d) ***Less-than-Significant Impact.*** The Proposed Project would not physically or permanently alter area publicly accessible roadways in a manner that might result in inadequate emergency access. Roadways atop levees within the Proposed Project Site would be affected by levee breach, but these roads were not used by the public.

During construction, there would be a temporary increase in traffic due to trucks hauling equipment. This increase in traffic would be insufficient to impede emergency access due to the already limited traffic on the area's roads and the preferential use of barges over dump trucks for hauling. Traffic would return to baseline conditions following construction. As the Proposed Project would not physically impede or alter roads needed for emergency access and traffic increases would be temporary, the Proposed Project would not result in inadequate emergency access and there would be a ***less-than-significant impact.***

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18. Tribal Cultural Resources. a. Would the project cause a substantial adverse change in the significance of a tribal cultural resource, defined in Public resources Code section 21074 as either a site, feature, place, cultural landscape that is geographically defined in terms of the size and scope of the landscape, sacred place, or object with cultural value to a California Native American tribe, and that is:	**Potentially Significant Impact**	**Less Than Significant with Mitigation Incorporated**	**Less Than Significant Impact**	**No Impact**
i. Listed or eligible for listing in the California Register of Historical Resources, or in a local register of historical resources as defined in Public Resources Code section 5020.1(k), or	✓			
ii. A resource determined by the lead agency, in its discretion and supported by substantial evidence, to be significant pursuant to criteria set forth in subdivision (c) of Public Resources Code Section 5024.1. In applying the criteria set forth in subdivision (c) of Public Resources Code Section 5024.1, the lead agency shall consider the significance of the resource to a California Native American tribe.	✓			

In September 2014, the California Legislature passed Assembly Bill ("AB") 52, which added provisions to the Public Resources Code ("PRC") concerning the evaluation of impacts on tribal cultural resources under CEQA, and consultation requirements with California Native American tribes. AB 52 also requires lead agencies to engage in additional consultation procedures with respect to California Native American tribes (PRC Sections 21080.3.1, 21080.3.2, 21082.3). AB 52's provisions apply to projects that have a notice of preparation filed on or after July 1, 2015.

Discussion

a.i, a.ii) ***Potentially Significant Impact.*** Criteria for listing on the California Register of Historical Resources is described in Section 4.5 (Cultural Resources). As part of the EIR, DWR will solicit tribes as required by AB-52 to determine if tribal cultural resources are present within the Project Site. Following consultation DWR will determine if there are any impacts to Tribal Cultural Resources. Thus, impacts are ***potentially significant impact***, and will be further examined in the EIR.

19. Utilities & Service Systems.

Would the project:

		Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
a.	Require or result in the relocation or construction of new or expanded water, wastewater treatment or storm water drainage, electrical power, natural gas, or telecommunications facilities, the construction or relocation of which could cause significant environmental effects?			✓	
b.	Have sufficient water supplies available to serve the project and reasonably foreseeable future development during normal, dry, and multiple dry years?			✓	
c.	Result in a determination by the wastewater treatment provider which serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?				✓
d.	Generate solid waste in excess of State or local standards, or in excess of the capacity of local infrastructure, or otherwise impair the attainment of solid waste reduction goals?			✓	
e.	Comply with federal, state, and local management and reduction statutes and regulations related to solid waste reduction?			✓	

Discussion:

a) ***Less-than-Significant Impact.*** The Proposed Project would not use water or generate wastewater, except some possible temporary water use for construction and ecosystem establishment purposes. Any such water use would not require treatment. No construction of new facilities or expansion of existing facilities would be necessary for water or wastewater treatment.

Man-made water control structures and equipment would be removed to expand water flow into the Proposed Project Site. Such changes should prove positive and alleviate strain on downstream stormwater drainage systems, as the Proposed Project is anticipated to enhance connectivity of tidal marsh/floodplain habitat. This would provide additional flood storage and conveyance within the Yolo Bypass. Additionally, improvements to the existing levee system would be designed to protect the area's infrastructure and reduce flooding.

Locally-serving PG&E distribution lines would be removed. These lines only serve infrastructure that would be removed as part of the Proposed Project; so this would have no effect on electrical demand or necessitate construction of replacement electrical facilities. In addition, a small sub-set of locally-serving PG&E distribution lines would be moved from the south side of Liberty Island Road to the north side to continue to provide power to a pump house and one residence. Regionally-serving transmission lines would remain in place. Elevated peninsulas would be constructed to facilitate PG&E access to these transmission lines, assuring no relocation of these lines or construction of replacement facilities would be required.

As discussed in further detail in Section 11, Mineral Resources, the Proposed Project Site sits atop a depleted natural gas field with plugged wells. A remoteness opinion issued by a state-licensed geologist found that further extraction from this field is so remote as to be negligible. There would therefore be no displacement or loss of natural gas extraction and no new or relocated facilities would be required.

There are no telecommunications facilities present within the Proposed Project Site requiring relocation. Further, the Proposed Project would not create new demand for expanded telecommunications facilities.

In conclusion, the Proposed Project would not require or result in the relocation or construction of new or expanded water, wastewater treatment or storm water drainage, electrical power, natural gas, or telecommunications facilities. The Proposed Project is not growth-inducing, so no new or expanded facilities would be required due to increased demand. Changes to drainage, electrical power, and natural gas facilities would not require relocation or construction of new facilities. Thus, impacts would be ***less than significant.***

b) ***Less-than-Significant Impact.*** The Proposed Project is located within Reclamation District 2098, which has a population of 25 people and covers 6,100 acres. RD 2098 uses surface water as its primary water source. Project construction would use surface water sourced from existing entitlements from adjacent sloughs, which would be adequate to serve the Proposed Project's minimal water needs, including during dry and multiple dry years, although multiple dry years are unlikely due to construction's short-term nature. Following completion of construction, the Proposed Project would be native ecosystem which would not require application of water and would be resilient to changes in precipitation. Existing water entitlements and resources are therefore sufficient to service the Proposed Project, and there would be a ***less-than-significant impact.***

c) ***No Impact.*** The Proposed Project would not generate wastewater. No service would be required from the local wastewater provider. There would therefore be ***no impact***, and the service provider's existing commitments would not be expanded.

d-e) ***Less-than-Significant Impact.*** The nearest landfill to the Proposed Project Site is the Hay Road Landfill (Landfill). As of 2013, the Landfill had 30,433,000 cubic yards of remaining capacity, with a maximum permitted capacity of 37,000,000 cubic yards and a maximum daily tonnage of 2,400.00 tons per day. The Landfill is estimated to have capacity until 2077[28]. The completed Project would not generate any solid waste, but construction activities will result in waste related demolition of existing facilities, modification of levees, excavation of tidal channels, and removal of vegetation.

Most vegetation and soil would be disposed of or reused on-site, so most solid waste would come from building demolition. Infrastructure to be demolished includes one 15,529 square foot (sq ft) bridge, 337,806 sq ft of concrete-lined ditches, 5,309 sq ft of concrete pads, 208,517 ft of fence, 37 plugged gas wells, one metal tower, eight pumps, 12 tanks, eight trash/material piles, 114,321 sq ft of farm buildings, and 219 utility poles. The demolition of these facilities would not generate sufficient solid waste to overwhelm the capacity of local facilities, given that Hay Road Landfill has several million cubic yards of storage remaining and is anticipated to have capacity until 2077.

Chapter 23 of the Solano County code regulates refuse and garbage. Chapter 23 generally provides requirements of solid waste collectors, and does not establish any waste reduction requirements. Similarly, the US EPA encourages solid waste reduction, but does not impose any substantive requirements. The State of California has a goal of 75% recycling, composting, or source reduction of solid waste by 2020, which is to be attained using a statewide approach. Solid waste would be reduced to the extent practical and otherwise disposed of in accordance with all applicable laws and regulations.

[28] *Department of Resources Recycling and Recovery (DRR), "Solid Waste Facility Listing/Details Page," accessed June 27, 2018, http://www.calrecycle.ca.gov/SWFacilities/Directory/48-aa-0002/Detail/.*

The Proposed Project would not generate solid waste in excess of state or local standards or in excess of the capacity of local infrastructure, impair solid waste reduction attainment, or conflict with any local, state, or federal regulations on solid waste reduction. Thus, impacts would be ***less than significant.***

20. Wildfire.

If located in or near state responsibility areas or lands classified as very high fire hazard severity zones, would the project:

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
a. Substantially impair an adopted emergency response plan or emergency evacuation plan?			✓	
b. Due to slope, prevailing winds, and other factors, exacerbate wildfire risks, and thereby expose project occupants to pollutant concentrations from a wildfire or the uncontrolled spread of a wildfire?			✓	
c. Require the installation or maintenance of associated infrastructure (such as roads, fuel breaks, emergency water sources, power lines, or other utilities) that may exacerbate fire risk or that may result in temporary or ongoing impacts to the environment?				✓
d. Expose people or structures to significance risks, including downslope or downstream flooding or landslides, as a result of runoff, post-fire slope instability, or drainage changes?			✓	

Discussion:

a) ***Less-than-Significant Impact.*** The Proposed Project would not physically or permanently alter area publicly accessible roadways in a manner that might impede emergency response. Roadways atop levees within the Proposed Project Site would be affected by levee breach, but these roads are not publicly available and do not serve any areas which would require evacuation. Alterations to levee top roads along Cache and Shag Sloughs would therefore not affect emergency response.

During construction, there would be a temporary increase in traffic due to trucks hauling equipment. This increase in traffic would be insufficient to impede emergency access due to the already limited traffic on the area's roads and the preferential use of barges over

dump trucks for hauling. Traffic would return to baseline conditions following construction. As the Proposed Project would not physically impede or alter roads needed for emergency response and traffic increases would be temporary, the Proposed Project would not substantially impair an emergency response or evacuation plan—and there would be a ***less-than-significant impact.***

b) ***Less-than-Significant Impact.*** During construction, fire risk would increase due to the presence of fuels and construction equipment within the Proposed Project Site. Any increase in risk would be small and temporary. The Proposed Project would lead to a long-term reduction in fire risk by converting grasslands which could serve as a fuel source during a wildfire into a tidal marsh complex which poses less severe risks during a fire. Further, the Proposed Project does not propose any human-serving uses, and there would be no occupants of the Proposed Project Site. Thus, the Proposed Project would not expose Project occupants to pollutant concentrations from a wildfire or the uncontrolled spread of a wildfire; and there would be a ***less-than-significant impact.***

c) ***No Impact.*** The Proposed Project would not exacerbate long-term fire risk in the Proposed Project Site or its vicinity and would not attract more people to the area. No new roads, fuel breaks, emergency water sources, power lines, or other utilities that may exacerbate fire risk are proposed. Thus, there would be ***no impact.***

d) ***Less-than-Significant Impact.*** The Proposed Project Site and its surroundings are generally flat, so the Proposed Project would not expose people or structures to risk of downslope flooding or landslide. Should a fire occur in the Proposed Project Site, downstream people and structures could be at risk of drainage changes. However, the Proposed Project would not lead to any long-term exacerbation of fire risk which would induce such changes. In fact, the Proposed Project would slightly decrease on-site fire risk. Thus, there would be a ***less-than-significant impact.***

21. Mandatory Findings of Significance.

		Yes	No
a.	Does the project have the potential to substantially degrade the quality of the environment, substantially reduce the habitat of fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, substantially reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?		✓
b.	Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects)?		
c.	Does the project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?		

Discussion:

a) ***No.*** The proposed habitat restoration Project would restore approximately 3,400 acres of native Delta ecosystem, which has shrunken to a fraction of its original spatial footprint due to reclamation and agricultural activities. The Delta is a unique ecosystem with many sensitive natural communities, and is important to several special-status plant, animal, and wildlife species. The Proposed Project would therefore have a positive long-term effect on fish, plants, wildlife, and natural communities, and would expand the range of rare animals by restoring their native habitat. It does not threaten to eliminate a plant or animal community or substantially reduce the number or restrict the range of a rare or endangered plant or animal. This Initial Study has identified a number of potentially significant impacts to the environment which will be examined in the Draft EIR. .

A cultural resources survey of the Proposed Project Site conducted by a qualified archaeologist concluded that there is a low likelihood of discovering cultural resources on the site. There is an accordingly low risk of eliminating important examples of major periods of California history or pre-history. This risk will be further examined in the Draft EIR.

b) Does the Proposed Project have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a Project are considerable when viewed in connection with the effects of past Projects, the effects of other current Projects, and the effects of probable future Projects)?

Section 15130 of the CEQA Guidelines requires an evaluation of potential environmental impacts when the Proposed Project's incremental effect is cumulatively considerable. This Initial Study has identified potentially significant individual impacts. The Draft EIR will evaluate cumulative impacts along with the evaluation of individual impacts.

c) Does the Proposed Project have environmental effects that will cause substantial adverse effects on human beings, either directly or indirectly?

This Initial Study has identified potentially significant impacts to human beings. The Draft EIR will evaluate these impacts to determine whether they will cause substantial adverse effects on humans, either directly or indirectly.

Appendix A:

Biological Resources Assessment (BRA)

WRA, Inc. 2019

Biological Resources Assessment

LOOKOUT SLOUGH RESTORATION PROJECT

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Ecosystem Investment Partners

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LIST OF ACRONYMS AND ABBREVIATIONS

APN	Assessor Parcel Number
BRA	Biological Resources Assessment
Cal-IPC	California Invasive Plant Council
CBR	California black rail
CCR	California Code of Regulations
CDFG	California Department of Fish and Game
CDFW	California Department of Fish and Wildlife
CEQA	California Environmental Quality Act
CESA	California Endangered Species Act
CFR	Code of Federal Regulations
CFGC	California Fish and Game Code
CNDDB	California Natural Diversity Database
CNPS	California Native Plant Society
Corps	U.S. Army Corps of Engineers
CWA	Clean Water Act
DPS	Distinct Population Segment
DWSC	Sacramento River Deep Water Shipping Channel
eDNA	Environmental DNA
EFH	Essential Fish Habitat
ESA	Federal Endangered Species Act
ESU	Evolutionarily Significant Unit
FAC	Facultative plant species
FACW	Facultative wetland plant species
FMP	Fisheries Management Plan
Inventory	California Native Plant Society Inventory of Rare and Endangered Plants
MBTA	Migratory Bird Treaty Act of 1918
MMPA	Marine Mammal Protection Act of 1972
MSL	Mean Sea Level
NFH	Livingston Stone National Fish Hatchery
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
OBL	Obligate wetland plant species
OHWM	Ordinary High Water Mark
qPCR	Quantitative Polymerase Chain Reaction
Rank	California Rare Plant Ranks
RWQCB	Regional Water Quality Control Board
SWHA TAC	Swainson's Hawk Technical Advisory Committee
TAC	Technical Advisory Committee
USDA	United States Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WBWG	Western Bat Working Group
WRA	WRA, Inc.

EXECUTIVE SUMMARY

The purpose of this report is to provide an analysis to support the proposed Lookout Slough Restoration Project of existing natural biological communities and potential special-status species at the approximately 3,637-acre portion of land (Study Area), located in the unincorporated Solano and Yolo Counties, California.

On multiple dates throughout 2017 and 2018, WRA, Inc. (WRA) conducted a biological resources assessment throughout the Study Area. WRA observed 13 biological communities, 148 plant species, and 88 wildlife species during the biological resources assessment. In total, five of the eight biological communities, covering approximately 1,492 acres, were determined to be sensitive biological communities. A total of four special-status plant species and 23 special-status wildlife species were determined to have a moderate or high potential of occurrence, or are considered present within the Study Area.

1.0 INTRODUCTION

On multiple site visits in 2017 and 2018, WRA, Inc. (WRA) conducted assessments of biological resources at the 3,637-acre portion of land (Study Area), located primarily within unincorporated Solano County, with an approximately 24-acre portion in unincorporated Yolo County, California (Figure 1, Appendix A). The Study Area is located in the Liberty Island U.S. Geological Survey (USGS) 7.5-minute quadrangle (USGS 2018) and contains three distinct areas: (1) Bowlsbey Ranch (Assessor Parcel Numbers [APNs]: 0143-240-030, 0143-240-040,0042-140-200, and 0042-140-210), located in the northern and eastern portions of the Study Area; (2) Liberty Farms (APNs: 0042-140-070, 0042-140-230, 0042-140-120, 0042-140-140, 0042-140-240, 0042-140-250, 0042-160-170, 0042-160-180, and 0042-140-110), located in the southern portion of the Study Area; and (3) Vogel (APNs 0042-140-100 and 0042-140-160) located in the southern portion of the Study Area.

For the purpose of this assessment, the Study Area was expanded beyond the APN property boundaries to include jurisdictional waters. The Study Area contains three non-tidal slough channels: Duck Slough, Lookout Slough, and Sycamore Slough. The Study Area is bounded by undeveloped land and tidal sloughs, including Cache Slough and Haas Slough to the west and south, which comprise a portion of the Cache Slough Complex, and Shag Slough to the east, which falls within the Yolo Bypass. Both Bowlsbey Ranch and Liberty Farms are currently located behind an U.S. Army Corps of Engineers (Corps) levee associated with the Yolo Bypass West levee system, whereas the Vogel property is located outside of the Corps levee.

The biological resources assessment (BRA) was conducted to identify, describe, and map the current baseline conditions within the Study Area. This assessment was based on site conditions observed on the dates of the site visits, a review of public databases and related literature available at the time of the assessment, and past reports completed in areas proximal to the Study Area. The BRA includes protocol-level rare plant surveys; however, protocol-level surveys for listed wildlife species were not completed. Additional protocol-level surveys may be required for Project approval by local, state, or federal agencies. This report describes the results of the site visits, which assessed the Study Area for: (1) the potential to support special-status species, and (2) the presence of other sensitive biological resources protected by local, state, and federal laws and regulations. A formal delineation of aquatic resources within the Study Area was completed concurrent with the BRA site visits and additional information and delineation results are provided in the Aquatic Resources Delineation Report (WRA 2018).

2.0 REGULATORY BACKGROUND

The following sections explain the regulatory context of the BRA, including applicable laws and regulations that were applied to the field investigations.

2.1 Sensitive Biological Communities

Sensitive biological communities include habitats that fulfill special functions or have special values, such as wetlands, streams, or riparian habitat. These habitats are protected under federal regulations, such as the Clean Water Act (CWA); state regulations, such as the Porter-Cologne Act, the California Department of Fish and Wildlife (CDFW) Streambed Alteration Program, and the California Environmental Quality Act (CEQA); or local ordinances or policies, such as city or county tree ordinances, Special Habitat Management Areas, and General Plan Elements.

Waters of the United States

The Corps regulates "Waters of the United States" under Section 404 of the CWA. Waters of the U.S. are defined in the Code of Federal Regulations (CFR) as waters susceptible to use in commerce, including interstate waters and wetlands, all other waters (intrastate waterbodies, including wetlands), and their tributaries (33 CFR 328.3). Potential wetland areas, according to the three criteria used to delineate wetlands as defined in the *Corps of Engineers Wetlands Delineation Manual* (Environmental Laboratory 1987), are identified by the presence of: (1) hydrophytic vegetation, (2) hydric soils, and (3) wetland hydrology. Areas that are inundated at a sufficient depth and for a sufficient duration to exclude growth of hydrophytic vegetation are subject to Section 404 jurisdiction as "other waters" and are often characterized by an ordinary high water mark (OHWM). Other waters, for example, generally include lakes, rivers, and streams. The placement of fill material into Waters of the U.S. generally requires an individual or nationwide permit from the Corps under Section 404 of the CWA.

Waters of the State

The term "Waters of the State" is defined by the Porter-Cologne Act as "any surface water or groundwater, including saline waters, within the boundaries of the state." The Regional Water Quality Control Board (RWQCB) protects all waters in its regulatory scope and has special responsibility for wetlands, riparian areas, and headwaters. These waterbodies have high resource value, are vulnerable to filling, and are not systematically protected by other programs. RWQCB jurisdiction includes "isolated" wetlands and waters that may not be regulated by the Corps under Section 404. Waters of the State are regulated by the RWQCB under the State Water Quality Certification Program, which regulates discharges of fill and dredged material under Section 401 of the CWA and the Porter-Cologne Water Quality Control Act. Projects that require a Corps permit, or fall under other federal jurisdiction, and have the potential to impact Waters of the State, are required to comply with the terms of the Water Quality Certification determination. If a proposed project does not require a federal permit, but does involve dredge or fill activities that may result in a discharge to Waters of the State, the RWQCB has the option to regulate dredge and fill activities under its state authority in the form of Waste Discharge Requirements.

Streams, Lakes, and Riparian Habitat

Streams and lakes, as habitat for fish and wildlife species, are subject to jurisdiction by the CDFW under Sections 1600-1616 of the California Fish and Game Code (CFGC). Alterations to or work within or adjacent to streambeds or lakes generally require a Section 1602 Lake and Streambed Alteration Agreement. The term "stream", which includes creeks and rivers, is defined in the California Code of Regulations (CCR) as "a body of water that flows at least periodically or intermittently through a bed or channel having banks and supports fish or other aquatic life [including] watercourses having a surface or subsurface flow that supports or has supported riparian vegetation" (14 CCR 1.72). In addition, the term "stream" can include ephemeral streams, dry washes, watercourses with subsurface flows, canals, aqueducts, irrigation ditches, and other means of water conveyance if they support aquatic life, riparian vegetation, or stream-dependent terrestrial wildlife (California Department of Fish and Game [CDFG] 1994). "Riparian" is defined as "on, or pertaining to, the banks of a stream." Riparian vegetation is defined as "vegetation which occurs in and/or adjacent to a stream and is dependent on, and occurs because of, the stream itself" (CDFG 1994). Removal of riparian vegetation also requires a Section 1602 Lake and Streambed Alteration Agreement from the CDFW.

Other Sensitive Biological Communities

Other sensitive biological communities not discussed above include habitats that fulfill special functions or have special values. Natural communities considered sensitive are those identified in local or regional plans, policies, regulations, or by the CDFW. The CDFW ranks sensitive communities as "threatened" or "very threatened" and keeps records of their occurrences in its California Natural Diversity Database (CNDDB; CDFW 2018a). Sensitive plant communities are also identified by the CDFW (California Native Plant Society [CNPS] 2018a). CNDDB vegetation alliances are ranked 1 through 5 based on NatureServe's (2010) methodology, with those alliances ranked globally (G) or statewide (S) as 1 through 3 considered sensitive. Impacts to sensitive natural communities identified in local or regional plans, policies, or regulations, or those identified by the CDFW or U.S. Fish and Wildlife Service (USFWS), must be considered and evaluated under CEQA (CCR Title 14, Div. 6, Chap. 3, Appendix G). Specific habitats may also be identified as sensitive in city or county general plans or ordinances.

