter 1999, Moyle 2002).

The Smelt Larva Survey has sampled larval longfin smelt reliably, and occasionally in quantity, in the Deep Water Ship Channel and Cache Slough confluence, confirming the importance of this area as rearing habitat (CDFW 2021).

Longfin smelt frequently occur in shallow, tidal marshes, especially in low-flow years (Merz et al. 2013; Grimaldo et al. 2020). Larval longfin smelt utilize brackish marshes as rearing areas. Larvae consume copepods while juveniles and adults consume larger crustaceans, especially mysid shrimp (Barros et al. 2022). Planktonic food resources have been reduced for longfin smelt due to shifts in zooplankton community and invasive clams (USFWS 2022).

### **Chinook Salmon**

Special-status Chinook salmon (*Oncorhynchus tshawytscha*) with potential to occur in the Study Area consist of four ESUs; the fall-run, late fall-run, winter-run, and spring-run (NMFS 2014):

- Sacramento River winter-run Chinook salmon evolutionarily significant unit (ESU) is listed as an endangered species under both the CESA and FESA (59 FR 440). Winter-run Chinook salmon return to the upper Sacramento River between December and July, but delay spawning until the spring and summer (April–August) (Moyle 2002). Juveniles typically spend 5–9 months in the river and Sacramento–San Joaquin River Delta (Delta) before entering the ocean (Moyle 2002).
- Central Valley spring-run Chinook salmon ESU is listed as a threatened species under CESA and FESA (50 FR 50394). Spring-run Chinook salmon enter the Sacramento River system between March and September and move upstream into the headwaters, where they hold in pools until they spawn between August and October (Moyle 2002). Juveniles typically emigrate from the tributaries from mid-November through June; however, some juveniles spend a year in the streams and emigrate as yearlings the following October (Moyle 2002).
- Central Valley fall- and late fall-run Chinook salmon ESUs are federal species of concern. Fall-run Chinook salmon is the most widely distributed and most numerous run occurring in the Sacramento and San Joaquin rivers and their tributaries (McEwan and Jackson 1996). After spawning, eggs generally hatch in 6–12 weeks, and newly emerged larvae remain in the gravel for another 2–4 weeks until the yolk is absorbed. Fall-run juveniles typically rear in fresh water for up to 5 months before migrating to sea.

Chinook salmon are relatively common within the Sacramento–San Joaquin River system. Adult winter-run Chinook salmon immigration (upstream migration) through the Delta and into the Sacramento River occurs from December through July, with peak immigration occurring from January through April. Juvenile emigration (downstream migration) through the lower Sacramento River into the Delta generally occurs between January and April (Figure 3-4).

Spring-run Chinook salmon enter the Sacramento River from late March through September (Reynolds et al., 1993), but peak abundance of immigrating adults in the Delta and lower Sacramento River occurs from April through June. A small portion of an annual year-class may emigrate as post-emergent fry (less than 1.8 inches long) and reside in the Delta undergoing smoltification. Most juveniles rear in the upper river and tributaries during winter and spring, emigrating as juveniles from November through June.

Fall-run Chinook salmon have historically spawned in Putah Creek and, after decades of sparse occurrences, returned to spawn in lower Putah Creek following changes in flow management and other restoration efforts (Willmes et al. 2021).

Chinook salmon (*Oncorhynchus tshawytscha*) utilize the Cache Slough confluence, Yolo Bypass and Deep Water Ship Channel as an adult spawning migration route and a juvenile emigration route. Estuarine wetlands are important nursery habitat for juvenile Chinook salmon (Sherman et al. 2017). Juvenile salmon diets are supported by detritus-based food webs, such as supported by tidal marshes (Maier and Simenstad 2009, Simenstad et al. 2000, Weitkamp et al. 2022). Juvenile Chinook salmon are known to forage in shallow areas with protective cover such as intertidal and subtidal mudflats, marshes, channels, and sloughs. Small size classes favor shallow water habitats, and the smallest rear in shallow peripheral channels regardless of vegetation types (Bottom et al. 2012). Marsh corridors and shallow water habitat that fringes channels may also have a large beneficial effect on out-migrating salmon (Hanson et al. 2012, Jones et al. 2014, Goertler et al. 2017).

Predation risk to juvenile Chinook salmon is greater in subtidal areas invaded by nonnative aquatic vegetation such as Brazilian waterweed (*Egeria densa*), which can harbor invasive predatory fish such as largemouth bass. Artificial structures that can also create bottlenecks and predation hotspots. Structural habitat complexity can provide refuge for juvenile salmon (Sherman et al. 2017).