Solano County Multispecies Habitat Conservation Plan

Solano County is a member of a habitat conservation plan that allows local agencies to be issued incidental take permits via State and Federal agencies for the 37 species covered. Additional species are covered for the purpose of allowing a single review of all potential impacts to sensitive species. Projects seeking coverage under the Solano County Habitat Conservation Plan are required to present mandatory baseline studies, avoidance and minimization measures, and mitigation measure requirements prior to obtaining any incidental take coverage.

2.2 Sensitive Special-Status Species

Special-status species include those plants and wildlife species that have been formally listed, are proposed as endangered or threatened, or are candidates for such listings under the federal Endangered Species Act (ESA) or California Endangered Species Act (CESA). These acts afford protection to both listed species and those that are formal candidates for listing. The federal Bald and Golden Eagle Protection Act also provides broad protections to both eagle species that in some regards are similar to those provided by ESA. Additionally, CDFW Species of Special Concern, CDFW California Fully Protected species, USFWS Birds of Conservation Concern, and CDFW Special-status Invertebrates are all considered special-status species. Although these aforementioned species generally have no special legal status, they are given special consideration under CEQA. Bat species are also evaluated for conservation status by the Western Bat Working Group (WBWG), a non-governmental entity; bats named as a "High Priority" or "Medium Priority" species for conservation by the WBWG are typically considered special-status and also considered under CEQA. In addition to regulations for special-status species, most native birds in the United States (including non-status species) are protected by the federal Migratory Bird Treaty Act of 1918 (MBTA) and the CFGC: Sections 3503, 3503.5, and 3513. Under these laws, deliberately destroying active bird nests, eggs, and/or young is illegal. Although not all marine mammals are considered special-status species, all marine mammals are protected under the Marine Mammal Protection Act of 1972 as amended (MMPA), and unauthorized take including harassment is prohibited.

Plant species on the CNPS Inventory of Rare and Endangered Plants (Inventory) with California Rare Plant Ranks (Rank) of 1 and 2 are also considered special-status plant species and must be considered under CEQA. Rank 3 and Rank 4 species are afforded little or no protection under CEQA, but are included in this analysis for completeness. A description of CNPS Ranks is provided below in Table 1.

Table 1. Description of CNPS Ranks and Threat Codes

California Rare Plant Ranks (formerly known as CNPS Lists)	
Rank 1A	Presumed extirpated in California and either rare or extinct elsewhere
Rank 1B	Rare, threatened, or endangered in California and elsewhere
Rank 2A	Presumed extirpated in California, but more common elsewhere
Rank 2B	Rare, threatened, or endangered in California, but more common elsewhere
Rank 3	Plants about which more information is needed - A review list
Rank 4	Plants of limited distribution - A watch list
Threat Ranks	
0.1	Seriously threatened in California
0.2	Moderately threatened in California
0.3	Not very threatened in California

Critical Habitat

Critical habitat is a term defined in the ESA as a specific and designated geographic area that contains features essential for the conservation of a threatened or endangered species and that may require special management and protection. The ESA requires federal agencies to consult with the USFWS to conserve listed species on their lands and to ensure that any activities or projects they fund, authorize, or carry out will not jeopardize the survival of a threatened or endangered species. In consultation for those species with critical habitat, federal agencies must also ensure that their activities or projects do not adversely modify critical habitat to the point that it will no longer aid in the species' recovery. In many cases, this level of protection is similar to that already provided to species by the ESA jeopardy standard. However, areas that are currently unoccupied by the species but which are needed for the species' recovery are protected by the prohibition against adverse modification of critical habitat.

Essential Fish Habitat

Essential Fish Habitat (EFH) is regulated through the National Marine Fisheries Service (NMFS), a division of the National Oceanic and Atmospheric Administration (NOAA). Protection of EFH is mandated through changes implemented in 1996 to the Magnuson-Stevens Fishery Conservation and Management Act to protect the loss of habitat necessary to maintain sustainable fisheries in the United States. The Magnuson-Stevens Act defines EFH as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity" [16 USC 1802(10)]. NMFS further defines essential fish habitat as areas that "contain habitat essential to the long-term survival and health of our nation's fisheries" (NMFS 2007). EFH can include the water column, certain bottom types such as sandy or rocky bottoms, vegetation such as eelgrass or kelp, or structurally complex coral or oyster reefs. Under regulatory guidelines issued by NMFS, any federal agency that authorizes, funds, or undertakes action that may affect EFH is required to consult with NMFS (50 CFR 600.920).

3.0 METHODS

Multiple site visits to the Study Area were conducted to perform baseline and focused biological surveys. During the site visits, shown below in Table 2, the Study Area was traversed on foot to determine: (1) plant communities present within the Study Area; (2) if existing conditions provided suitable habitat for any special-status plant or wildlife species; and (3) if sensitive habitats are present. All plant and wildlife species encountered were recorded and are summarized in Appendix B. Plant nomenclature follows Baldwin et al. (2012) and subsequent revisions by the Jepson Flora Project (2018), except where noted. Relevant synonyms are provided in brackets due to recent changes in classification for many of the taxa treated by Baldwin et al. and the Jepson Flora Project. For cases in which regulatory agencies, the CNPS, or other entities base rarity on older taxonomic classifications, precedence was given to the classifications used by those entities. In some cases, it was necessary to expand our assessment beyond the Study Area shown on Figure 1 in Appendix A to include adjacent sloughs, which are hydrologically important to the Study Area and may supply water for agriculture, or inundate the Study Area during seasonal flooding.

Table 2. Biological Surveys in the Study Area

Survey Date	Survey Effort
January 6 and 13, 2017	Bowlsbey Ranch and Vogel property general biological reconnaissance survey
July 28, 2017	Giant Garter Snake eDNA survey
September 19, 2017	Liberty Farms general biological reconnaissance surveys
September 20-22, 2017	Protocol level rare plant surveys
October 2, 2017	Protocol level rare plant surveys
March 8 and 9, 2018	General Fish Assemblage
April 4 and 5, 2018	Delineation of aquatic resources
March 23 through April 18, 2018	Swainson's Hawk and Nesting Raptors surveys
April 18, 2018	California Black Rail surveys
May 9, 2018	Delineation of aquatic resources
August 27, 2018	Valley Elderberry Longhorn Beetle surveys
July 20, 2018	Delineation of aquatic resources

3.1 Biological Communities

Prior to the site visits, the Soil Survey of Solano County, California (U.S. Department of Agriculture [USDA] 1977) was examined to determine if any unique soil types that could support sensitive plant communities were present in the Study Area. Biological communities present in the Study Area were classified based on existing plant community descriptions described in the *Preliminary Descriptions of the Terrestrial Natural Communities of California* (Holland 1986). However, in some cases it is necessary to identify variants of community types or to describe unvegetated areas that are not described in the literature. Biological communities were classified as sensitive or non-sensitive as defined by CEQA and other applicable laws and regulations.

3.1.1 Non-sensitive Biological Communities

Non-sensitive biological communities are those communities that are not afforded special protection under CEQA, and other state, federal, and local laws, regulations and ordinances. These communities may, however, provide suitable habitat for some special-status plant or wildlife species, and are identified or described in Section 4.1.1 below.

3.1.2 Sensitive Biological Communities

Sensitive biological communities are defined as those communities that are given special protection under CEQA and other applicable federal, state, and local laws, regulations and ordinances. Applicable laws and ordinances are discussed above in Section 2.0. Special methods used to identify sensitive biological communities are discussed below.

Jurisdictional Wetlands and Non-Wetland Waters

The Study Area was surveyed to determine if any wetlands and non-wetland waters potentially subject to jurisdiction by the Corps, RWQCB, or CDFW were present. A wetland delineation was performed concurrently during the BRA surveys, on April 4-5, May 9, and July 20, 2018, and was based primarily on the presence of wetland plant indicators; however, it also included observed indicators of wetland hydrology and wetland soils. Any potential wetland areas were identified as areas dominated by plant species with a wetland indicator status[1] of obligate (OBL), facultative wetland (FACW), or facultative (FAC), as provided on the Corps National Wetlands Plant List (Lichvar et al. 2016). Evidence of wetland hydrology can include direct evidence (primary indicators), such as visible inundation or saturation, algal mats, and oxidized root channels, or indirect (secondary) indicators, such as a water table within two feet of the soil surface during the dry season. Some indicators of wetland soils include dark colored soils, soils with a sulfidic odor, and soils that contain redoximorphic features as defined by the Corps Manual (Environmental Laboratory 1987) and *Field Indicators of Hydric Soils in the United States* (NRCS 2010).

The wetland delineation was based primarily on the presence of unvegetated, ponded areas or flowing water, or evidence indicating their presence, such as a high water mark or a defined drainage course. The wetland delineation was used to inform the BRA regarding the sensitivity of community types, as jurisdictional communities are considered sensitive. A more detailed

[1] OBL = Obligate, almost always found in wetlands; FACW = Facultative wetland, usually found in wetlands; FAC = Facultative, equal occurrence in wetland or non-wetlands.

description of delineation methods and results can be found in the wetland delineation report concurrently conducted during this BRA (WRA 2018).

Other Sensitive Biological Communities

The Study Area was evaluated for the presence of other sensitive biological communities, including riparian areas and sensitive plant communities recognized by the CDFW. Prior to the site visit, aerial photographs, local soil maps, and *A Manual of California Vegetation, Online Edition* (CNPS 2018a) were reviewed to assess the potential for sensitive biological communities to occur in the Study Area. All alliances within the Study Area with a ranking of 1 through 3 were considered sensitive biological communities and were mapped. These communities are described in Section 4.1.2 below.

3.2 Special-Status Species

3.2.1 Literature Review

The potential occurrence of special-status species in the Study Area was evaluated by first determining which special-status species occur in the vicinity of the Study Area through a literature and database search. Database searches for known occurrences of special-status species focused on the Liberty Island 7.5-minute USGS quadrangle and the eight surrounding USGS quadrangles. The following sources were reviewed to determine which special-status plant and wildlife species have been documented to occur in the vicinity of the Study Area:

- CNDDB records (CDFW 2018a)
- USFWS Information for Planning and Conservation Species Lists (USFWS 2018b)
- USFWS Critical Habitat Mapper (USFWS 2018c)
- CNPS Inventory records (CNPS 2018b)
- CDFG publication *California's Wildlife, Volumes I-III* (Zeiner et al. 1990)
- CDFG publication *California Bird Species of Special Concern* (Shuford and Gardali 2008)
- CDFW and University of California Press publication *California Amphibian and Reptile Species of Special Concern* (Thomson et al. 2016)
- *A Field Guide to Amphibians and Reptiles of California* (Stebbins and McGinnis 2012)
- *Fairy Shrimps of California's Puddles, Pools and Playas* (Eriksen and Belk 1999)
- University of California at Davis Information Center for the Environment Distribution Maps for Fishes in California (2018)
- National Marine Fisheries Service Official Species List Generator (2018a)
- National Marine Fisheries Service Distribution Maps for California Salmonid Species (2018b)
- National Marine Fisheries Service, Essential Fish Habitat Mapper (2018c)
- Breeding Birds of Solano County (Rippey 2014)
- The Solano County Habitat Conservation Plan (Solano 2012)
- Western Bat Working Group Species Accounts (WBWG 2018)

3.2.2 Site Assessment

A site visit was made to the Study Area to search for suitable habitats for special-status species. Habitat conditions observed in the Study Area were used to evaluate the potential for presence of special-status species based on these searches and the professional expertise of the

investigating biologists. The potential for each special-status species to occur in the Study Area was then evaluated according to the following criteria:

- No Potential. Habitat on and adjacent to the site is clearly unsuitable for the species requirements (foraging, breeding, cover, substrate, elevation, hydrology, plant community, site history, disturbance regime).
- Unlikely. Few of the habitat components meeting the species requirements are present, and/or the majority of habitat on and adjacent to the site is unsuitable or of very poor quality. The species is not likely to be found on the site.
- Moderate Potential. Some of the habitat components meeting the species requirements are present, and/or only some of the habitat on or adjacent to the site is unsuitable. The species has a moderate probability of being found on the site.
- High Potential. All of the habitat components meeting the species requirements are present and/or most of the habitat on or adjacent to the site is highly suitable. The species has a high probability of being found on the site.
- Present. Species is observed on the site or has been recorded (i.e., CNDDB, other reports) on the site recently.

The site assessments are intended to identify the presence or absence of suitable habitat for each special-status species known to occur in the vicinity in order to determine its potential to occur in the Study Area. Protocol-level surveys were completed for rare plants as described below in Section 3.2.3.

In cases where little information is known about species occurrences and habitat requirements, species evaluation was based on best professional judgment of WRA biologists with experience working with the species and habitats. If necessary, recognized experts in individual species biology were contacted to obtain the most up-to-date information regarding species biology and ecology.

If a special-status species was observed during the site visit, its presence was recorded and is discussed below in Section 4.2. For some wildlife species, a site assessment at the level conducted for this report may not be sufficient to determine presence or absence of a species to the specifications of regulatory agencies. In these cases, species were assumed to be present or protocol-level special-status species surveys were conducted. Special-status species that warranted protocol-level surveys, as well as species that further protocol-level surveys, are described below in Section 4.2.

3.2.3 Rare Plant Surveys

Protocol-level rare plant surveys were conducted to locate any rare plants species present within the Study Area. The CNPS (2001) guidelines state that surveys should be conducted "at the proper time of year when rare, threatened, or endangered species are both evident and identifiable." Usually, this is when the plants are in bloom; however, there are species that are identifiable outside of the blooming period because non-floral structures (e.g., leaves, roots) are sufficient to make a species determination and/or floral structures (e.g., fruits, buds) are necessary to be in a state of maturity beyond or prior to the documented blooming period. When rare plants are known to occur in the type(s) of habitats present in the Study Area, nearby accessible occurrences of the plants (reference sites) should be observed to determine that the plants are identifiable at the time of the survey. In addition, the CDFW (CDFG 2009) and the USFWS (1996) give detailed instructions pertaining to the adequacy of surveys and results.

Floristic, protocol-level rare plant surveys that were conducted are shown above in Table 2. The surveys employed wandering transects across the entirety of the Study Area, with focus given to areas thought to be suitable for rare species and sensitive natural communities. Rare plant survey dates corresponded to the peak blooming periods for observing and accurately identifying hundreds of plant species in Solano County, including the 12 species with moderate or high potential to occur in the Study Area.

The surveys followed the protocol for plant surveys described in recommended resource agency guidelines (CNPS 2001, CDFG 2000, CDFG 2009, USFWS 1996). All plants were identified to the taxonomic level necessary to determine whether or not they were rare using the Jepson eFlora (Jepson Flora Project 2018). Species nomenclature adhered to those provided in the Jepson Flora Project (2018). Sensitive natural communities were identified following *A Manual of California Vegetation, Online Edition* (CNPS 2018a), the CFGC, or other applicable regulations (such as the CWA). Plant surveys were floristic in nature. All observed species were recorded and are included on a comprehensive species list provided in Appendix B. All rare plant populations and sensitive natural communities were mapped using a handheld Global Positioning System equipment with sub-meter accuracy.

3.2.4 Special-Status Wildlife Surveys

Following the general wildlife assessment and biological reconnaissance surveys, several focused wildlife and fisheries surveys were performed to better evaluate the potential for special-status wildlife species to occur within the Study Area. The following section describes the general methodology used for the focused wildlife surveys, which included Swainson's hawk (*Buteo swainsoni*), California black rail (CBR; *Laterallus jamaicensis coturniculus*), western pond turtle (*Actinemys marmorata*), giant garter snake (*Thamnophis gigas*), valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*), and general fish assemblage surveys.

Focused surveys for Swainson's hawk were conducted by WRA biologists trained in the species' identification and experienced with the protocol survey methodology. Four Swainson's hawk surveys were conducted in 2018 during the Swainson's hawk nesting season covering Periods II and III of the "Recommended Timing and Methodology for Swainson's Hawk Nesting Surveys in California's Central Valley" (Swainson's Hawk Technical Advisory Committee [SWHA TAC] 2000). Two surveys were conducted in Period II on March 23 and April 4, 2018, and two surveys were conducted in Period III on April 12 and 18, 2018. The survey area included the Study Area and areas immediately adjacent to the Study Area. Additionally, one survey was conducted on July 28, 2017 in the Phase V survey window, which corresponds to the post-fledging period. The Swainson's hawk survey methods followed the recommendations in the Technical Advisory Committee (TAC) guidelines cited above, and were performed using the naked eye, binoculars, and spotting scopes.

A dedicated survey for the state-listed CBR was performed on April 18, 2018 from 7:00 AM to 10:35 AM. Survey methods generally followed the "PRBO Black Rail Survey Protocol" by Jules Evens (unpublished). Eleven separate survey stations in the southernmost portion of the Study Area were visited. These stations were selected specifically to cover wetland habitats assessed to have the highest potential to support CBR (e.g., freshwater perennial emergent marsh and the more densely vegetated portions of managed wetlands). These stations were situated along an existing road or roadbed. Following five minutes of passive listening at each station, the surveyor broadcast approximately one minute of black rail "kik-kik-kerr" and "grrr" vocalizations, which was followed by several minutes of passive listening. A minimum of ten minutes was spent at each station. Calls were broadcast using a Domon IP65 portable speaker. The location of any CBRs

detected was recorded via directional bearing and estimated distance from the listening station. This survey was performed by a WRA biologist with the appropriate authorization from the CDFW (Memorandum of Understanding under Scientific Collecting Permit No. # SC-9777).

Focused surveys to evaluate habitat for giant garter snake and western pond turtle, and to collect environmental DNA (eDNA) samples for giant garter snake, were performed on July 28, 2017. Two WRA biologists trained in eDNA sampling methodology collected water samples within the Bowlsbey Ranch portion of the Study Area on this date. Collection procedures followed Blankenship and Schumer (2016) and Bergman et al. (2016). Water collection samples for eDNA were obtained from four locations. Sample locations were associated with three water features distributed throughout Bowlsbey Ranch, including Sycamore Slough, toe drains along Lookout Slough, and Duck Slough. Lookout Slough itself was not sampled. To ensure enough water was filtered at each location, each eDNA sample was represented by two sterivex filters. Total water volume filtered at each location was dictated by the water quality at the time of sampling. The volume of water that was filtered was recorded for each sterivex filter. All sterivex filters or eDNA samples were sent to and processed by Genidaqs using a quantitative Polymerase Chain Reaction (qPCR) hardware platform.

Focused surveys for valley elderberry longhorn beetle and the species host plant were conducted in the Study Area by WRA biologists on August 27 and September 7, 2018, and were supplemented with the rare plant surveys referenced in Section 3.2.3. Surveys followed USFWS 2017 *Framework for Assessing Impacts to the Valley Elderberry Longhorn Beetle;*, which included the preliminary surveys to identification elderberry host plants within the Study Area, a survey of all habitat and elderberry plants within 50 meters (165 feet) of host plants found within the Study Area, and an examination of elderberry stems for exit holes and presence of the beetle. Elderberry host plants were photographed and their locations were recorded.

General fish assemblage surveys were conducted within canals, ponds, and sloughs interior to the surrounding levee system in the Study Area. Three WRA fisheries biologists conducted fish assemblage surveys on March 8 and 9, 2018. All sampled features are isolated from the external Cache Slough area, and have been artificially constructed or manipulated. Additionally, they are used to convey agricultural and managed water through the Bowlsbey and Liberty Farms properties within the Study Area. No areas exterior to the flood control levees were sampled. Fish sampling was conducted via seine net, dip nets, and hook-and-line. Fish sampling was performed opportunistically in an effort to sample representative habitat within each artificially/managed target feature. Captured fish were identified to the species level and were released back into the water feature they were collected from. General fish size and age class, along with abundance, were qualitatively assessed for each sampled feature. Since the survey objective was to identify representative fish species and existing condition information for the interior Study Area fish assemblage, catch-per-unit effort and population size were not evaluated. In additional to fish species identification, water quality parameters, including temperature and salinity, and estimated water depth were recorded for each aquatic feature that was surveyed.

4.0 RESULTS

The approximately 3,637-acre Study Area is located primarily in unincorporated Solano County, with the northeastern corner located within unincorporated Yolo County, California. The Study Area is situated in the center of the Liberty Island USGS 7.5-minute quadrangle and is composed of three areas: Bowlsbey Ranch, Liberty Farms, and the Vogel property. Both Bowlsbey Ranch and Liberty Farms are currently protected by a Corps' flood control levee associated with the Yolo Bypass West levee system, whereas Vogel is located outside of a Corps levee. A detailed description of each of these areas is discussed below. The following sections present the results of the biological assessment conducted within the Study Area.

Bowlsbey Ranch

Bowlsbey Ranch is bordered by Liberty Island Road to the north, by non-tidal waters of Duck Slough to the northwest, by the Vogel property to the south, and by non-tidal waters of Lookout Slough to the southeast and south. Opposite of Lookout Slough, land associated with Liberty Farms occurs to the south and east. Additionally, an existing Corps' flood control levee associated with the Yolo Bypass West levee system separates Bowlsbey Ranch from tidal waters of Shag Slough along the northeast perimeter and from tidal waters of Haas and Cache Sloughs (and the Vogel property) along the southwest and south perimeter, respectively. Elevations within Bowlsbey Ranch range from approximately 0 to 10 feet (WGS84) above mean sea level (MSL) (Google Earth 2018).

Bowlsbey Ranch contains an active cattle grazing operation that consists of developed areas and agricultural fields divided by concrete-lined irrigation ditches and earthen ditches that are utilized conveying water for irrigated pasture. The majority of Bowlsbey Ranch is characterized by ruderal/agricultural vegetation with some wetland vegetation existing within and along irrigation ditches. The non-tidal Sycamore Slough is encompassed by the southwestern portion of Bowlsbey Ranch.

Liberty Farms

Liberty Farms is bordered by tidal waters of Shag Slough to the east, tidal waters of Cache Slough to the south, and non-tidal waters of Lookout Slough to the west and north. Again, a Corps' flood control levee associated with the Yolo Bypass West levee system separates Liberty Farms from adjacent tidal waters associated with Shag Slough to the east and Cache Slough to the south. The Cache Slough Complex, which is situated within the Yolo Bypass, is located to the south and west of Liberty Farms. Bowlsbey Ranch is located opposite of Lookout Slough to the north and northeast of Liberty Farms. The CDFW-managed Liberty Island Ecological Reserve occurs opposite of Shag Slough to the east of Liberty Farms. Elevations within Liberty Farms range from approximately 0 to 8 feet (WGS84) above MSL (Google Earth 2018).

Liberty Farms consists of land actively managed for duck hunting that has water artificially pumped and gravity fed through a series of ditches. The majority of land within the southern two-thirds of Liberty Farms are seasonally flooded to provide habitat for waterfowl and to allow for recreational hunting. Liberty Farms is dominated by wetlands in the south and ruderal/agricultural vegetation in the north, with planted windrows scattered within the south and developed areas along the eastern portion.

Vogel

The Vogel property is located south of Bowlsbey Ranch and is surrounded by Cache Slough to the east, south, and west; and Haas Slough to the northwest. Elevations within the Vogel property range from approximately 0 to 8 feet (WGS84) above MSL (Google Earth 2018).

The Vogel property consists of agricultural fields utilized for grazing, and several irrigation ditches. The majority of the Vogel property is dominated by wetland or ruderal/agricultural vegetation.

4.1 Biological Communities

Table 3 summarizes each biological community type observed in the Study Area. In total, the Study Area contains eight biological communities, five of which are sensitive. Non-sensitive biological communities in the Study Area include irrigated pasture, non-native grassland, and developed land cover. The five sensitive biological communities that occur in the Study Area include coastal and valley freshwater marsh, drainage ditches, irrigation ponds, slough (tidal/non-tidal), and great valley mixed riparian forest. Biological communities that occur in the Study Area are discussed in the following sections. Biological communities within the Study Area are shown on Figure 2 in Appendix A.

Table 3. Summary of Biological Communities in the Study Area

Vegetation Structure	Community (Holland 1986)	Vegetation Alliance (Sawyer et al. 2009, CNPS 2018)	Sensitive	Acres within Study Area[3]
Tree/Shrub	Great Valley mixed riparian forest	Arroyo willow thickets with Valley oak woodland	Yes	35.58
Herbs	Coastal and Valley freshwater marsh	Hardstem bulrush marsh; California bulrush marsh; Cattail marshes	Yes	1,127.13
	Irrigated pasture[1]	N/A	No[2]	1,364.19
	Non-native grassland[1]	Wild oats grasslands; Annual brome grasslands; Perennial rye grass fields; Bent grass-tall fescue meadows	No[2]	487.00
Open Water	Slough (tidal/non-tidal)[1]	N/A	Yes	329.64
	Drainage ditches[1]	N/A	Yes	
	Irrigation ponds[1]	N/A	Yes	
N/A	Developed[1]	N/A	No	293.00
Total				3,636.54

[1] Community not described by Holland (1986).

[2] Portions of these biological communities are delineated as features subject to the jurisdiction of the Corps and RWQCB and therefore are considered sensitive under CEQA. Please see the Aquatic Resources Delineation Report for more information (WRA 2018).

[3] Sum of individual communities may not equal total due to rounding.

4.1.1 Non-Sensitive Biological Communities

Irrigated pasture

Though not described in the literature, irrigated pastures are areas which include land used primarily for the production of food, fiber, and livestock. Irrigated pastures within the Study Area are managed either by seeding, grazing, and/or irrigation. Within the Study Area, this land cover type occurs throughout Bowlsbey Ranch, and comprises approximately 38% of the Study Area. Plant species observed within the irrigated pasture land cover type in the Study Area include dallis grass (*Paspalum dilatatum*), barley (*Hordeum* spp.), clover (*Trifolium* spp.), rabbitsfoot grass (*Polypogon monspeliensis*), Italian ryegrass (*Festuca perennis*; Moderate California Invasive Plant Council [Cal-IPC] Rating), tall fescue (*Festuca arundinacea*; Moderate Cal-IPC Rating), Bermuda grass (*Cynodon dactylon*; Moderate Cal-IPC Rating), bird's-foot trefoil (*Lotus corniculatus*), perennial pepperweed (*Lepidium latifolium*; High Cal-IPC Rating), narrowleaf plantain (*Plantago lanceolata*), smut grass (*Sporobolus indicus*), saltgrass (*Distichlis spicata*) cocklebur (*Xanthium strumarium*), wild radish (*Raphanus sativus*), wild fennel (*Foeniculum vulgare*; Moderate Cal-IPC Rating), and bristly ox-tongue (*Helminthotheca echioides*) (Cal-IPC 2018).

This biological community is not subject to the jurisdiction of federal, state, or local legislation and is therefore not considered sensitive under CEQA. However, portions of irrigated pasture are considered irrigated wetland, subject to the jurisdiction of the Corps and RWQCB and therefore are considered sensitive under CEQA. Please see the Aquatic Resources Delineation Report for more information on irrigated wetland (WRA 2018).

Non-native grassland

This biological community contains elements of four herbaceous alliances, including perennial rye grass fields (*Lolium perenne* [*Festuca perennis*] Herbaceous Semi-Natural alliance), annual brome grasslands (*Bromus diandrus, B. hordeaceus-Brachypodium distachyon* Herbaceous Semi-Natural Alliance), wild oats grasslands (*Avena* [*barbata, fatua*] Herbaceous Semi-Natural Alliance), and bent grass-tall fescue meadows (*Agrostis* [*gigantea, stolonifera*]-*Festuca arundinacea* Herbaceous Semi-Natural Alliance) (Sawyer et al. 2009). Within the Study Area, this community occurs in the northern half of Liberty Farms, along levee roads, and throughout the Vogel property. At limited locations along Lookout Slough, Himalayan blackberry (*Rubus armeniacus*, Moderate Cal-IPC Rating) is a component of this community. Non-native grassland comprises approximately 13% of the Study Area. Non-native grassland in the Study Area is dominated by non-native annual grasses, such as Italian ryegrass, ripgut brome (*Bromus diandrus*; Moderate Cal-IPC Rating), and soft chess (*Bromus hordeaceus*). Additional species within non-native grassland within the Study Area include: bull thistle (*Cirsium vulgare*; Moderate Cal-IPC Rating), broad leaf filaree (*Erodium botrys*), spring vetch (*Vicia sativa*), wild carrot (*Daucus carota*), wild radish, milk thistle (*Silybum marianum*), Italian thistle (*Carduus pycnocephalus*; Moderate Cal-IPC Rating), red stemmed filaree (*Erodium cicutarium*), mallow (*Malva* sp.), and Canada horseweed (*Erigeron canadensis*) (Cal-IPC 2018).

This biological community is not subject to the jurisdiction of federal, state, or local legislation and is therefore not considered sensitive under CEQA. However, within the Vogel property and northern portions of Liberty Farms, non-native grassland is considered managed wetland and subject to the jurisdiction of the Corps and RWQCB. Therefore, areas considered managed wetland are considered sensitive under CEQA. Please see the Aquatic Resources Delineation Report for more information on managed wetland (WRA 2018).

Developed
Though not described in the literature, the developed land cover type includes portions of the Study Area that have been highly disturbed or impacted through development, including Bowlsbey Ranch facilities such as a barn, livestock complex, and ranch roads. Additional developed land exists within eastern portion of Liberty Farms associated with active and abandoned duck club facilities. Himalayan blackberry is present around riprap along the exterior sloughs in the developed cover type. Additionally, roads situated atop levees are also classified as developed land cover. Developed land cover comprises approximately 8% of the Study Area.

This biological community is not subject to the jurisdiction of federal, state, or local legislation and is therefore not considered sensitive under CEQA.

4.1.2 Sensitive Biological Communities

Great valley mixed riparian forest
Within the Study Area, great valley mixed riparian forest contains elements of alliances including approximately 28.04 acres of arroyo willow thickets (*Salix lasiolepis* Shrubland Alliance) and approximately 7.54 acres of valley oak woodland (*Quercus lobata* Woodland Alliance) (Sawyer et al. 2009). Holland (1986) recognized great valley mixed riparian as consisting of red willow (*S. laevigata*), arroyo willow, and common buttonbush (*Cephalanthus occidentalis*).

Great valley mixed riparian forest comprises less than 1% of the Study Area. This biological community occurs on an island along Cache Slough between the Vogel property and Liberty Farms and scattered along the higher-elevation margins of channels and outboard levees within the Study Area. Particularly, great valley mixed riparian forest has established along the non-tidal waters of Lookout Slough that bisect the Study Area. The canopy of this community ranges from open to closed configurations and areas that comprise the arroyo willow thicket alliance had an average of 72 percent absolute cover of arroyo willow shrubs while the valley oak woodland alliance had 100 percent tree canopy cover predominantly comprised of valley oak and white alder (*Alnus rhombifolia*). Himalayan blackberry dominates the understory of both communities (Cal-IPC 2018) and California wild rose (*Rosa californica*) is occasionally present.

Great valley mixed riparian forest is comprised of alliances including arroyo willow thickets (Rarity Ranking G4 S4) and valley oak woodland (Rarity Ranking G3 S3), indicating that arroyo willow thicket is secure globally and statewide while valley oak woodland is vulnerable globally and statewide. This biological community may be subject to the jurisdiction of CDFW and the RWQCB and is therefore considered sensitive under CEQA.

Coastal and valley freshwater marsh
Within the Study Area, coastal and valley freshwater marsh contains elements of several alliances including hardstem bulrush marsh (*Schoenoplectus acutus* Herbaceous Alliance), California bulrush marsh (*Schoenoplectus californicus* Herbaceous Alliance), and cattail marshes (*Typha* [*angustifolia, domingensis, latifolia*] Herbaceous Alliance) (Sawyer et al. 2009). Holland (1986) describes coastal and valley freshwater marsh as dominated by perennial, emergent monocots including these species. Coastal and valley freshwater marsh is situated within the southern half of Liberty Farms and is actively flooded and drained to support waterfowl. These areas are flooded on an annual basis and the vegetation is managed to provide food sources for waterfowl; scraping, or plowing, to create contiguous, heterogeneous habitat; and areas have been planted with trees. In late 2005 to early 2006, a variety of willow tree species (*Salix* spp.) were planted along irrigation ditches in Liberty Farms (Google Earth 2018). These trees may have been installed as wind rows and do not represent natural historic conditions in the area. Coastal and

valley freshwater marsh comprises approximately 31% of the Study Area. Within this community, hardstem bulrush (*Schoenoplectus acutus*) is dominant or co-dominant with broadleaf cattail (*Typha latifolia*), flat sedge (*Cyperus* spp.), common reed grass (*Phragmites australis*), and Himalayan blackberry. In areas of still water, Pacific mosquito fern (*Azolla filiculoides*) occurs on the water's surface.

Coastal and valley freshwater marsh is considered sensitive under CEQA, as it is subject to the jurisdiction of the Corps and RWQCB.

Open water
Within the Study Area, open water exists in several different forms, including drainage ditches, irrigation ponds, and sloughs (tidal/non-tidal). Open water comprises approximately 10% of the Study Area. Both Sawyer (2009) and Holland (1986) do not describe this biological community.

Drainage ditches within the Study Area are earthen-lined ditches used to drain agricultural fields on Bowlsbey Ranch and convey water to the southern portion of Liberty Farms. These ditches vary in size from approximately 5 feet in width to over 20 feet in width, and have varying water regimes, with some ditches being permanently inundated and others carrying water for only a portion of the year. All ditches are manmade, excavated features connected through a complex network of screw gates and pumps. Although many of the ditches are lined with cattails and hardstem bulrush, they were classified as open water due to the small amount of vegetation relative to the overall size of the features and because vegetation within the ditches is regularly removed through current land use management.

Irrigation ponds within the Study Area include two raised, earthen-lined ponds located on the western side of Bowlsbey Ranch. The ponds are supported by earthen berms. Water is pumped into these ponds via two pumps, located in Duck Slough. From the ponds, water is gravity-fed into a network of concrete-lined irrigation ditches where it is diverted to individual pastures for flood irrigation. The ponds are regularly maintained and did not contain vegetation at the time of the surveys.

Sloughs within the Study Area include tidal perennial and non-tidal perennial open water habitat. Tidal perennial open water habitat occurs in the southern portion of the Study Area within Cache and Haas Sloughs, and in the eastern portion of the Study Area within Shag Slough. Non-tidal perennial open water habitat occurs within Duck, Lookout, and Sycamore Sloughs. Both tidal and non-tidal sloughs contain emergent vegetation, such as cattails and hardstem bulrush.

Open waters associated with drainage ditches and irrigation ponds are considered sensitive, as they are jurisdictional of the Corps and RWQCB. Sloughs (tidal/non-tidal) are considered sensitive, as they are jurisdictional of the Corps, RWQCB, and CDFW.

4.2 Special-Status Species

4.2.1 Plants

Based on a review of the resources and databases discussed in Section 3.2.1, 36 special-status plant species have been documented within a 5-mile radius of the Study Area shown on Figure 3 in Appendix A. The potential for these species to occur within the Study Area was evaluated prior to site visits (Appendix C). In total, 12 of the 36 species were determined to have moderate or high potential to occur in the Study Area. These species include the following:

- Watershield (*Brasenia schreberi*); CNPS Rank 2B.3
- Bristly sedge (*Carex comosa*); CNPS Rank 2B.1
- Pappose tarplant (*Centromadia parryi* spp. *parryi*); CNPS Rank 1B.2
- Parry's rough tarplant (*Centromadia parryi* ssp. *rudis*); CNPS Rank 4.2
- Bolander's water-hemlock (*Cicuta maculata* var. *bolanderi*); CNPS Rank 2B.1
- Woolly rose-mallow (*Hibiscus lasiocarpos* var. *occidentalis*); CNPS Rank 1B.2
- Delta tule pea (*Lathyrus jepsonii* var. *jepsonii*); CNPS Rank 1B.2
- Mason's lilaeopsis (*Lilaeopsis masonii*); State Listed Rare, CNPS Rank 1B.1
- Delta mudwort (*Limosella australis*); CNPS Rank 2B.1
- Sanford's arrowhead (*Sagittaria sanfordii*); CNPS Rank 1B.2
- Suisun Marsh aster (*Symphyotrichum lentum*); CNPS Rank 1B.2
- Saline clover (*Trifolium hydrophilum*); CNPS Rank 1B.2

Prior to the site visit, the other 24 special-status species documented in the vicinity of the Study Area were determined to have unlikely or no potential to occur based on the lack of the following habitats or site conditions:

- Meadows and seeps
- Valley or foothill grasslands
- Vernal pools
- Alkaline soils
- Chaparral

Additionally, after protocol-level rare plant surveys were conducted, it was determined that four of the 12 species with high or moderate potential to occur are present in the Study Area. These species are listed below:

- Parry's rough tarplant; CNPS Rank 4.2
- Woolly rose-mallow; CNPS Rank 1B.2
- Mason's lilaeopsis; State Listed Rare, CNPS Rank 1B.1
- Suisun Marsh aster; CNPS Rank 1B.2

The other eight species evaluated as having moderate or high potential to occur prior to the protocol-level rare plant surveys are described in Appendix C as unlikely to occur despite suitable habitat being present since they were not observed during the appropriately-timed rare plant surveys. The 12 special-status plant species that were originally believed to have moderate or high potential to occur in the Study Area are discussed below. The location and distribution of species observed during protocol-level rare plant surveys are shown on Figure 4 in Appendix A.

Special-Status Plant Species Determined to Have Moderate or High Potential to Occur within the Study Area That Were Not Found to be Present

Watershield (*Brasenia schreberi*). CNPS Rank 2B.3. Watershield is a perennial herb in the watershield family (Cabombaceae) that blooms from June to September. It typically occurs in freshwater marshes and swamps at elevations ranging from 99 to 7,260 feet (CNPS 2018b). This species is an OBL plant species (Lichvar et al. 2016). This species is known to occur in marshes, swamps, and wetlands. Associated species include rushes (*Juncus* spp.), tule (*Schoenoplectus acutus* var. *occidentalis*), pondweed (*Potamogeton* spp.), and great yellow pond lily (*Nuphar polysepala*) (CDFW 2018a).

This species has been recorded throughout 17 different counties within California: Butte, El Dorado, Fresno, Kern, Lake, Lassen, Mendocino, Nevada, Plumas, Sacramento, Shasta, Siskiyou, San Joaquin, Sutter, Tehama, Tulare, and Tuolumne Counties (CNPS 2018b). There are no occurrences of watershield within the vicinity of the Study Area (Figure 3, Appendix A) (CDFW 2018a).

Watershield was not observed during protocol-level rare plant surveys that occurred within this species' blooming period. Thus, this species has an unlikely potential to occur in the Study Area.

Bristly sedge (*Carex comosa*). CNPS Rank 2B.1. Bristly sedge is a perennial herb in the sedge family (Cyperaceae) that blooms from May to September. It typically occurs in coastal prairies, lake margins, marshes, swamps, and valley and foothill grasslands at elevations ranging from 0 to 2,060 feet (CNPS 2018b). This species is an OBL plant species (Lichvar et al. 2016). Associated species include tall flatsedge (*Cyperus eragrostis*), willows, tule, and cattail (CDFW 2018a).

Bristly sedge has been recorded throughout ten different counties within California, including Contra Costa, Lake, Mendocino, Sacramento, San Bernardino, Santa Cruz, San Francisco, Shasta, San Joaquin, and Sonoma Counties (CNPS 2018b). There are no occurrences of bristly sedge within the vicinity of the Study Area (Figure 3, Appendix A) (CDFW 2018a).

Bristly sedge was not observed during protocol-level rare plant surveys that occurred within this species' blooming period. Thus, this species has an unlikely potential to occur in the Study Area.

Pappose tarplant (*Centromadia parryi* ssp. *parryi*). CNPS Rank 1B.2. Pappose tarplant is an annual herb in the sunflower family (Asteraceae) that blooms from May to November. It typically occurs in alkaline soils in chaparral, coastal prairie, meadows, seeps, coastal salt marshes and swamps, and vernally mesic foothill and valley grasslands at elevations ranging from 0 to 1,386 feet (CNPS 2018b). This species is has not been assigned a wetland indicator status (Lichvar et al. 2016). Associated species include Italian rye grass, saltgrass, Mediterranean barley (*Hordeum marinum* ssp. *gussoneanum*), perennial pepperweed, yellow star thistle (*Centaurea solstitialis*), alkali heath (*Frankenia salina*), and brass buttons (*Cotula coronopifolia*) (CDFW 2018a).

This species has been recorded in eight different counties within California, including Butte, Colusa, Glenn, Lake, Napa, San Mateo, Solano, and Sonoma Counties (CNPS 2018b). There are no occurrences of this species within the vicinity of the Study Area (Figure 3, Appendix A) (CDFW 2018a).

Pappose tarplant was not observed during protocol-level rare plant surveys that occurred within this species' blooming period. Thus, this species has an unlikely potential to occur in the Study Area.

Bolander's water-hemlock (*Cicuta maculata* var. *bolanderi*). CNPS Rank 2B.1. Bolander's water-hemlock is a perennial herb in the umbellifers family (Apiaceae) that blooms from July to September. It typically occurs in coastal brackish or freshwater marshes and swamps at elevations ranging from 0 to 660 feet (CNPS 2018b). This species is an OBL plant species (Lichvar et al. 2016). Associated species include rushes, slough sedge (*Carex obnupta*), bulrush (*Scirpus* spp.), and tule (CDFW 2018a).

This species has been recorded in five different counties within California, including Contra Costa, Marin, Sacramento, Santa Barbara, and Solano Counties (CNPS 2018b). There is one CNDDB

occurrence record (#14) located approximately six miles west of the Study Area (Figure 3, Appendix A) (CDFW 2018a).

Bolander's water-hemlock was not observed during protocol-level rare plant surveys that occurred within this species' blooming period. Thus, this species has an unlikely potential to occur in the Study Area.

Delta tule pea (*Lathyrus jepsonii* var. *jepsonii*). CNPS Rank 1B.2. Delta tule pea is a perennial herb in the pea family (Fabaceae) that blooms from May to July. It typically occurs in freshwater and brackish marshes and swamps at elevations ranging from 0 to 16 feet (CNPS 2018b). This species is an OBL plant species (Lichvar et al. 2016). Associated species include bulrushes, willows, Mason's lilaeopsis, perennial pepperweed, California wild rose, and tall flatsedge (CDFW 2018a).

This species has been recorded in seven different counties within California, including Contra Costa, Napa, Sacramento, San Joaquin, Solano, Sonoma, and Yolo Counties (CNPS 2018b). There are eight CNDDB occurrence records within a 5-mile radius of the Study Area with the closest occurrence (#53) located approximately 1.8 miles west of the Study Area (Figure 3, Appendix A) (CDFW 2018a).

Delta tule pea was not observed during protocol-level rare plant surveys that occurred within this species' blooming period. Thus, this species has an unlikely potential to occur in the Study Area.

Delta mudwort (*Limosella australis*). CNPS Rank 2B.1. Delta mudwort is a perennial herb in the figwort family (Scrophulariaceae) that blooms from May to August. It typically occurs in riparian scrub, mud banks, marshes and swamps (freshwater or brackish) at elevations ranging from 0 to 10 feet (CNPS 2018b). This species has not been assigned a wetland indicator status (Lichvar et al. 2016). Associated species include Mason's lilaeopsis, bulrushes, willows, rushes, whorled pennywort (*Hydrocotyle verticillata*), and spikesedges (*Eleocharis* spp.) (CDFW 2018a).

This species has been recorded in four different counties within California, including Contra Costa, Sacramento, San Joaquin, and Solano Counties (CNPS 2018b). There are three CNDDB occurrence records in the vicinity of the Study Area (CDFW 2018a). The nearest documented occurrence is from August 1986, located at the confluence of Miner Slough and Cache Slough south of Liberty Island (Figure 3, Appendix A) (CDFW 2018a).

Delta mudwort was not observed during protocol-level rare plant surveys that occurred within this species' blooming period. Thus, this species has an unlikely potential to occur in the Study Area.

Sanford's arrowhead (*Sagittaria sanfordii*). CNPS Rank 1B.2. Sanford's arrowhead is a perennial herb in the water plantains family (Alismataceae) that blooms from May to October. It typically occurs in assorted shallow freshwater habitats, such as marshes and swamps at elevations ranging from 0 to 1,430 feet (CNPS 2018b). This species is an OBL plant species (Lichvar et al. 2016). Known associated species include hardstem bulrush, common rush, willows, floating primrose-willow (*Ludwigia peploides*), flat sedge, cockspur grass (*Echinochloa crus-galli*), and Malabar sprangletop (*Leptochloa fusca*) (CDFW 2018a).

This species has been recorded in 19 different counties within California, including Butte, Del Norte, El Dorado, Fresno, Merced, Mariposa, Marin, Napa, Orange, Placer, Sacramento, San Bernardino, Shasta, San Joaquin, Solano, Tehama, Tulare, Ventura, and Yuba Counties (CNPS 2018b). There are four CNDDB occurrence records in the vicinity of the Study Area (CDFW

2018a). The nearest documented occurrence is from August 2005, located in Miner Slough on the east side of Prospect Island (Figure 3, Appendix A) (CDFW 2018a).