### **California Central Valley Steelhead**

The Central California Coast steelhead Distinct Population Segment (DPS) (*Oncorhynchus mykiss*) is listed as an endangered species under the FESA (59 FR 440) and utilizes Cache Slough, the Deep Water Ship Channel and Yolo Bypass. Adult steelhead enter freshwater to spawn between November and April, with peak numbers in January and February. Most Sacramento River juvenile steelhead emigrate in spring and early summer (Reynolds et al., 1993).

Outmigrating juvenile steelhead may forage and take refuge in the sloughs within low intertidal and tidal marsh (Raabe et al., 2010). The CDFW Spring Kodiak Trawl survey has historically documented outmigrating juvenile steelhead during February through April in the Deep Water Ship Channel, Cache Slough and Yolo Bypass area (CDFW 2021). Although juvenile steelhead are



usually larger than juvenile Chinook salmon in the Delta, beneficial habitat features and foraging use are likely similar to those described previously for Chinook salmon (Weitkamp et al. 2022).

### ***Southern DPS of North American Green Sturgeon***

The Southern DPS of North American green sturgeon (*Acipenser medirostris*) is listed as an endangered species under the FESA (59 FR 440). Life history and habitat use attributes are summarized from the Final Recovery Plan (NMFS 2018) and the 5-Year Status Review (NMFS 2021). Green sturgeon are known to utilize the Cache Slough region.

Adults spend most of their life in coastal areas. They enter estuaries to feed and mature adults migrate long-distances upriver to spawn in the upper mainstem Sacramento River (NMFS 2018) as well as the Feather and Yuba rivers (Seeholtz et al. 2014). Eggs, larvae and young-of-year typically occur in freshwater portions of mainstem rivers, upstream of the Delta.

Juvenile green sturgeon can use riverine, subtidal and intertidal habitats in the lower portions of mainstem rivers (Radtke 1966, Klimley et al. 2015). Juvenile green sturgeon migrate downstream toward the estuary between six months and two years of age (Radtke 1966). Juveniles have been captured in shallow shoals on the lower San Joaquin River (Radtke 1966). Green sturgeon are opportunistic feeders that consume a variety of prey items (NMFS 2018). The diet of larval green sturgeon is unknown but may be similar to that of larval white sturgeon, which includes macrobenthic invertebrates such as insect larvae, oligochaetes, and decapods (NMFS 2009 as cited in NMFS 2018). In the San Francisco Bay Delta Estuary, juvenile green sturgeon feed on shrimp, amphipods, isopods, clams, annelid worms, and an assortment of crabs and fish (Radtke 1966).

## **3.6 Wildlife Movement Corridors**

Wildlife movement corridors link together areas of suitable wildlife habitat that are otherwise separated by rugged terrain, changes in vegetation, or by areas of human disturbance or urban development. Topography and other natural factors in combination with urbanization can fragment or separate large open-space areas. The fragmentation of natural habitat can create isolated “islands” of vegetation and habitat that may not provide sufficient area to accommodate sustainable populations and can adversely impact genetic and species diversity. The retention of wildlife movement corridors ameliorates the effects of such fragmentation by allowing animals to move between remaining habitats, which in turn allows depleted populations to be replenished. Such movement may also promote genetic exchange between separated populations.

The Study Area is currently used for a variety of agricultural purposes including cattle grazing on the Powell Property. Wildlife that is able to pass through or over the fencing may move through the Study Area from expansive grassland/agricultural areas to the west. However, the Study Area is bordered on the east and north by the Cache Slough which limits wildlife movement east and north of the Study Area. Wildlife that currently use the Study Area would have to use other open space areas west of the Study Area if future land use changes limited habitat quality or movement within the Study Area.

### **3.7 Critical Habitat for Listed Fish and Wildlife Species**

The USFWS defines the term “critical habitat” in the federal Endangered Species Act as a specific geographic area(s) that contains features essential for the conservation of a threatened or endangered species and that may require special management and protection. The Study Area is not within designated critical habitat for any listed plant species but is adjacent to primary constituent elements of designated critical habitat for federally threatened delta smelt (*Hypomesus transpacificus*).

### **3.8 Heritage and Protected Trees**

The Study Area does not support any trees protected by Solano County ordinances, and no trees were removed, trimmed, or damaged during geotechnical explorations.

# CHAPTER 4

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# Appendix A

## **Regulatory Context**





# Appendix B

## **Special-Status Species Considered in the Study Area**