Sanford's arrowhead was not observed during protocol-level rare plant surveys that occurred within this species' blooming period. Thus, this species has an unlikely potential to occur in the Study Area.

Saline clover (*Trifolium hydrophilum*). CNPS Rank 1B.2. Saline clover is an annual herb in the pea family (Fabaceae) that blooms from April to June. It typically occurs in mesic alkaline valley and foothill grasslands, vernal pools, marshes, and swamps at elevations ranging from 0 to 660 feet (CDFW 2018a, CNPS 2018). This species is a FAC plant species (Lichvar et al. 2016). Associated species include saltgrass, whitetip clover (*Trifolium variegatum*), Italian rye grass, seaside barley, doublehorn calicoflower (*Downingia bicornuta*), California goldfields (*Lasthenia californica*), and stick sandspurry (*Spergularia macrotheca*) (CDFW 2018a).

This species has been recorded in different counties within California, including Alameda, Contra Costa, Colusa, Lake, Monterey, Napa, Sacramento, San Benito, Santa Clara, Santa Cruz, San Joaquin, San Luis Obispo, San Mateo, Solano, Sonoma, and Yolo Counties (CNPS 2018b). There is one CNDDB occurrence record in the vicinity of the Study Area (CDFW 2018a). This occurrence was last observed in April of 1974 and is located a mile northeast of Bunker Station (Figure 3, Appendix A) (CDFW 2018a).

Saline clover was not observed during protocol-level rare plant surveys within this species' blooming period. Thus, this species has an unlikely potential to occur in the Study Area.

Special-Status Plant Species Observed in the Study Area

Parry's rough tarplant (*Centromadia parryi* ssp. *rudis*). CNPS Rank 4.2. Parry's rough tarplant is an annual herb in the sunflower family (Asteraceae) that blooms from May to October. It typically occurs in alkaline, vernally mesic valley and foothill grasslands and vernal pools and seeps, and sometimes along roadsides at elevations ranging from 0 to 330 feet (CDFW 2018a, CNPS 2018b). This species is a FACW plant species (Lichvar et al. 2016). Associated species include pappose tarplant, yellow dock, hayfield tarplant (*Hemizonia congesta*), Mediterranean barley (*Hordeum murinum*), common lippia (*Phyla nodiflora*), saltgrass, narrowleaf milkweed (*Asclepias fascicularis*), alkali mallow (*Malvella leprosa*), cutleaf plantain (*Plantago coronopus*), and sundry annual grasses (CDFW 2018a).

This species has been recorded in 35 different counties within California, including Butte, Colusa, Glenn, Lake, Merced, Sacramento, San Joaquin, Solano, Sutter, and Yolo Counties (CNPS 2018b). There are no recorded CNDDB occurrences of this species within the vicinity of the Study Area (Figure 3, Appendix A) (CDFW 2018a); however, this species has been recorded within five of the surrounding eight quadrangles by the CNPS (2018b).

Parry's rough tarplant was present within the Study Area. Approximately 348 individuals were observed on and adjacent to levee roads within the non-native grassland community on Bowlsbey Ranch and ten individuals at were observed at one location (alongside a levee road in the same biological community) on the Vogel property. Individuals were found along fence lines and along both gravel and dirt access roads. Locations of individuals observed are shown on Figure 4 in Appendix A.

Woolly rose-mallow (*Hibiscus lasiocarpus* var. *occidentalis*). CNPS Rank 1B.2. Woolly rose-mallow is a perennial herb in the mallow family (Malvaceae) that blooms from June to September. It typically occurs in freshwater marshes and swamps, often within riprap on the sides of levees at elevations ranging from 0 to 394 feet (CDFW 2018a, CNPS 2018b, and CDFW 2018a). This species has no wetland indicator status (Lichvar et al. 2016). Associated species include cattail, club-rush, knotweeds, and willows (CDFW 2018a, CDFW 2018a).

This species has been recorded in 36 different counties within California, including Butte, Contra Costa, Colusa, Glenn, Sacramento, San Joaquin, Solano, Sutter, and Yolo Counties (CNPS 2018b). There are two CNDDB records (#142 and #223) located within a 5-mile radius of the Study Area (CDFW 2018a). The nearest documented occurrence was last observed in August of 2005 and is located along the southern edge of Haas Slough (Figure 3, Appendix A) (CDFW 2018a).

Woolly rose-mallow was present within the Study Area. In total, approximately 80 individuals were observed among emergent vegetation located along the eastern bank of Sycamore Slough in the northeastern portion of Bowlsbey Ranch. Locations of individuals observed are shown on Figure 4 in Appendix A.

Mason's lilaeopsis (*Lilaeopsis masonii*). State Listed Rare. CNPS Rank 1B.1. Mason's lilaeopsis is a rhizomatous, tuft-forming, diminutive perennial forb in the carrot family (Apiaceae) that blooms from April to November. It typically occurs in areas within the direct tidal or splash zones on mud banks of sloughs and channels in riparian scrub and freshwater and brackish marsh habitat at elevations ranging from 0 to 35 feet (CDFW 2018a, CNPS 2018b). This species is an OBL plant species (Lichvar et al. 2016). Associated species include Baltic rush, low bulrush (*Isolepis cernua*), tule, cattails, common reed, fleshy jaumea (*Jaumea carnosa*), salt grass, fat hen (*Atriplex prostrata*), arrow grasses (*Triglochin* spp.), water parsley (*Oenanthe sarmentosa*), gumweed (*Grindelia* spp.), and pickleweed (*Salicornia virginica*) (CDFW 2018a).

This species has been recorded in 24 different counties within Alameda, Contra Costa, Marin, Napa, Sacramento, San Joaquin, Solano, and Yolo Counties (CNPS 2018b). There are 19 CNDDB occurrence records in the vicinity of the Study Area (CDFW 2018A). The nearest documented occurrence was observed in August of 2005 (#73) and is located at the confluence of Cache and Haas Slough (Figure 3, Appendix A) (CDFW 2018a).

Mason's lilaeopsis was present within the Study Area. Approximately 12 occurrences were observed on the outboard side of levees within the tidal zone of the Vogel property. Mason's lilaeopsis was observed growing often in dense patches where it was the dominant species, though it was also observed growing amongst other species as a subdominant. In some locations, it co-occurred with Suisun Marsh aster.

As stated above, Mason's lilaeopsis is rhizomatous, and it produces tufts at intervals along the rhizomes. As such, it would not be possible to estimate the number of individuals without digging the plants up. Instead, the dimensions of the area occupied at each occurrence were estimated, as were the density of tufts per square foot. The area occupied by each occurrence ranged from 2 to 35 square feet. Densities ranged from 50 to 155 tufts per square foot. Locations of occurrences observed are shown on Figure 4 in Appendix A.

Suisun Marsh aster (*Symphyotrichum lentum*). CNPS Rank 1B.2. Suisun Marsh aster is a perennial forb in the sunflower family (Asteraceae) that blooms from May to November. It typically occurs along sloughs and channels in dense marsh vegetation in freshwater and coastal brackish

marsh habitat at elevations ranging from 0 to 10 feet (CDFW 2018a, CNPS 2018b). This species is an OBL plant species (Lichvar et al. 2016). Known associated species include gumweed, western goldenrod (*Euthamia occidentalis*), Delta tule pea, cattails, hardstem bulrush, Olney's bulrush (*Schoenoplectus americanus*), California tule, Baltic rush, marsh fleabane (*Pluchea odorata*), California wild rose, and common reed (CDFW 2018a).

This species has been recorded in 26 different counties within Contra Costa, Napa, Sacramento, San Joaquin, Solano, and Yolo counties (CNPS 2018b). Thirty CNDDB occurrence records occur in the vicinity of the Study Area (CDFW 2018A). The nearest colony of Suisun Marsh aster is located approximately 0.4 mile southwest of the Study Area (CNDDB occurrence #193). This occurrence was last observed in 2008 and contained three robust patches of individuals (CDFW 2018a). Additionally, two colonies of Suisun Marsh aster (CNDDB occurrences #191 and #192) are located approximately 0.6 and 0.7 mile northwest of the Study Area, respectively (CDFW 2018a). These colonies are located among emergent tidal marsh vegetation along Haas Slough and are presumed extant (though abundance estimations in these colonies were not recorded).

Suisun Marsh aster was present within the Study Area. Approximately 241 individuals of Suisun Marsh aster were observed in the Study Area. In total, 216 individuals were observed on the outboard side of the levee that parallels Shag Slough. The remaining 27 individuals of Suisun Marsh aster were observed on the outboard side of the levee that surrounds the Vogel property. Suisun Marsh aster was found alongside Mason's lilaeopsis. Locations of individuals observed are shown on Figure 4 in Appendix A.

4.2.2 Wildlife

Based upon a review of the available resources, 90 special-status wildlife species have been documented in the vicinity of the Study Area. Of these, 25 special-status wildlife species were observed within, or have a moderate or high potential to occur in the Study Area. All species with potential to occur, or that are known to occur, are discussed below. Any wildlife species observed have been recorded in Appendix B. Appendix C summarizes the potential for all species evaluated for the Project. Wildlife species documented in the CNDDB within 5 miles of the Study Area are shown on Figure 5 in Appendix A. Of the 90 special-status wildlife species documented in the vicinity of the Study Area, the majority of species have no potential or are unlikely to occur due to a lack of suitable habitat or habitat components. Some of those habitats and components, which are not present within the Study Area, include:

- vernal pools
- burrowing mammals or burrows constructed by burrowing mammals (i.e. ground squirrels)
- Caves or rock outcroppings
- oak woodlands
- suitable soils to support host plants
- species-specific host plants
- beaches or dune habitats
- salt marsh
- suitable old growth riparian forest

In addition to the aforementioned resources, WRA also conducted a series of wildlife surveys within the Study Area (Table 4).

Table 4. Wildlife Surveys Conducted within the Study Area

Target Species or Taxa	Survey Dates	Results
General Fish Assemblage	March 8 and 9, 2018	No federal or state listed species observed. One individual splittail was the only special-status fish documented in the Study Area. Aquatic features were dominated by non-native fish. A full list of fish encountered is provided in Appendix B.
Swainson's Hawk and Nesting Raptors	March 23 – April 18, 2018	Two nests were observed within the Study Area and two nests were observed outside of it (within 500 feet of the boundary).
Giant Garter Snake eDNA survey	July 28, 2017	eDNA for this species was detected in Lookout Slough and Sycamore Slough.
California Black Rail	April 18, 2018	No individuals were detected.
Valley Elderberry Longhorn Beetle	August 27 and September 7, 2018	Five elderberry shrubs and two samplings were found on the outboard side of the levee. Plants were not part of a continuous or remnant riparian corridor; the area is subject to levee maintenance. No exit holes or beetles were observed on stems.

Species that were determined to have a moderate or high potential, or are known to occur within the Study Area are discussed below, which is followed by a discussion of federally listed species known in the area, but are not likely to occur within the Study Area.

Species Considered Present within the Study Area

Loggerhead shrike (*Lanius ludovicianus*). USFWS Bird of Conservation Concern, CDFW Species of Special Concern. The loggerhead shrike is a year-round resident and winter visitor in lowlands and foothills throughout California. This species is associated with open country with short vegetation and scattered trees, shrubs, fences, utility lines, and/or other perches. Although they are songbirds, shrikes are predatory and forage on a variety of invertebrates and small vertebrates. Captured prey items are often impaled on suitable substrates for storage purposes, including thorns or spikes on vegetation, and barbed wire fences. Nests are located in trees and large shrubs. Nests are usually placed 3 to 10 feet off the ground (Shuford and Gardali 2008).

This species was observed within the Study Area during the January 6, 2017 site visit. The Study Area contains short-statured grasslands suitable for foraging by the species. In addition, trees, shrubs, and other suitable vegetation is present along levees or in scattered patches around the Study Area, which may support nesting by the species. The species has been observed within the Study Area, and both foraging and nesting habitat are present. This species was determined to have high potential to nest within the Study Area.

Song sparrow - Modesto Population (*Melospiza melodia*). CDFW Species of Special Concern. The Modesto population of the song sparrow is endemic to the north-central portion of the Central Valley. The highest densities of this species occur in the Butte Sink area. This song sparrow has an affinity for emergent freshwater marshes, but will also nest in willow thickets, valley oak riparian forests, and along vegetated irrigation ditches and levees.

This species has been recorded in marshes within 5-miles to the south of the Study Area (CDFW

2018a), and song sparrows have been observed within the Study Area during site visits by WRA. Additionally, marshes within the southern section of the Study Area have been managed as a duck hunting club and may provide suitable nesting and foraging habitat for the species. Therefore, due to the proximity of occurrences and observations on site, as well as the presence of marsh habitat, this species was determined to be present within the Study Area.

Swainson's hawk (*Buteo swainsoni*). State Threatened, USFWS Bird of Conservation Concern. Swainson's hawk is a summer resident and migrant in California's Central Valley and in scattered portions of the southern California interior. Nests are constructed of sticks and are placed in trees located in otherwise largely open areas. Areas typically used for nesting include the edge of narrow bands of riparian vegetation, isolated patches of oak woodland, lone trees, and both planted and natural trees associated with roads, farmyards, and sometimes adjacent residential areas. Foraging occurs in open habitats, including grasslands, open woodlands, and agricultural areas. While breeding, adults feed primarily on rodents (and other vertebrates). For the remainder of the year, large insects (e.g., grasshoppers, dragonflies) comprise most of this species' diet. In many areas, Swainson's hawks have adapted to foraging primarily in and around agricultural plots (particularly alfalfa, wheat and row crops), as prey are both numerous and conspicuous at harvest and/or during flooding or burning (Bechard et al. 2010).

During the survey conducted by WRA in the spring of 2018, two nests associated with this species were observed within the Study Area (Figure 6, Appendix A). Additionally, two nests were observed outside of the Study Area, but within 500 feet of the boundary. A nest for this species was also recorded from 2001-2005 and in 2007 (CNDDB Occurrence 1148, CDFW 2018a). This species is considered present in the Study Area because it was observed nesting during cursory surveys

Giant garter snake (*Thamnophis gigas*). State Threatened Species, Federal Threatened Species. This endemic species of snake is found only in the Sacramento and San Joaquin Valleys. Giant garter snake prefers freshwater marshes and low gradient streams, but has adapted to drainage channels and irrigation ditches. Giant garter snake inhabits agricultural wetlands and other waterways, such as irrigation and drainage canals, sloughs, ponds, small lakes, low gradient streams, and adjacent uplands in the Central Valley.

Giant garter snake is endemic to the Central Valley wetlands of California. It is active when water temperatures are at 20 degrees Fahrenheit or more. It is dormant underground when its aquatic habitat is below this 20 degrees Fahrenheit. Fish and frogs form a large portion of the diet of this species. This highly aquatic snake is active during daylight year-round and at night, temperatures permitting. It uses vegetation near water for basking, but is evasive and difficult to approach. Giant garter snake will quickly submerge into the water from its basking site when startled. This species hibernates in animal burrows and emerges from overwintering sites in March.

This species was previously believed to be extirpated from the adjacent Liberty Island area of the Delta (USFWS 2012). However, a specimen was recorded along the southeastern border of the Study Area in 2017 (CDFW 2018a). Additionally, WRA passively sampled Environmental DNA (eDNA) from this species in Lookout and Sycamore Sloughs. Furthermore, in 2018, the USGS conducted trapping surveys for giant garter snake within the Study Area. While the survey results have not been finalized or released at this time, WRA biologists accompanied the USGS for a day of trapping, during which time it was confirmed that giant garter snake had been captured in one of the traps. Therefore, this species is considered present within the Study Area.

Western pond turtle (*Actinemys marmorata*). CDFW Species of Special Concern. This turtle can be found in suitable aquatic habitat throughout California, west of the Sierra-Cascade crest and Transverse Ranges. Pond turtles inhabit perennial aquatic habitats, such as lakes, ponds, rivers, streams, and canals that provide submerged cover and suitable basking structures, such as rocks and logs (Zeiner et al. 1990). Pond turtles prefer to nest on unshaded upland slopes close to their aquatic habitat, and hatchlings require shallow water with relatively dense emergent and submerged vegetation for aquatic invertebrate foraging (Thompson et al. 2016). Within the Delta, pond turtle is typically found where suitable basking sites, deep water, and friable soils occur together.

This species was observed within the Study Area and in the adjacent waters of the Cache Sough Complex. The presence of deep water found in irrigation ditches and in Sycamore Slough, combined with multiple sloughs surrounding the Study Area, provides an abundance of suitable habitat within and surrounding the Study Area. Additionally, the Study Area provides suitable basking sites and friable soils capable of supporting reproduction for this species. Therefore, this species is considered present within the Study Area.

Sacramento splittail (*Pogonichthys macrolepidotus*). CDFW Species of Special Concern. Splittail are primarily freshwater fish that have been found mostly in slow-moving sections of rivers and sloughs. In the Delta and Suisun Marsh, they often congregate in dead end sloughs (Moyle et al. 1982, Daniels and Moyle 1983). Splittail are benthic foragers that feed extensively on opossum shrimp (*Neomysis mercedis*). However, detrital material typically comprises a high percentage of their stomach contents. They will feed opportunistically on earthworms, clams, insect larvae, and other invertebrates. They are preyed upon by striped bass and other predatory fish. Splittail ostensibly require flooded vegetation for spawning and as foraging areas for young, hence they are found in habitat subject to periodic flooding during the breeding season (Caywood 1974).

Aquatic habitat surrounding the Study Area is composed of slow-moving tidal sloughs, which are suitable for both foraging and spawning by the species (Young et al. 2015, Calfish 2018). Surveys conducted by University of California, Davis have documented this species within the surrounding Cache Slough Complex (Young et al. 2015). Additionally, during aquatic surveys throughout the irrigation ditches of the Study Area, an individual of this species was observed. Therefore, as Sacramento splittail is known to occur in the habitats that surround the Study Area and was detected within the Study Area, it is considered present.

Species with High Potential to Occur within the Study Area

Northern harrier (*Circus cyaneus*). CDFW Species of Special Concern. The northern harrier is a resident within and winter visitor to open habitats throughout most of California, including freshwater and brackish marshes, grasslands and fields, agricultural areas, and deserts. Harriers typically nest in treeless areas within patches of dense, relatively tall vegetation that varies in composition. Nests are constructed on the ground and are often located near water or within wetlands (Shuford and Gardali 2008). Harriers are birds of prey that subsist on a variety of small mammals and other vertebrates.

Open areas composed of shrubby vegetation in close proximity to marsh and foraging habitat create potential nesting habitat for the northern harrier. This species has been observed foraging in and adjacent to the Study Area. While agricultural disturbance may degrade portions of the nesting habitat, the large scale of the Study Area, which contains contiguous and open non-wooded habitats, provides a high potential for this species to nest.

Chinook salmon - Central Valley Fall/late fall-run, Evolutionarily Significant Unit (ESU) (*Oncorhynchus tshawytscha*). NMFS Species of Concern, CDFW Species of Special Concern. The Central Valley fall/late fall-run ESU includes all naturally spawned spring-run Chinook salmon populations from the Sacramento/San Joaquin River mainstem and its tributaries. Late-fall run Chinook salmon are morphologically similar to spring-run Chinook salmon. They are large salmonids, reaching 75-100 cm standard length and weighing up to 9-10 kilograms or more. The vast majority of late-fall Chinook salmon appear to spawn in the mainstem of the Sacramento River, which they enter from October through February. Spawning occurs in January, February and March, although it may extend into April in some years. Eggs are laid in large depressions (redds) hollowed out in gravel beds. The embryos hatch following a 3-4 month incubation period and the alevins (sac-fry) remain in the gravel for another 2-3 weeks. Once their yolk sac is absorbed, the fry emerge and begin feeding on aquatic insects. All fry have emerged by early June. The juveniles hold in the river for nearly a year before migrating to the ocean the following December through March. Once in the ocean, salmon are largely piscivorous and grow rapidly. The specific habitat requirements of late-fall Chinook salmon have not been determined, but they are presumably similar to other Chinook salmon runs and fall within the range of the physical and chemical characteristics of the Sacramento River above Red Bluff.

The Study Area is located directly off of the primary migration corridors (the Sacramento River and the Sacramento River Deep Water Shipping Channel [DWSC]) used by this species when migrating to the American, Sacramento, or Fall River spawning grounds (Moyle 2002). While adults do not typically use sloughs or marshes like those surrounding the Study Area during migration, juvenile salmonids require such habitats for rearing, and as cover during outmigration (Meyers et al. 1998). Fish salvage operations at the Yolo Bypass have identified this species as being present in the local area (Acierto et al. 2014). Therefore, due to the presence of habitat within and surrounding the Study Area, as well as the proximity to the migration corridors used by salmonids moving through the Sacramento River, this species was determined to have high potential to be seasonally present, particularly during the outmigration period of juvenile fish.

Chinook salmon - Central Valley Spring-run ESU (*Oncorhynchus tshawytscha*). Federal Threatened, State Threatened. The Central Valley Spring-run ESU includes all naturally spawned spring-run populations from the Sacramento/San Joaquin River mainstem and its tributaries. Chinook salmon are anadromous (adults migrate from a marine environment into the freshwater streams and rivers of their birth) and semelparous (spawn only once and then die). Spring-run Chinook salmon enter the Sacramento River between February and June. They move upstream and enter tributary streams from February through July, peaking in May-June. These fish migrate into the headwaters, hold in pools until they spawn, starting as early as mid-August and ending in mid-October, peaking in September. They are fairly faithful to the home streams in which they were spawned, using visual and chemical cues to locate these streams. While migrating and holding in the river, spring chinook do not feed, relying instead on stored body fat reserves for maintenance and gonadal maturation. Eggs are laid in large depressions (redds) hollowed out in gravel beds. Some fish remain in the stream until the following October and emigrate as "yearlings", usually at the onset of storms starting in October and lasting through the following March (peaking in November-December). Large pools with cold water provide essential over-summering habitat for this species.

The Study Area is located directly adjacent to the primary migration corridors (the Sacramento River and the DWSC) used by this species (NMFS 2016b). While adults do not typically use sloughs and marshes like those surrounding the Study Area during migration, juvenile salmonids require such habitat for rearing, and as cover during outmigration (NMFS 2016b). Spring Kodiak trawl data from the CDFW operations south of Liberty Island, as well as fish rescue operations in

the Yolo Bypass, have confirmed the presence of this species throughout the local area (CDFW 2018b, Acierto et al. 2014). Therefore, due to: (1) the presence of suitable rearing and foraging habitat within and surrounding the Study Area, (2) the proximity to primary migration corridors used by Chinook salmon moving through the Sacramento River, and (3) confirmed occurrences of Chinook salmon in the local area, this species was determined to have a high potential to be seasonally present, particularly during the outmigration period of juvenile fish.

Chinook salmon - Sacramento River Winter-run ESU (*Oncorhynchus tshawytscha).* Federal Endangered, State Endangered. The ESU includes all naturally spawned populations of winter-run Chinook salmon in the Sacramento River and its tributaries in California, as well as two artificial propagation programs: winter-run Chinook salmon from the Livingston Stone National Fish Hatchery (NFH), and winter-run Chinook salmon in a captive broodstock program maintained at Livingston Stone NFH and at the University of California Bodega Marine Laboratory. Winter-run chinook salmon are unique because they spawn during summer months when air temperatures usually approach their yearly maximum. As a result, these salmon require stream reaches with cold water sources that will protect embryos and juveniles from the warm ambient conditions in summer. Winter-run chinook salmon are primarily restricted to the mainstem Sacramento River.

The Study Area is located directly off of the primary migration corridors (the Sacramento River and the DWSC) used by this species (NMFS 2014). While adults do not typically use sloughs and marshes like those surrounding the Study Area during migration, juvenile salmonids require such habitat for rearing, and as cover during outmigration (NMFS 2014, Moyle 2002). This species has been detected during CDFW Kodiak trawls south of Liberty Island, as well as during fish salvage operations within the Yolo Bypass (CDFW 2018b, Acierto et al. 2014). Therefore, due to the presence of rearing and foraging habitat within and surrounding the Study Area, as well as the proximity to this species' primary migration corridor, and the recorded occurrences of the species within adjacent waters, this species was determined to have high potential to be seasonally present, particularly during the outmigration period of juvenile fishes.

Delta smelt (*Hypomesus transpacificus*). Federal Endangered, State Threatened. Delta smelt are a pelagic species (i.e., they spend their lives within the water column and are not associated with a structural physical habitat). All life stages of Delta smelt generally occur within two meters of the surface and tend to concentrate near the mixing zone where salinities of 2 parts per 1,000 (ppt) occur (USFWS 2003). The point in the estuary where the average daily salinity at the bottom of the water is two ppt is referred to as the X2. This is the distance from the Low Salinity Zone (about 0.6 to 3.0 ppt) to the Golden Gate Bridge, measured in kilometers (USFWS 2008). This distance changes over the course of the year based on freshwater inflow through the Delta, and during years when the X2 is centered around the shallows of Suisun Bay during the spring generally result in high abundance of Delta smelt in the fall (USFWS 2003).

The only known important physical habitat for Delta smelt occurs during spawning, when suitable spawning substrate is required. Suitable spawning habitat is composed of open, unvegetated, shallow subtidal (less than 3 meters) waters with sand or pebble-sized substrate found within freshwater sloughs (USFWS 2008, Moyle 2002). Most spawning is believed to occur at temperatures between 7 and 15 degrees Celsius (USFWS 2003). Smelt are broadcast spawners with demersal, or bottom-sinking, fertilized eggs that adhere to pebble or sand substrate to keep them from washing away and to allow them to "tumble incubate" with wave movement (USFWS 2008). Spawning generally occurs during the late winter and spring months, with peak spawning activity occurring in April and May (Moyle 2002). Adults migrate to more freshwater environments of the upper Delta, where they seek sloughs and shallow edge areas. Most spawning occurs

within the upper Delta and in the Sacramento River above Rio Vista (Moyle 2002). Spawning locations are inferred by the locations of captured gravid females, spent females, and larvae in trawl samples. Wet years, in which higher levels of freshwater are moving through the Delta system, appear to result in a greater abundance and distribution of smelt in the following year (USFWS 2003). Larvae hatch in 10 to 14 days, are planktonic (float with the water currents), and are washed downstream until they reach areas near the X2. Delta smelt are fast-growing and short-lived, with the majority of growth occurring within the first 7 to 9 months of life. Throughout their lifespan, this species feeds entirely on zooplankton (USFWS 2008).

The area surrounding Liberty Island, as well as the Cache Slough Complex, are known to support Delta smelt spawning and rearing habitat (DWR 2015, Bennett 2005, USFWS 1996). A small portion of the Delta smelt population is believed to inhabit the Cache Slough Complex year-round (Bennett 2005). Data from CDFW trawls also support this information. Trawl Station 716 is located at the southern end of Liberty Island and data collected from this location confirm that adult, juvenile, and larval smelt have been consistently detected in this area (CDFW 2018b). Given the confirmed presence of the species immediately downstream of the Study Area, as well as at Liberty Island which borders the Study Area to the east, this species is considered present in the surrounding sloughs and was determined to have high potential to occur adjacent to and within the Vogel portion of the Study Area during flood events.

Longfin smelt (*Spirinchus thaleichthys*). Federal Candidate, State Threatened, CDFW Species of Special Concern. The longfin smelt is an anadromous fish found in California's bay, estuary, and nearshore coastal environments. Its range extends along the Pacific Coast of North America from the Sacramento-San Joaquin Estuary in California, north to the Gulf of Alaska (Moyle 2002). The San Francisco Estuary supports the largest, and southern-most population in California (Moyle 2002). Longfin smelt are known to inhabit the entire San Francisco Estuary, including portions of the Napa River, Suisun Marsh, and the Sacramento-San Joaquin Delta (CDFW 2009). The species is also currently proposed for listing under the federal ESA (USFWS 2013).

Juvenile longfin smelt feed on copepods and cladocerans. With subsequent growth, their diet expands to include mysids and amphipods (CDFW 2009). Longfin smelt are an important prey species and are fed upon by many native and non-native species of predatory fish. However, striped bass (*Morone saxatilis*) are a dominant predator of longfin smelt in the Sacramento-San Joaquin Delta (CDFW 2009). The other primary threats to the species are due to the effects of water diversions from the Delta (Moyle 2002).

Longfin smelt typically use backwater sloughs and channels like those within the Cache Slough Complex for both feeding and rearing (CDFW 2009). This species has been documented immediately downstream of the Study Area near Liberty Island during CDFW trawl surveys (CDFW 2018b). Focused surveys within the Cache Slough Complex and Yolo Bypass conducted by University of California, Davis has documented this species in Cache, Haas, and Shag Sloughs (Young et al. 2015). Given that the Study Area is surrounded by documented occurrences of this species, and suitable habitat for rearing and foraging is present, the species is considered present within the surrounding tidal sloughs and was determined to have high potential to occur within the waters immediately adjacent to the Study Area and potentially within the Vogel property during periods of flooding.

Steelhead - Central Valley Distinct Population Segment (DPS; *Oncorhynchus mykiss*). Federal Threatened. The Central Valley DPS includes all naturally spawned populations (and their progeny) in the Sacramento and San Joaquin Rivers and their tributaries, excluding San Francisco and San Pablo Bays and their tributaries. Preferred spawning habitat for steelhead is in perennial streams with cool to cold water temperatures, high dissolved oxygen levels and fast flowing water. During the winter or early spring, the spawning fish reach suitable gravel riffles (shallow areas with gravel or cobble substrate) in the upper sections of streams, where they dig their redds. Abundant riffle areas for spawning and deeper pools with sufficient riparian cover for rearing are necessary for successful breeding. When steelhead spawn, they nearly always return to the stream in which they were hatched. At that time, they may weigh between 2 to 12 pounds, or more.

The Study Area is located directly adjacent to the primary migration corridor (the Sacramento River and the DWSC) for this species (NMFS 2016a). While adults do not typically use sloughs, marshes, or off-channel habitats like those surrounding the Study Area, juvenile salmonids require such habitat for rearing, and as cover during outmigration (NMFS 2016a). Juvenile steelhead have been regularly encountered by the CDFW within the Yolo Bypass during fish salvage operations following flood events (DWR 2015). The Yolo Bypass is hydrologically connected to the Study Area, therefore it is likely that the Cache Slough complex also serves as rearing habitat for the species. Therefore, due to the presence of habitat within and surrounding the Study Area, the proximity to migration corridors used by the species, and the presence of steelhead in adjacent habitats during salvage operations, this species was determined to have high potential to be seasonally present, particularly during the outmigration period of juvenile fishes.

Species with Moderate Potential to Occur within the Study Area

Pallid bat (*Antrozous pallidus*). CDFW Species of Special Concern, WBWG High Priority. Pallid bats are distributed from southern British Columbia and Montana to central Mexico, and east to Texas, Oklahoma, and Kansas. This species occurs in a number of habitats ranging from rocky, arid deserts to grasslands, and into higher-elevation coniferous forests. They are most abundant in the arid Sonoran life zones below 6,000 feet, but have been found up to 10,000 feet in the Sierra Nevada Mountains. Pallid bats often roost in colonies of between 20 and several hundred individuals. Roosts are typically located in rock crevices, tree hollows, mines, caves, and a variety of man-made structures, including vacant and occupied buildings. Tree roosting has been documented in large conifer snags (e.g., ponderosa pine), inside basal hollows of redwoods and giant sequoias, and within bole cavities in oak trees. They have also been reported roosting in stacks of burlap sacks and stone piles. Pallid bats are primarily insectivorous, feeding on large prey that is usually taken on the ground but sometimes in flight. Prey items include arthropods, such as scorpions, ground crickets, and cicadas (WBWG 2018).

Several occurrences of this species are known within 5-mile vicinity of the Study Area (CDFW 2018a). Typically, this species has been found in attics and crawl spaces of buildings, which offer thermal refugia while still having close access to water and foraging opportunities. The Study Area contains farm buildings within attics, crawl spaces, or lofts, as well as nearby freshwater and marshes to support foraging. This species was determined to have moderate potential to occur within the Study Area because it is known to inhabit occupied buildings in Study Area portion of Solano County and due to the presence of suitable foraging habitat.

Black-crowned night-heron (*Nycticocorax nycticocorax*). No status; nesting sites (rookeries) monitored by the CDFW. The black-crowned night-heron is a year-round resident in California, and like other herons is associated with aquatic habitats. Nesting occurs colonially (often with other heron or waterbird species). Nesting substrates include trees (many types and sizes), shrubbery, emergent and herbaceous vegetation, and even the ground (Hothem et al. 2010). This species is generally nocturnal and forages primarily for fish and aquatic invertebrates.

A rookery of egrets and cormorants is located on a series of small islands within Haas Slough outside of the Study Area. This species has also been observed foraging and perching during surveys. A potential roosting or rookery was observed within the northern riparian portion of Lookout Slough; however, habitat quality in this area was lacking compared to the adjacent riparian islands and established rookery location. Therefore, this species is only considered to have a moderate potential to nest within the Study Area.

Grasshopper sparrow (*Ammodramus savannarum*). CDFW Species of Special Concern. Grasshopper sparrow is a summer resident in California, wintering in Mexico and Central America. This species occurs in open grassland and prairie-like habitats with short- to moderate-statured vegetation, and often in scattered shrubs (Shuford and Gardali 2008). Both perennial and non-native annual grasslands are used. Nests are placed on the ground and are well concealed, often adjacent to grass clumps (Shuford and Gardali 2008). Grasshopper sparrows are evasive and are generally detected by voice. Insects comprise the majority of their diet.

Rippey (2014) recorded nesting by this species within the local area. Primary land use within Bowlsbey Ranch portions of the Study Area is pasture, which maintains short-statured, open grassland in a habitat mosaic used for foraging by this species. Due to the presence of suitable habitat and nearby occurrences, this species was determined to have moderate potential to nest within the Study Area.

Greater sandhill crane (*Grus canadensis tabida*). State Threatened, CDFW Fully Protected Species. This species breeds only in Siskiyou, Modoc Lassen, Plumas, and Sierra Counties (USFWS, City of Sacramento, and Sutter County 2002). In summer, this species occurs in and near wet meadows, shallow lacustrine, and fresh emergent wetland habitats. It winters primarily in the Sacramento and San Joaquin valleys, where it frequents annual and perennial grassland habitats, moist croplands with rice or corn stubble, and open, emergent wetlands. It prefers relatively treeless plains.

The Study Area provides winter foraging when the greater sandhill crane seasonally migrate to the region. As the greater sandhill crane do not breed or nest in the Delta or the Central Valley, any occurrence of the species is anticipated to be associated with foraging and non-breeding activity. While the species has not been documented onsite; there is potential foraging habitat in and adjacent to the agricultural fields. Therefore, the greater sandhill crane was determined to have a moderate potential to occur.

Least bittern (*Ixobrychus exilis*). CDFW Species of Special Concern, USFWS Bird of Conservation Concern. California populations of least bittern are concentrated in low-lying areas of the Central Valley and Modoc Plateau, along the Colorado River, and coastal southern California, south of San Luis Obispo County. Colonial nesters are found in fresh and brackish marshlands and along margins of ponds and reservoirs which provide ample cover. Nests are usually placed low in hardstem bulrush, over water, and are constructed rom emergent aquatic vegetation and sticks (Poole et al. 2009).

Marshes around the southern edge of Liberty Farms within the Study Area have been historically

maintained as duck ponds for hunting. Such habitats are also likely to provide suitable nesting and foraging habitat for this species. This species has been observed in the vicinity of the Study Area (Sullivan et al. 2018), but recent surveys have not documented nesting within Solano County (Rippey 2014). Due to the presence of potentially suitable habitat and observations of least bittern in the vicinity of the Study Area, this species was determined to have moderate potential to nest within the Study Area.

Lesser sandhill crane (*Grus canadensis canadensis*). CDFW Species of Special Concern. The lesser sandhill crane is a California species of special concern. This subspecies breeds in Alaska but winters in California within the Central and Imperial Valleys. In winter, grains and seeds are the dominant food source for lesser sandhill crane (Shuford and Gardali 2008). Pastures, moist grasslands, and shallow wetlands or flooded fields are used for loafing and roosting.

The Study Area provides winter foraging when the lesser sandhill crane seasonally migrate to the region. As the lesser sandhill crane do not breed or nest in the Delta or the Central Valley, any occurrence of the species is anticipated to be associated with foraging and non-breeding activity. While the species has not been documented onsite; there is potential foraging habitat in and adjacent to the agricultural fields. Therefore, the lesser sandhill crane was determined to have a moderate potential to occur.

Nuttall's woodpecker (*Picoides nuttallii*). USFWS Bird of Conservation Concern. Nuttall's woodpecker, common in much of its range, is a year-round resident throughout most of California, west of the Sierra Nevada Mountains. Typical habitat for this species is oak or mixed woodland and riparian areas (Lowther 2000). Nesting occurs in tree cavities, principally those of oaks and larger riparian trees. Nuttall's woodpecker also occurs in older residential settings and on orchards, where trees provide suitable foraging and nesting habitat. This species forages on a variety of arboreal invertebrates.

In this portion of Solano County, this species is fairly common and is known to nest in trees bordering sloughs (Rippey 2014). During multiple site visits, woodpecker cavities were observed in trees throughout the Study Area. Based on the evidence of previous use of the area by woodpeckers and the documented occurrences nearby, this species was determined to have moderate potential to occur in the Study Area.

Tricolored blackbird (*Agelaius tricolor*). State Candidate (Endangered), CDFW Species of Special Concern, USFWS Bird of Conservation Concern. The tricolored blackbird is a locally common resident in the Central Valley and along coastal California. Most tricolored blackbirds reside in the Central Valley March through August, then move into the Sacramento-San Joaquin Delta, and east to Merced County and coastal locations during winter (Meese et al. 2014). This species breeds adjacent to freshwater, preferring emergent wetlands with tall, dense cattails or tules, thickets of willow or blackberry, and/or tall herbs. Flooded agricultural fields with dense vegetation are also used (Shuford and Gardali 2008). This species is highly colonial; nesting habitat must be large enough to support a minimum of 30 pairs, and colonies are commonly substantially larger (up to thousands of pairs). The tricolored blackbird often intermingles with other blackbird species during the non-breeding season. Individuals typically forage up to 5.6 miles (9 kilometers) from their colonies; although, in most cases only a small part of the area within this range provides suitable foraging (Hamilton and Meese 2006).

There are records of the tricolor blackbirds within 5 miles of the Study Area, and likely breeding colonies within 10 miles (CDFW 2018a). Although the majority of the Study Area does not provide suitable habitat for the species, freshwater marshes with dense emergent vegetation on the

margins of the Study Area, especially in the south, could potentially support habitat for a breeding colony. Current maintenance of the majority of the Liberty Farms area as managed wetlands could limit food availability during the nesting season, thus the restoration project would increase the chances that a colony would be found within the Study Area.

White-tailed kite (*Elanus leucurus*). CDFW Fully Protected Species. The white-tailed kite is a resident in open to semi-open habitats throughout the lower-elevation areas of California, including grasslands, savannahs, woodlands, agricultural areas, and wetlands. Vegetative structure and prey availability seem to be more important habitat elements for this species than associations with specific plants or vegetative communities (Dunk 1995). Nests are constructed mostly of twigs and are placed in trees, often at habitat edges. Nest trees are highly variable in size, structure, and immediate surroundings, ranging from shrubs to trees greater than 150 feet tall (Dunk 1995). This species preys on a variety of small mammals, as well as other vertebrates and invertebrates.

This species has been observed within the local area and frequents agricultural areas where grasses are short and hunting for small mammals is aided by farm activities (Sullivan et al. 2018). While the Study Area has been regularly flood irrigated, open grasslands along levees and areas cleared for residential use are likely to support a prey base of small mammals, such as mice and voles as well as non-flooded annual grasslands. Large trees along levees also have sufficient structure to support nesting by this species. Given that potential foraging and nesting habitat are present, but the species has not been observed on-site during multiple surveys, this species was determined to have only moderate potential to nest within the Study Area.

Yellow warbler (*Setophaga (Dendroica) petechia brewsteri*). CDFW Species of Special Concern, USFWS Bird of Conservation Concern. The yellow warbler is a neotropical migrant bird that is widespread in North America, but it has declined throughout much of its California breeding range. The Brewster's (*brewsteri*) subspecies is a summer resident and represents the vast majority of yellow warblers that breed in California. West of the Central Valley, typical yellow warbler breeding habitat consists of dense riparian vegetation along watercourses, including wet meadows, with willow growth being favored (Shuford and Gardali 2008). Insects comprise the majority of this species' diet.

Willow riparian areas lining the banks of Lookout Slough and windrows within Liberty Farms provide potential nesting habitat for this species. Potential foraging habitat is also supported throughout the riparian along perimeter levees as well. Given that potential foraging and nesting habitat are present, but the species has not been observed on-site during multiple surveys, this species only was determined to have moderate potential to nest within the Study Area.

Green sturgeon - Southern DPS (*Acipenser medirostris*). Federal Threatened. The southernmost spawning population of green sturgeon is in the Sacramento River, with the principal spawning area located in the lower Feather River (Moyle 2002). Spawning populations of green sturgeon in the San Joaquin River are presumed to have been extirpated in the past 25-30 years. Green sturgeon are primarily marine species, entering into freshwater rivers mainly to spawn, although early life stages may reside in freshwater for up to two years (Moyle 2002). Adults typically migrate into freshwater from late February through late July. The spawning period occurs from March to July, with peak spawning occurring from mid-April to mid-June (Emmett et al. 1991). Green sturgeon prefer deep pools in large, turbulent, freshwater river mainstreams to spawn (Moyle et al. 1992). Juvenile green sturgeon migrate to the ocean primarily during the summer and fall before the end of their second year (Emmett et al. 1991). Green sturgeon adults, subadults, and juveniles are widely distributed throughout the Delta and estuary. Adults typically

migrate upstream on the western edge of the Delta, returning to the ocean when river temperatures decrease and flows increase during the fall and early winter. They may hold in low gradient or off-channel sloughs or coves where temperatures are within acceptable thresholds. Larvae prefer open aquatic habitats for foraging, but utilize structure habitat during the day. Juvenile rearing habitats for green sturgeon include spawning areas and migration corridors. Rearing habitat utilization varies depending on seasonal flows and temperatures. Juvenile green sturgeon are found year-round in the Delta and use the region as a migration corridor, feeding area, and juvenile rearing area (Lindley et al. 2011, Moyle 2002). Green sturgeon are salvaged at the CVP and SWP pumping plants on an irregular basis throughout the year, verifying their presence in the south Delta (EPIC et al. 2001).

Juvenile green sturgeon use the Delta as a migration corridor, as well as for feeding and rearing habitat (NMFS 2015, Lindley et al. 2011, Moyle 2002). The primary migration corridors for this species include the Sacramento River, the DWSC, and the Yolo Bypass, all of which converge near the southern end of the Study Area (NMFS 2015, DWR 2012). Due to difficulties associated with catching, tagging, and tracking this species, records are difficult to obtain. However, during flooding within the Yolo Bypass, green sturgeon are typically stranded and rescued, therefore this represents the nearest confirmed occurrences of the species to the Study Area (NMFS 2015). The Study Area is hydrologically connected to the adjacent Yolo Bypass, and given the proximity to the primary migration corridor for this species, it is anticipated that the Cache Slough Complex is also used by juveniles of the species for passage, rearing, and foraging. Given the location of the Study Area in relation to known occurrences of the species, the distance to the species migration corridor, and the presence of suitable rearing and foraging habitat in sloughs surrounding the Study Area, this species was determined to have high potential to occur seasonally within tidal habitats surrounding the Study Area and may occur within the Vogel portion of the Study Area during flooding.

White sturgeon (*Acipenser transmontanus*). CDFW Species of Special Concern. This sturgeon is found in most estuaries along the Pacific Coast, and is known to the San Francisco Bay Estuary. Adults in the San Francisco Bay Estuary system spawn in the Sacramento River and are not known to enter freshwater or non-tidal reaches of estuary streams. White sturgeon typically spawn in May through June. Their diet consists of crustaceans, mollusks, and some fish.

White sturgeon are known to use the Sacramento DWSC to migrate from spawning grounds in the Sacramento and Feather Rivers out to the San Francisco Bay (Calfish 2018). During these migrations, or during general foraging, individuals are anticipated to occur within sloughs surrounding the Study Area. Considering the known distributions of the species, and the location of the Study Area, the species was determined to have moderate potential to be present in waters surrounding the Study Area throughout the year.

4.2.3 Critical Habitat

A review of the background literature showed that the Study Area is located within or adjacent to critical habitat for four special-status fish species including:

- Delta smelt
- Central Valley Spring-run Chinook salmon
- Central Valley steelhead
- Southern DPS green sturgeon

Figure 7 in Appendix A shows the locations of those units of critical habitat in relation to the Study Area. Currently, flood control levees exclude the majority of the Study Area from providing biological or physical components of these species' critical habitat. The exception would be the exterior (outer) levee and Vogel portion of the Study Area, which afford some habitat to each species during flood events.

4.2.4 Essential Fish Habitat

A review of the background literature revealed that the Study Area is located within or adjacent to EFH for two fisheries management plans (FMP): Pacific Groundfish and Pacific Salmon. The waters of Cache, Haas, and Shag Sloughs are identified as EFH for Pacific Groundfish, while the entire watershed encompassing the Study Area is located within the Lower Sacramento unit of EFH for Pacific Salmonids. Similar to critical habitat discussed in Section 4.2.3, the majority of the Study Area is isolated from waters and habitat that form EFH due to flood control levees; the exception being the exterior (outer levee area and Vogel during flood event). A brief description of species covered by each fisheries management plan is outlined below.

Pacific Groundfish EFH: The Pacific Groundfish FMP is designed to protect habitat for approximately 80 species of fish, including various species of flatfish, rockfish, roundfish, and several species of sharks and skates.

Pacific Salmon EFH: The Pacific Salmon FMP is designed to protect habitat for commercially important salmonid species. Chinook salmon is the primary species that would be seasonally present within waters surrounding the Study Area.

5.0 SUMMARY

Five sensitive plant communities were identified within the Study Area. Four special-status plant species and 23 special-status wildlife species are present or have a moderate or high potential to occur within the Study Area.

5.1 Biological Communities

The Study Area contains sensitive biological communities including approximately 35.58 acres of great valley mixed riparian forest, 1,127.13 acres of coastal and valley freshwater marsh, and 329.64 acres of open waters associated with drainage ditches, irrigation ponds, and both tidal and non-tidal sloughs.

5.2 Special-Status Plant Species

Within the Study Area, four special-status species were determined to be present during protocol-level rare plant surveys, including Parry's rough tarplant, woolly rose-mallow, Mason's lilaeopsis, and Suisun Marsh aster.

5.3 Special-Status Wildlife Species

Within the Study Area, the following species that were observed and determined to be present: loggerhead shrike, Modesto song sparrow, Swainson's hawk, giant garter snake, western pond turtle, and Sacramento splittail. Seven special-status wildlife species were determined to have high potential of occurrence including northern harrier; chinook salmon - Central Valley fall/late fall-run, Central Valley spring-run, and Sacramento River winter-run ESUs; Delta smelt; longfin smelt; and steelhead - Central Valley DPS. Additionally, the following 12 species have moderate potential to occur within the Study Area: pallid bat; black-crowned night-heron; grasshopper sparrow; greater sandhill crane; least bittern; lesser sandhill crane; Nuttall's woodpecker; tricolored blackbird; white-tailed kite; yellow warbler; green sturgeon - Southern DPS; and white sturgeon.

Designated critical habitat for four species occurs within the Study Area, including Delta smelt, Central Valley Spring-run Chinook salmon, Central Valley steelhead, and Southern DPS green sturgeon. Furthermore, the Study Area contains EFH for species covered by the Pacific Groundfish and Pacific Salmon FMPs.

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APPENDIX A

FIGURES

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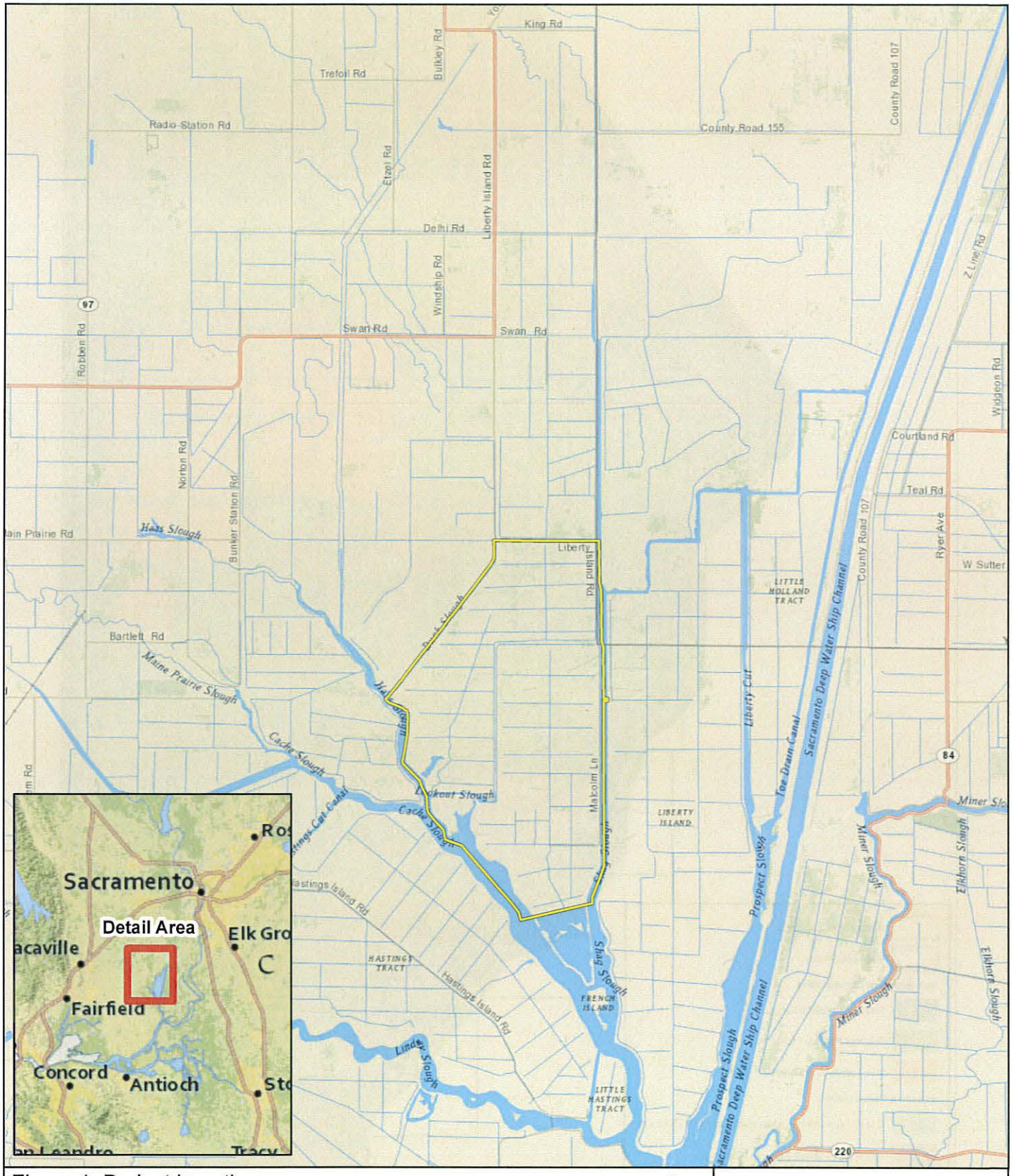

Figure 1. Project Location

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Lookout Slough Restoration Project

Ecosystem Investment Partners

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Map Prepared By: pkobylarz
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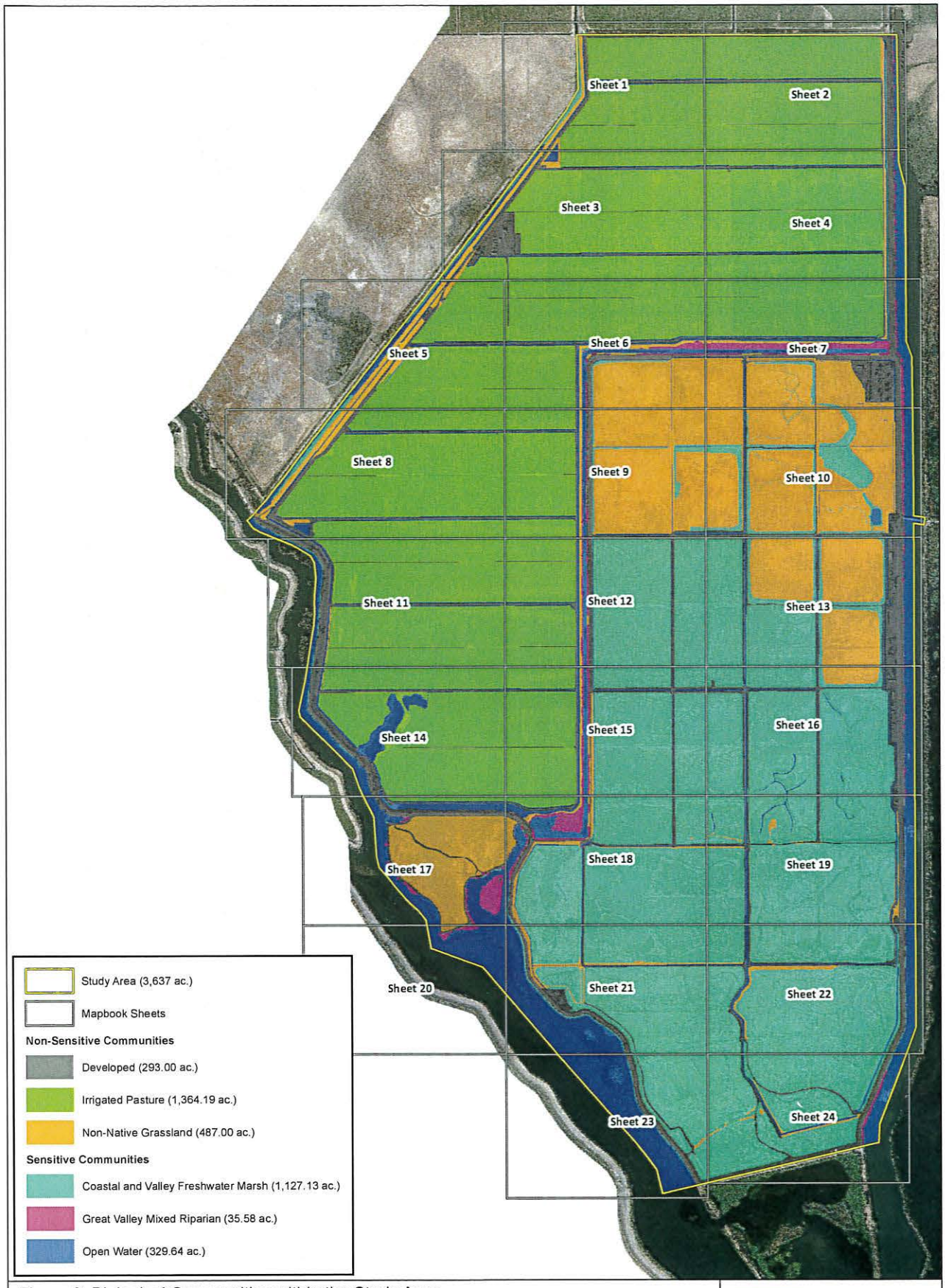

Figure 2. Biological Communities within the Study Area
Overview Page 1

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Ecosystem Investment Partners

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Map Prepared By: pkobylarz
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Lookout Slough Restoration Project

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Figure 2.
Biological Communities within the Study Area
Map Sheet 1

Lookout Slough Restoration Project

- Property Boundary (3,377.98 ac.)
- Study Area (3,637 ac.)

Non-Sensitive Communities

- Developed (293.00 ac.)
- Irrigated Pasture (1,364.19 ac.)
- Non-Native Grassland (487.00 ac.)

Sensitive Communities

- Coastal and Valley Freshwater Marsh (1,127.13 ac.)
- Great Valley Mixed Riparian (35.58 ac.)
- Open Water (329.64 ac.)

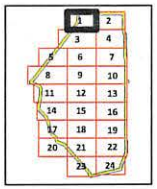

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Figure 2.
Biological Communities within the Study Area
Map Sheet 2

Lookout Slough Restoration Project

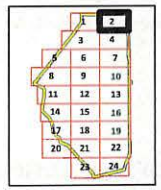
- Property Boundary (3,377.98 ac.)
- Study Area (3,637 ac.)

Non-Sensitive Communities

- Developed (293.00 ac.)
- Irrigated Pasture (1,364.19 ac.)
- Non-Native Grassland (487.00 ac.)

Sensitive Communities

- Coastal and Valley Freshwater Marsh (1,127.13 ac.)
- Great Valley Mixed Riparian (35.58 ac.)
- Open Water (329.64 ac.)



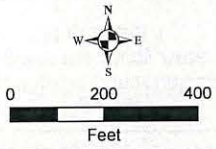


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Figure 2.
Biological Communities within the Study Area
Map Sheet 3

Lookout Slough Restoration Project

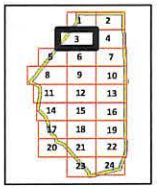
- Property Boundary (3,377.98 ac.)
- Study Area (3,637 ac.)

Non-Sensitive Communities

- Developed (293.00 ac.)
- Irrigated Pasture (1,364.19 ac.)
- Non-Native Grassland (487.00 ac.)

Sensitive Communities

- Coastal and Valley Freshwater Marsh (1,127.13 ac.)
- Great Valley Mixed Riparian (35.58 ac.)
- Open Water (329.64 ac.)



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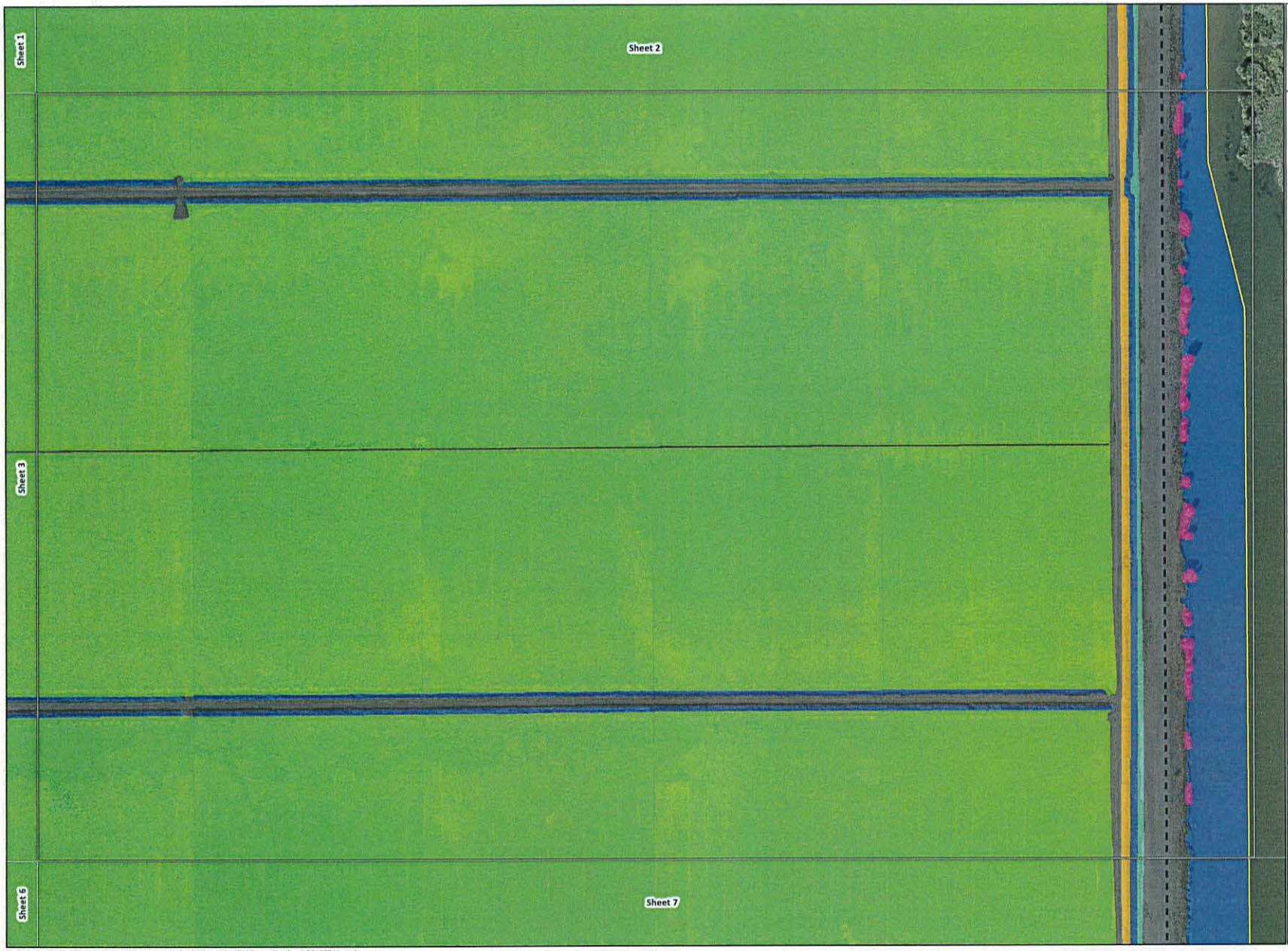

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Figure 2.
Biological Communities within the Study Area
Map Sheet 4

Lookout Slough Restoration Project

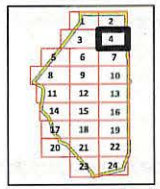
- Property Boundary (3,377.98 ac.)
- Study Area (3,637 ac.)

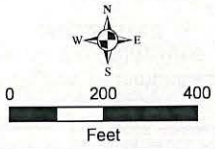
Non-Sensitive Communities

- Developed (293.00 ac.)
- Irrigated Pasture (1,364.19 ac.)
- Non-Native Grassland (487.00 ac.)

Sensitive Communities

- Coastal and Valley Freshwater Marsh (1,127.13 ac.)
- Great Valley Mixed Riparian (35.58 ac.)
- Open Water (329.64 ac.)





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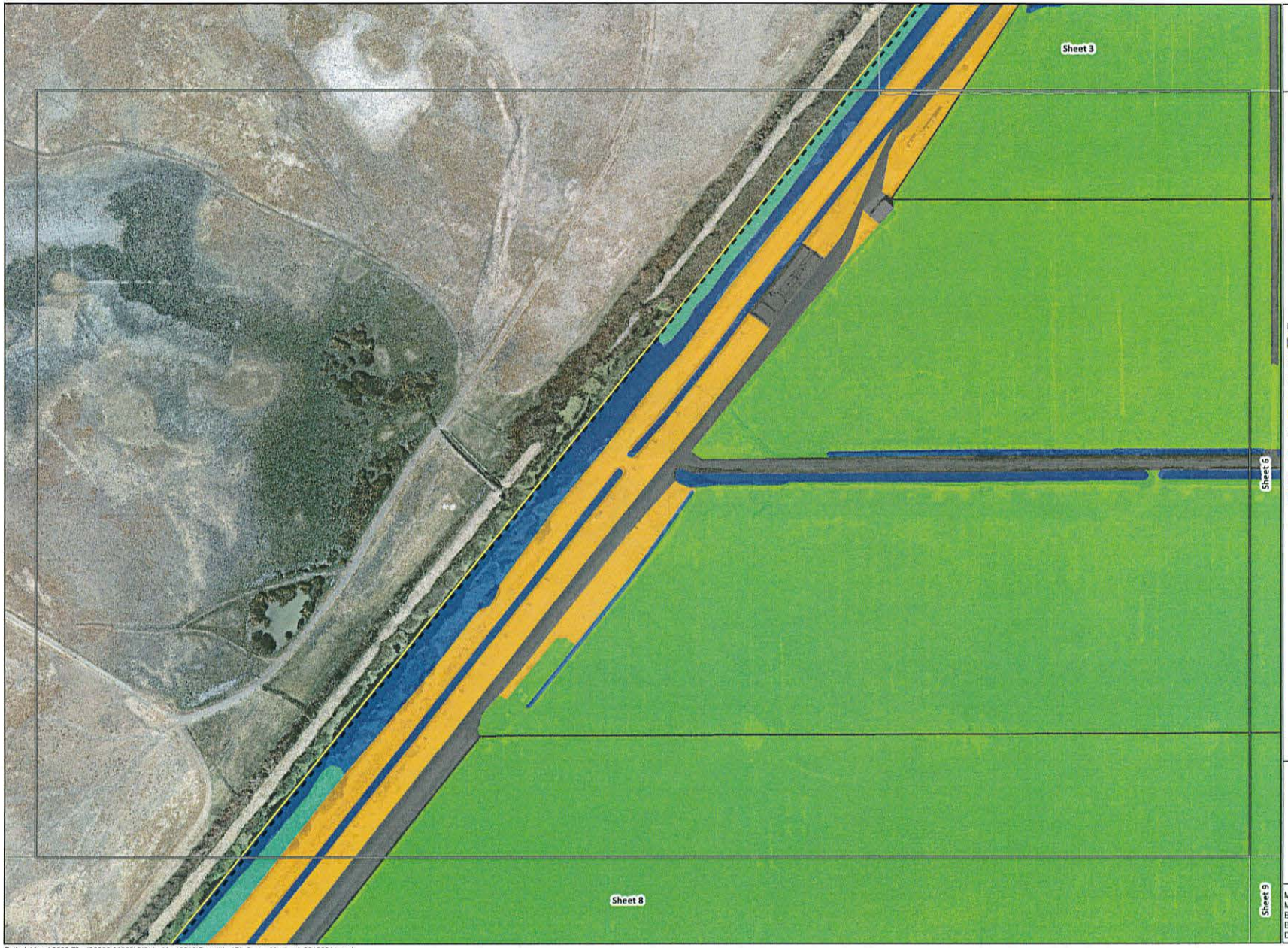

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Figure 2.
Biological Communities within the Study Area
Map Sheet 5

Lookout Slough Restoration Project

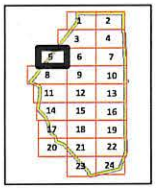
- Property Boundary (3,377.98 ac.)
- Study Area (3,637 ac.)

Non-Sensitive Communities

- Developed (293.00 ac.)
- Irrigated Pasture (1,364.19 ac.)
- Non-Native Grassland (487.00 ac.)

Sensitive Communities

- Coastal and Valley Freshwater Marsh (1,127.13 ac.)
- Great Valley Mixed Riparian (35.58 ac.)
- Open Water (329.64 ac.)



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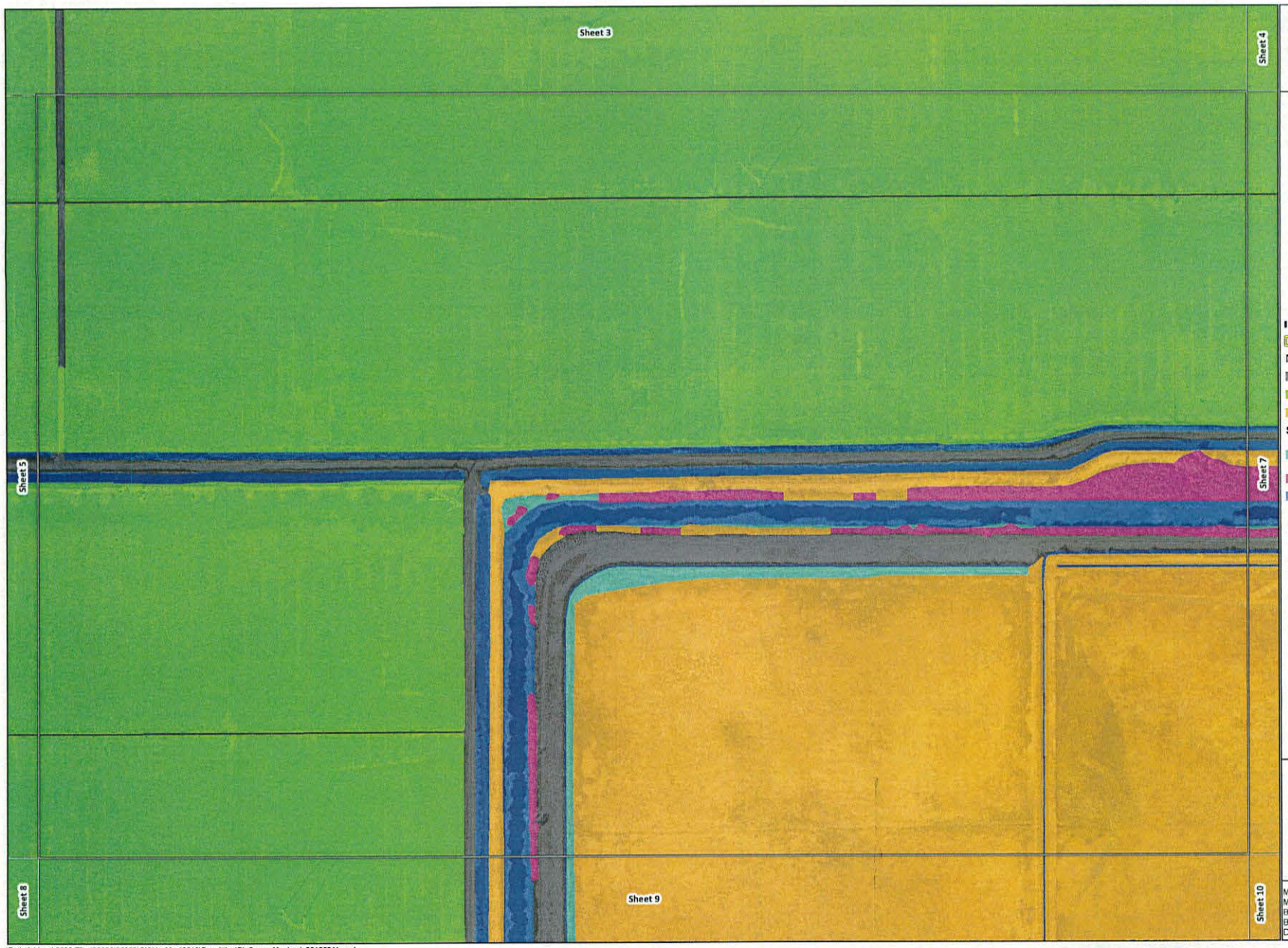

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Figure 2.
Biological Communities within the Study Area
Map Sheet 6

Lookout Slough Restoration Project

- Property Boundary (3,377.98 ac.)
- Study Area (3,637 ac.)

Non-Sensitive Communities

- Developed (293.00 ac.)
- Irrigated Pasture (1,364.19 ac.)
- Non-Native Grassland (487.00 ac.)

Sensitive Communities

- Coastal and Valley Freshwater Marsh (1,127.13 ac.)
- Great Valley Mixed Riparian (35.58 ac.)
- Open Water (329.64 ac.)

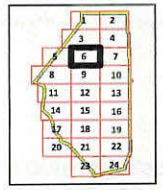

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Figure 2.
Biological Communities within the Study Area
Map Sheet 7

Lookout Slough Restoration Project

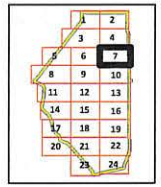
- Property Boundary (3,377.98 ac.)
- Study Area (3,637 ac.)

Non-Sensitive Communities

- Developed (293.00 ac.)
- Irrigated Pasture (1,364.19 ac.)
- Non-Native Grassland (487.00 ac.)

Sensitive Communities

- Coastal and Valley Freshwater Marsh (1,127.13 ac.)
- Great Valley Mixed Riparian (35.58 ac.)
- Open Water (329.64 ac.)



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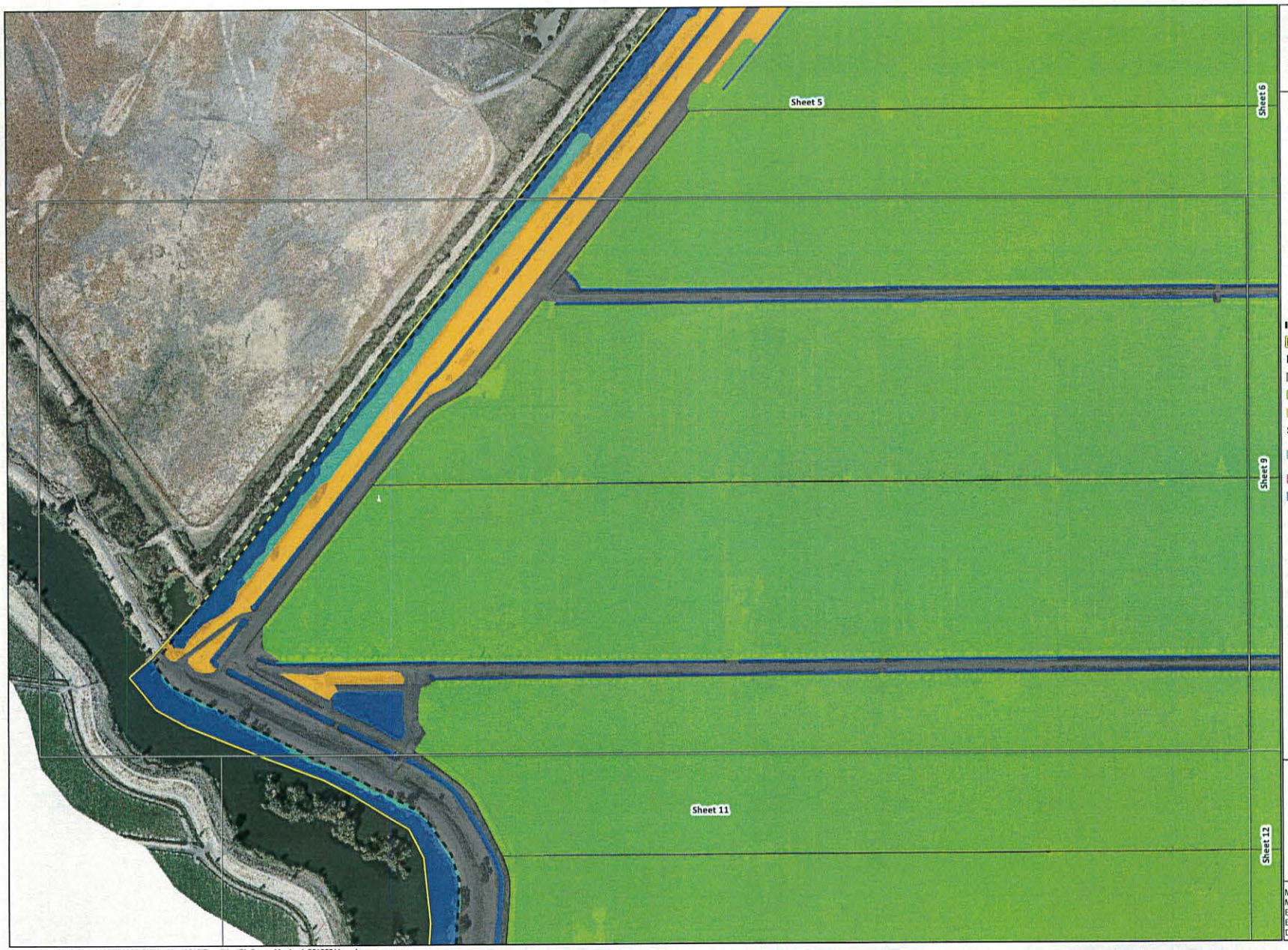

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Figure 2.
Biological Communities within the Study Area
Map Sheet 8

Lookout Slough Restoration Project

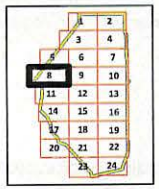
- Property Boundary (3,377.98 ac.)
- Study Area (3,637 ac.)

Non-Sensitive Communities

- Developed (293.00 ac.)
- Irrigated Pasture (1,364.19 ac.)
- Non-Native Grassland (487.00 ac.)

Sensitive Communities

- Coastal and Valley Freshwater Marsh (1,127.13 ac.)
- Great Valley Mixed Riparian (35.58 ac.)
- Open Water (329.64 ac.)



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Map Prepared By: pkobylarz
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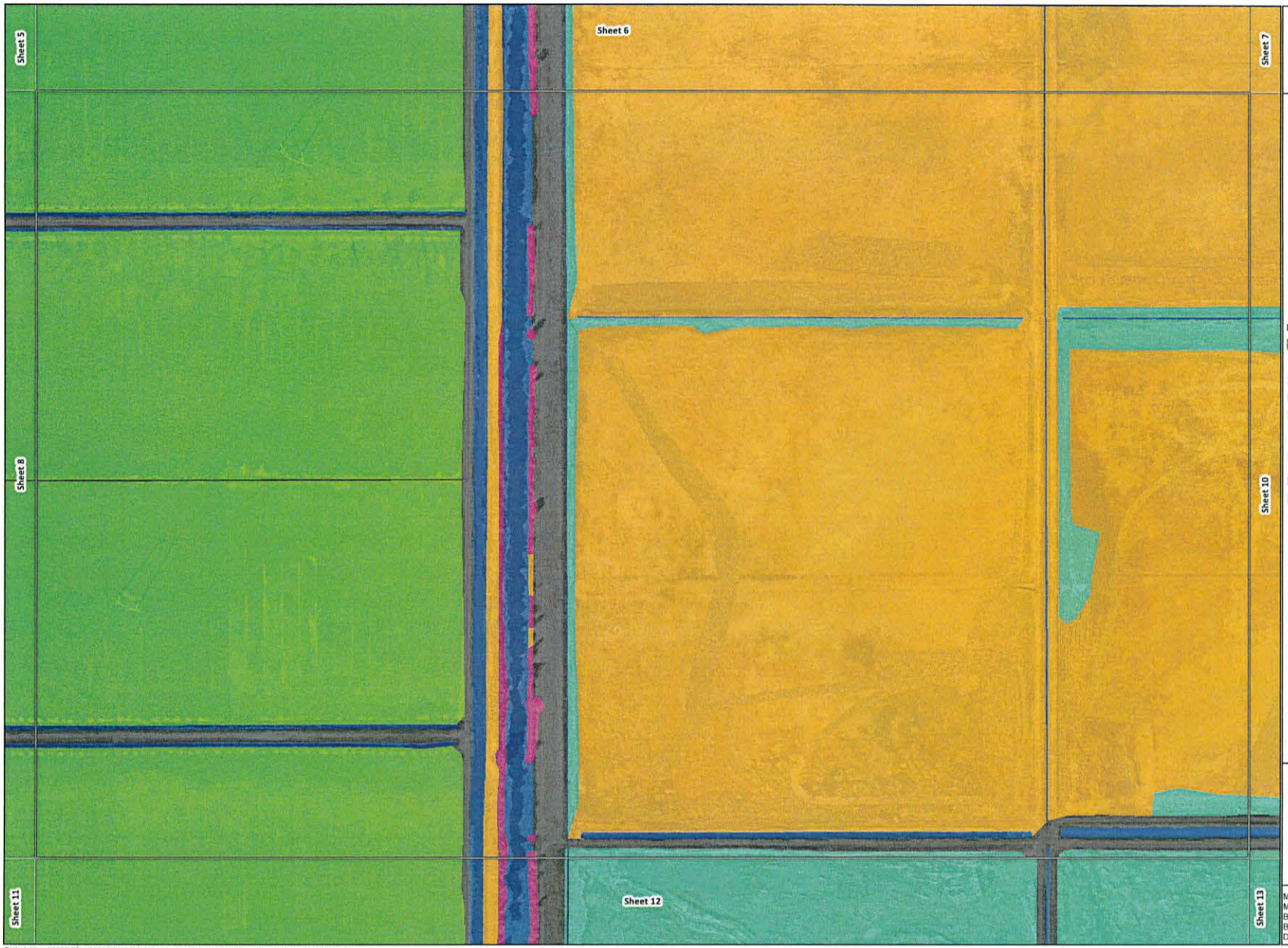

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Figure 2.
Biological Communities within the Study Area
Map Sheet 9

Lookout Slough Restoration Project

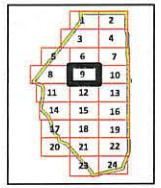
- Property Boundary (3,377.98 ac.)
- Study Area (3,637 ac.)

Non-Sensitive Communities

- Developed (293.00 ac.)
- Irrigated Pasture (1,364.19 ac.)
- Non-Native Grassland (487.00 ac.)

Sensitive Communities

- Coastal and Valley Freshwater Marsh (1,127.13 ac.)
- Great Valley Mixed Riparian (35.58 ac.)
- Open Water (329.64 ac.)



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Map Prepared By: pkobylarz
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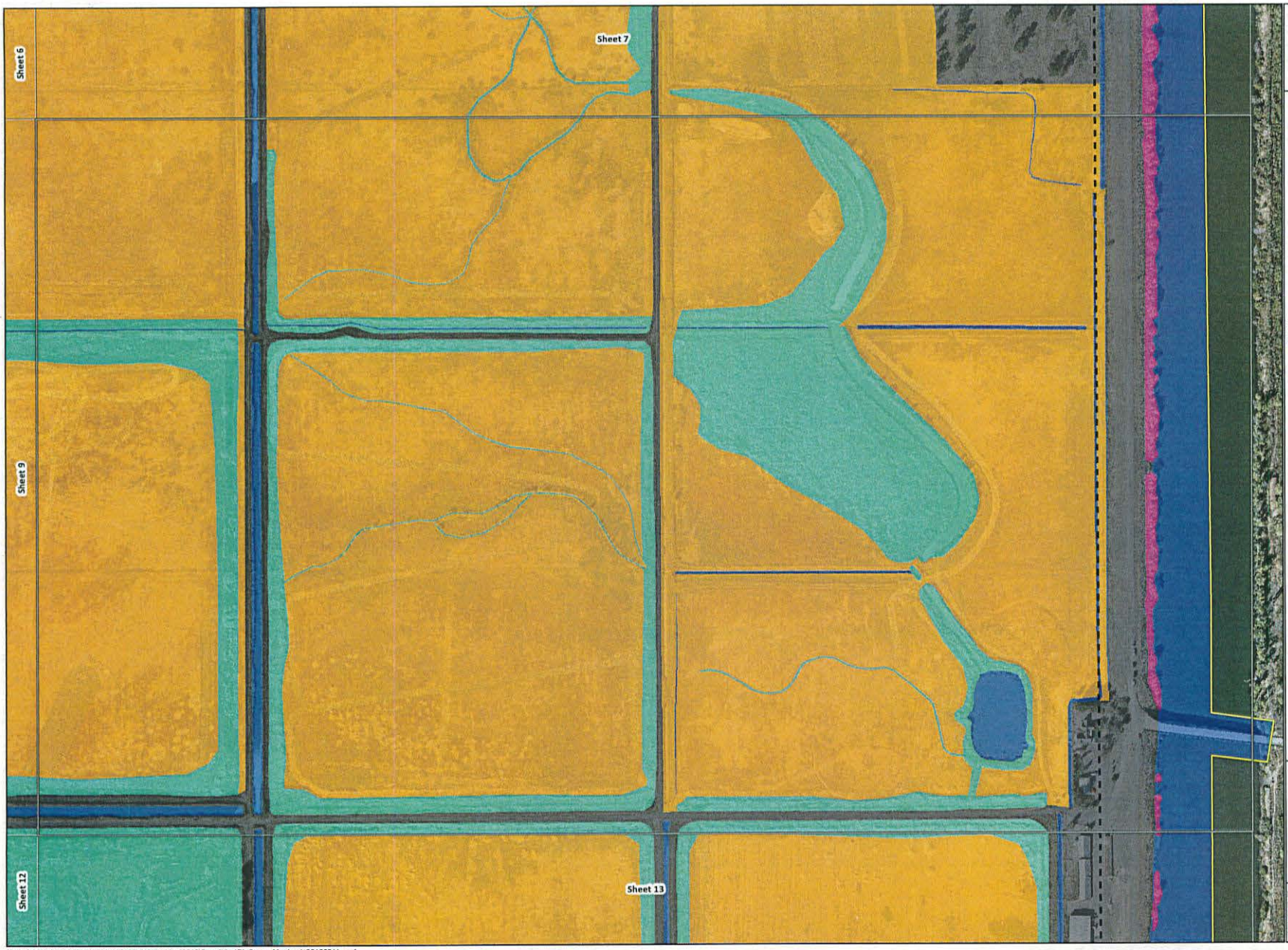

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Figure 2.
Biological Communities within the Study Area
Map Sheet 10

Lookout Slough Restoration Project

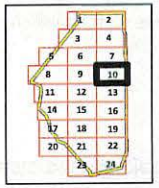
- Property Boundary (3,377.98 ac.)
- Study Area (3,637 ac.)

Non-Sensitive Communities

- Developed (293.00 ac.)
- Irrigated Pasture (1,364.19 ac.)
- Non-Native Grassland (487.00 ac.)

Sensitive Communities

- Coastal and Valley Freshwater Marsh (1,127.13 ac.)
- Great Valley Mixed Riparian (35.58 ac.)
- Open Water (329.64 ac.)



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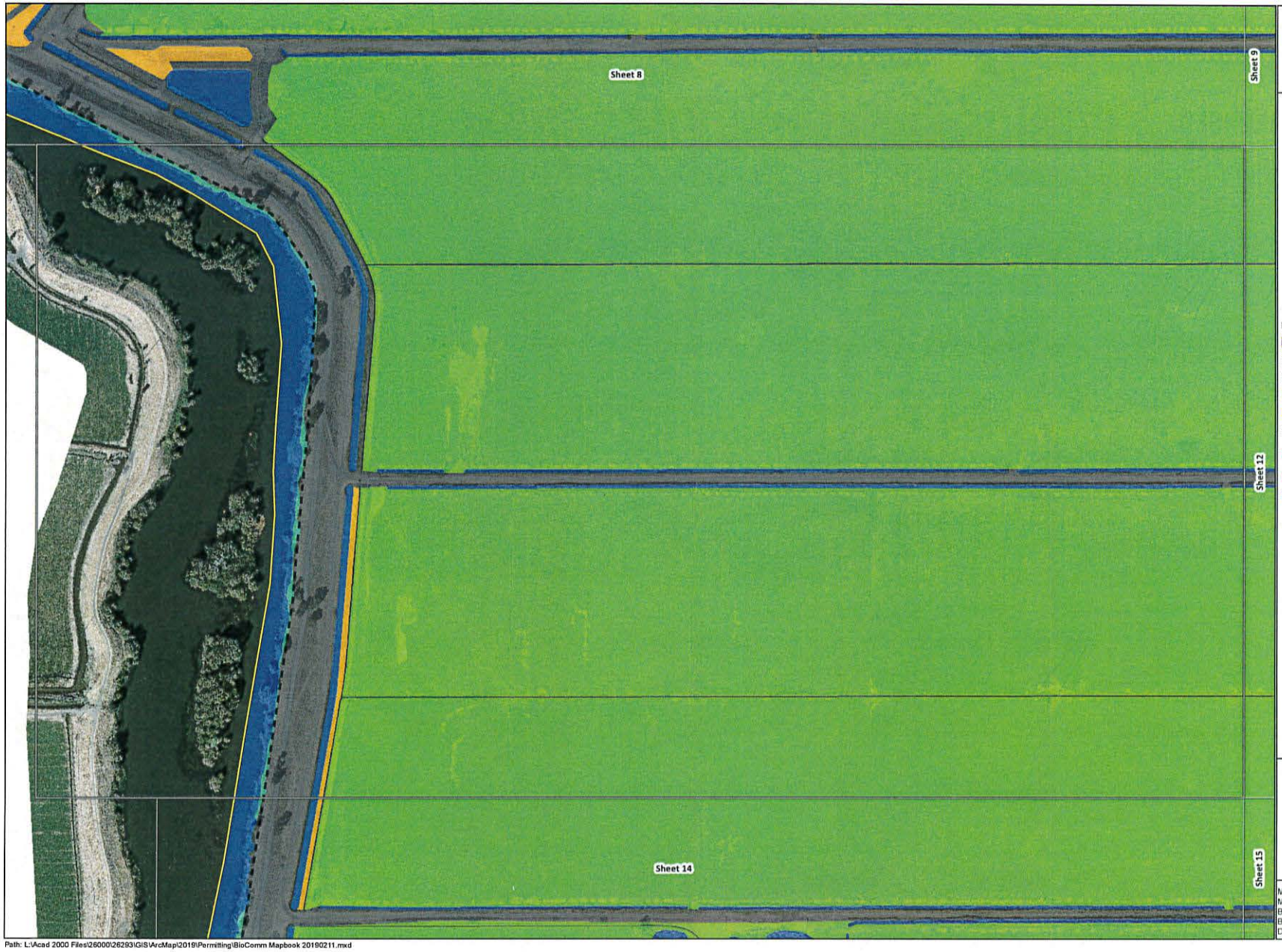

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Figure 2.
Biological Communities within the Study Area
Map Sheet 11

Lookout Slough Restoration Project

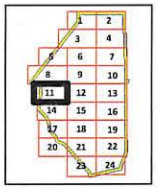
- Property Boundary (3,377.98 ac.)
- Study Area (3,637 ac.)

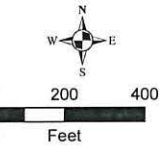
Non-Sensitive Communities

- Developed (293.00 ac.)
- Irrigated Pasture (1,364.19 ac.)
- Non-Native Grassland (487.00 ac.)

Sensitive Communities

- Coastal and Valley Freshwater Marsh (1,127.13 ac.)
- Great Valley Mixed Riparian (35.58 ac.)
- Open Water (329.64 ac.)





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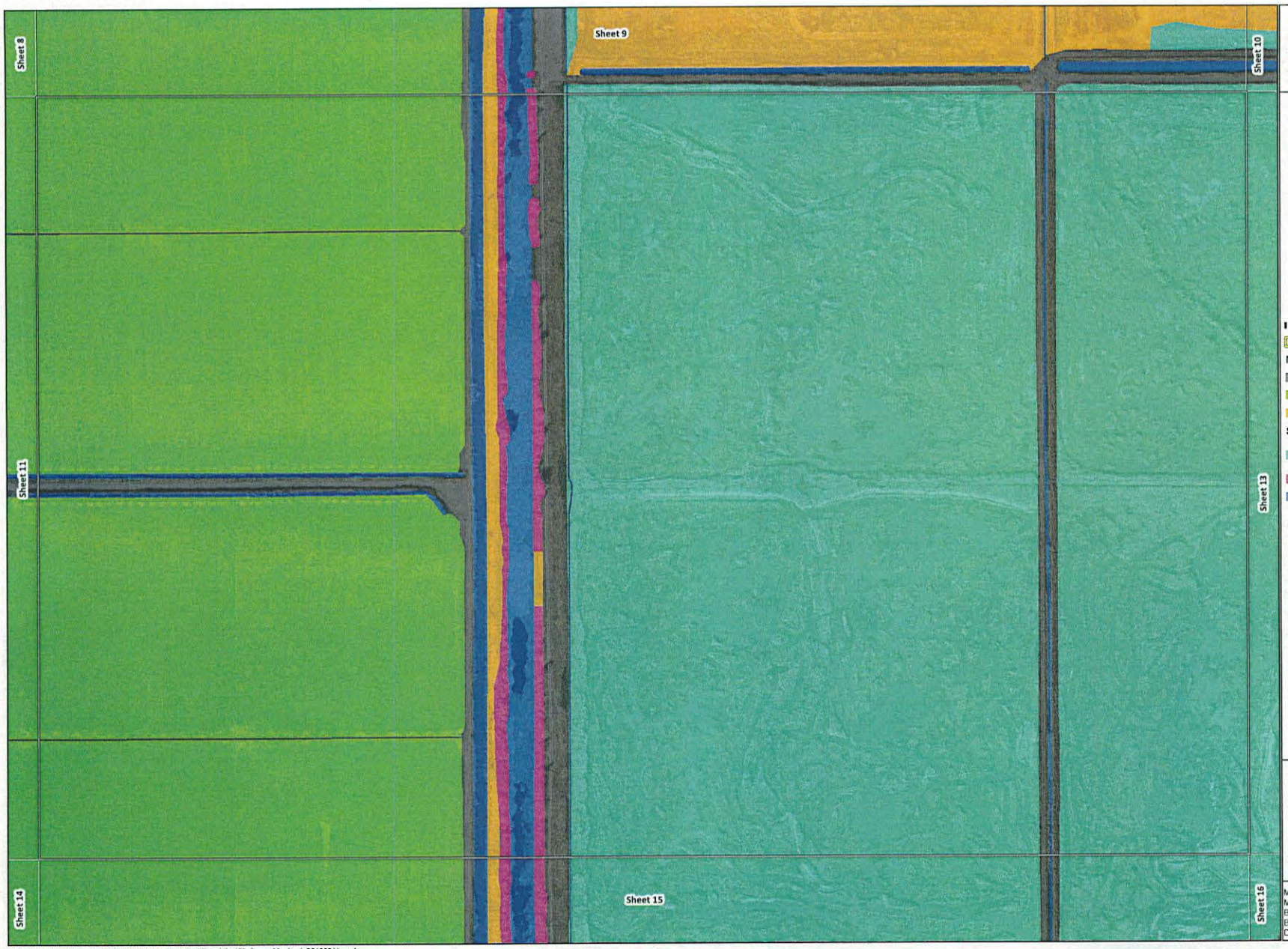

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Figure 2.
Biological Communities within the Study Area Map Sheet 12

Lookout Slough Restoration Project

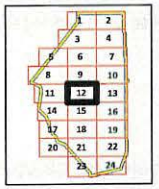
- Property Boundary (3,377.98 ac.)
- Study Area (3,637 ac.)

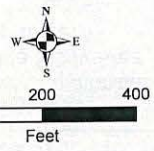
Non-Sensitive Communities

- Developed (293.00 ac.)
- Irrigated Pasture (1,364.19 ac.)
- Non-Native Grassland (487.00 ac.)

Sensitive Communities

- Coastal and Valley Freshwater Marsh (1,127.13 ac.)
- Great Valley Mixed Riparian (35.58 ac.)
- Open Water (329.64 ac.)





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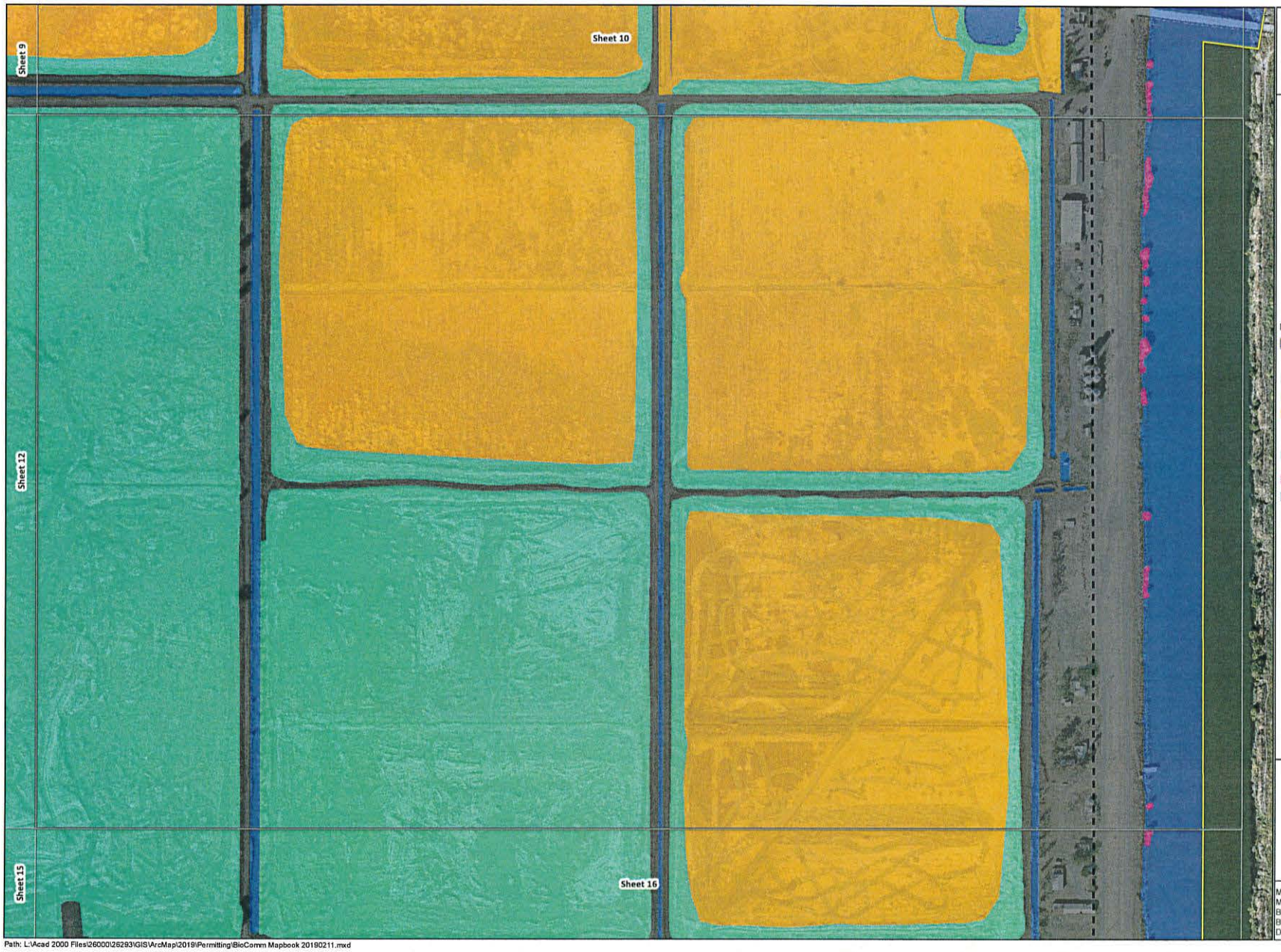

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Figure 2.
Biological Communities within the Study Area Map Sheet 13

Lookout Slough Restoration Project

- Property Boundary (3,377.98 ac.)
- Study Area (3,637 ac.)

Non-Sensitive Communities

- Developed (293.00 ac.)
- Irrigated Pasture (1,364.19 ac.)
- Non-Native Grassland (487.00 ac.)

Sensitive Communities

- Coastal and Valley Freshwater Marsh (1,127.13 ac.)
- Great Valley Mixed Riparian (35.58 ac.)
- Open Water (329.64 ac.)

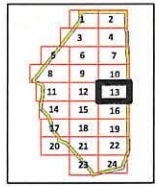

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Figure 2.
Biological Communities within the Study Area
Map Sheet 14

Lookout Slough Restoration Project

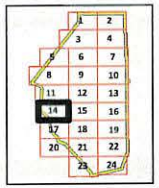
- Property Boundary (3,377.98 ac.)
- Study Area (3,637 ac.)

Non-Sensitive Communities

- Developed (293.00 ac.)
- Irrigated Pasture (1,364.19 ac.)
- Non-Native Grassland (487.00 ac.)

Sensitive Communities

- Coastal and Valley Freshwater Marsh (1,127.13 ac.)
- Great Valley Mixed Riparian (35.58 ac.)
- Open Water (329.64 ac.)



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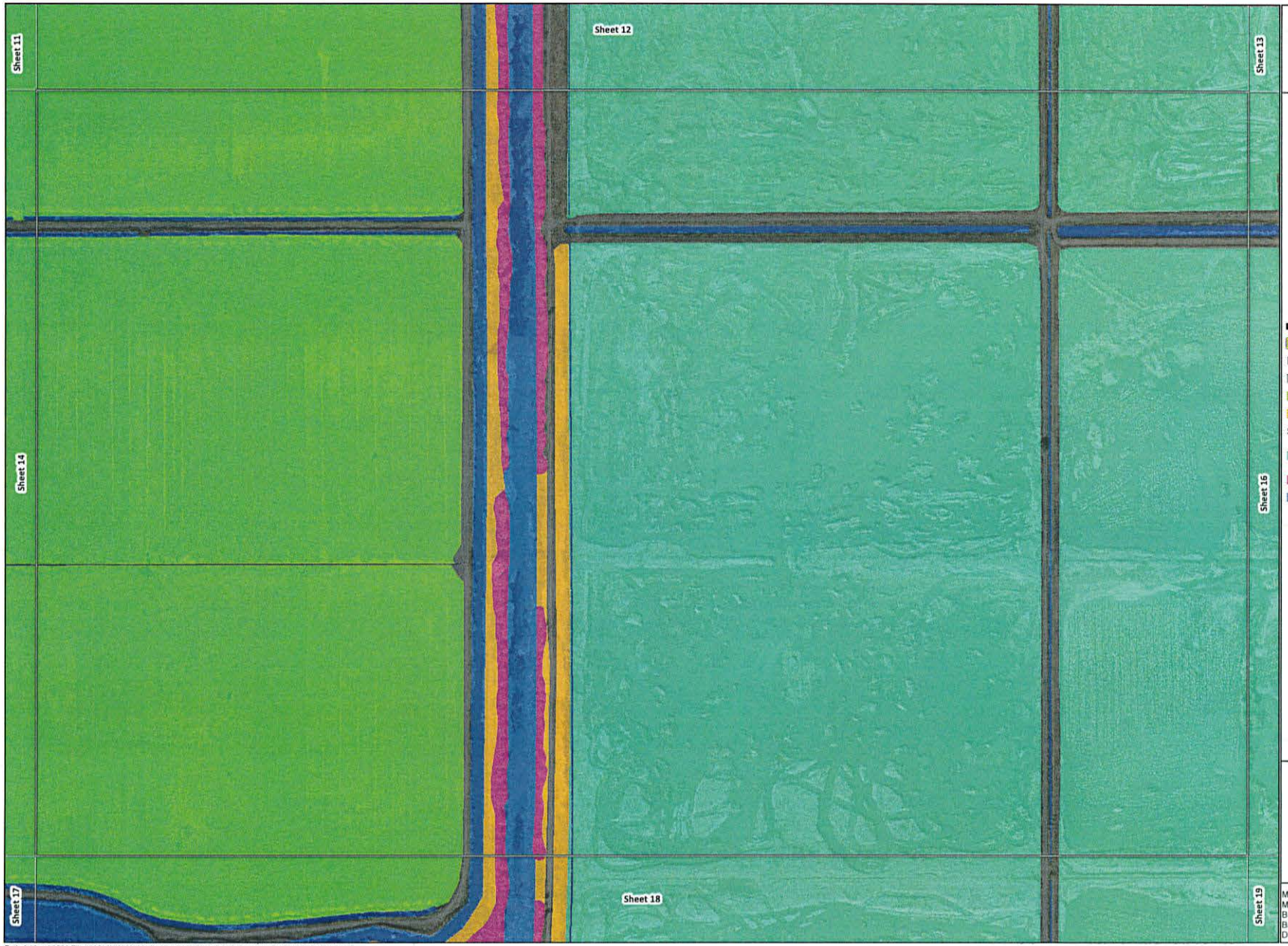

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Figure 2.
Biological Communities within the Study Area
Map Sheet 15

Lookout Slough Restoration Project

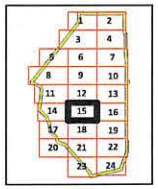
- Property Boundary (3,377.98 ac.)
- Study Area (3,637 ac.)

Non-Sensitive Communities

- Developed (293.00 ac.)
- Irrigated Pasture (1,364.19 ac.)
- Non-Native Grassland (487.00 ac.)

Sensitive Communities

- Coastal and Valley Freshwater Marsh (1,127.13 ac.)
- Great Valley Mixed Riparian (35.58 ac.)
- Open Water (329.64 ac.)



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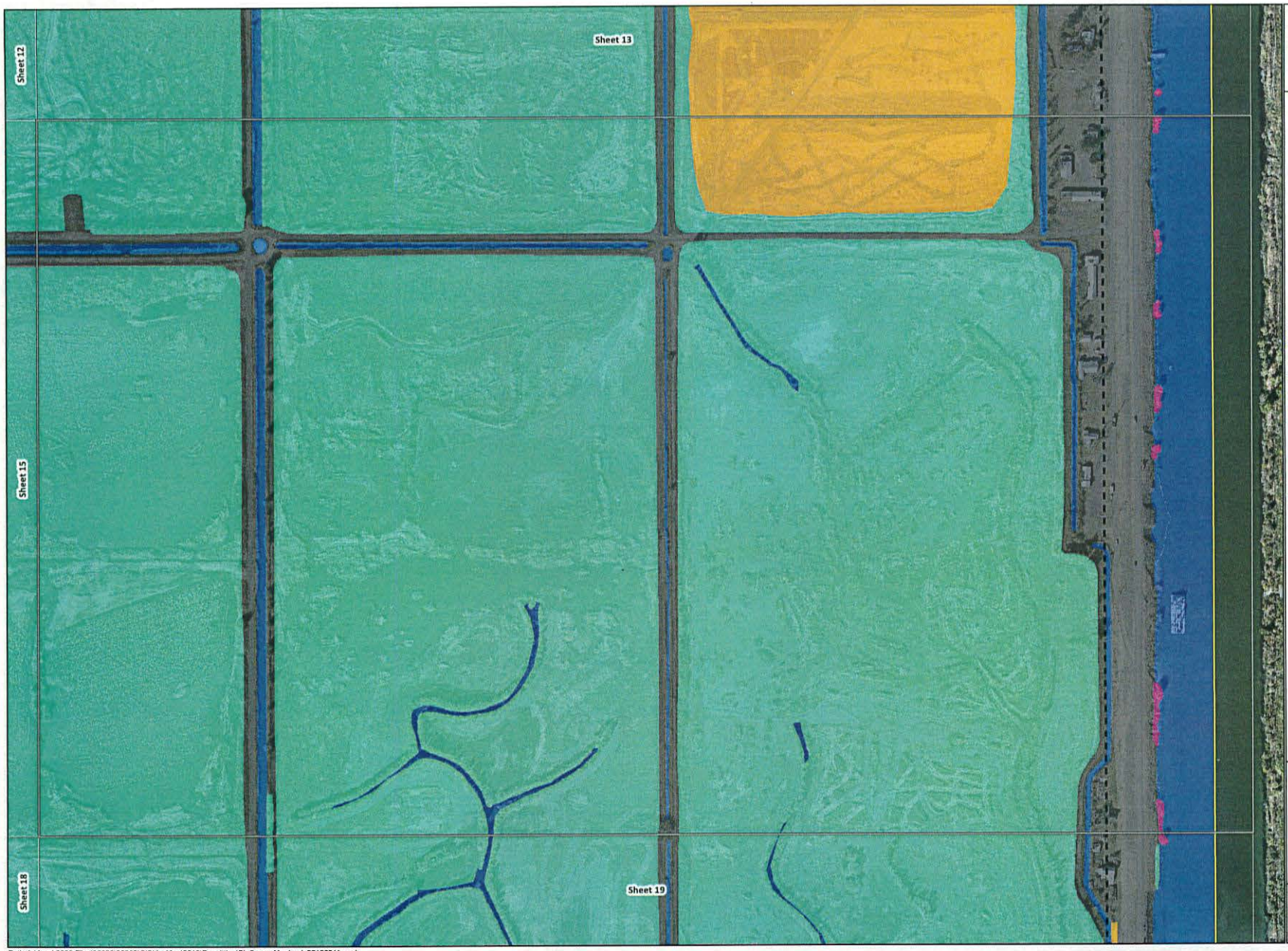

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Figure 2.
Biological Communities within the Study Area Map Sheet 16

Lookout Slough Restoration Project

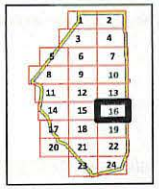
- Property Boundary (3,377.98 ac.)
- Study Area (3,637 ac.)

Non-Sensitive Communities

- Developed (293.00 ac.)
- Irrigated Pasture (1,364.19 ac.)
- Non-Native Grassland (487.00 ac.)

Sensitive Communities

- Coastal and Valley Freshwater Marsh (1,127.13 ac.)
- Great Valley Mixed Riparian (35.58 ac.)
- Open Water (329.64 ac.)



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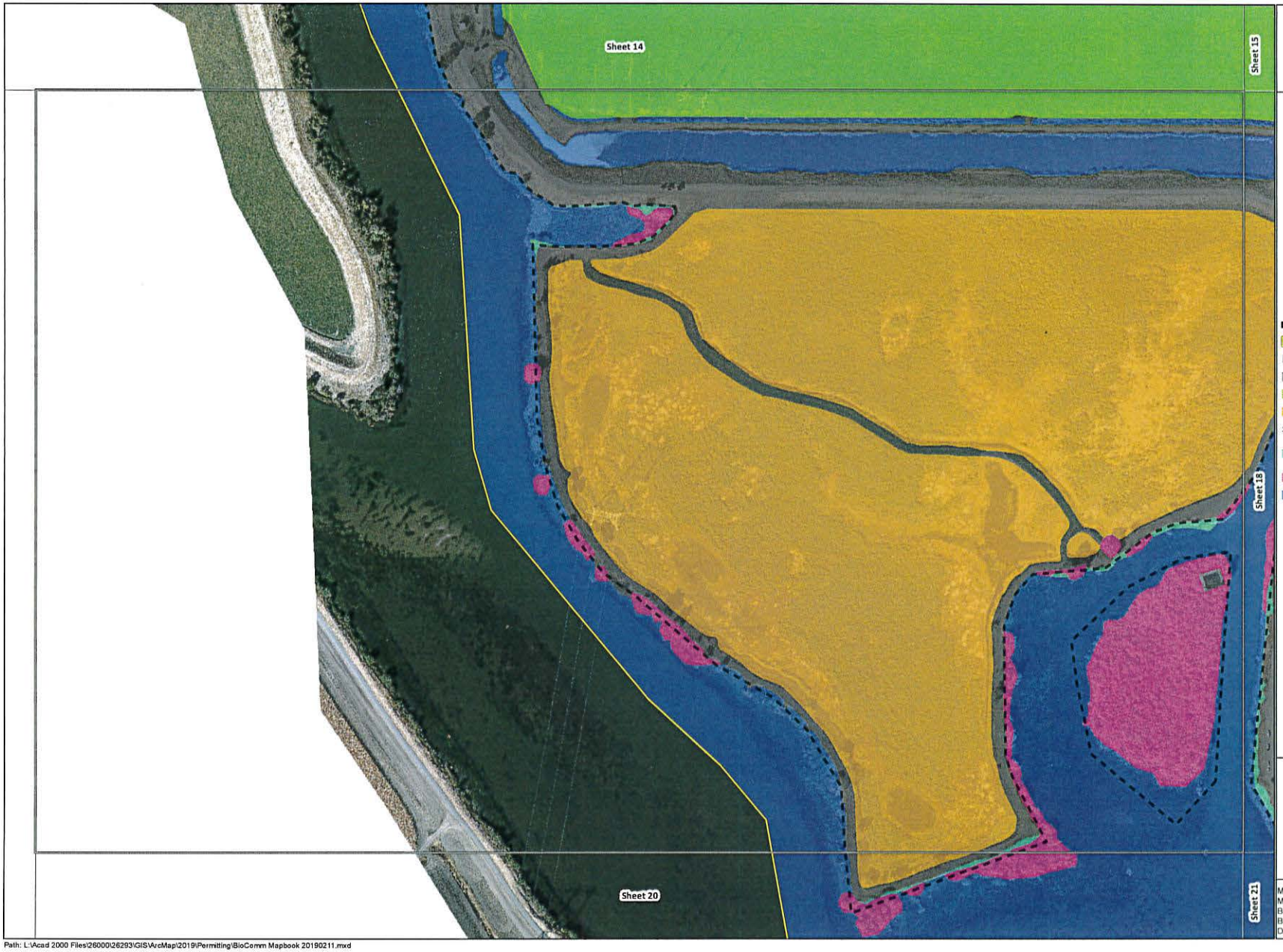

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Figure 2.
Biological Communities within the Study Area
Map Sheet 17

Lookout Slough Restoration Project

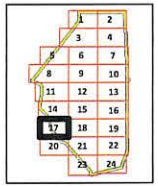
- Property Boundary (3,377.98 ac.)
- Study Area (3,637 ac.)

Non-Sensitive Communities

- Developed (293.00 ac.)
- Irrigated Pasture (1,364.19 ac.)
- Non-Native Grassland (487.00 ac.)

Sensitive Communities

- Coastal and Valley Freshwater Marsh (1,127.13 ac.)
- Great Valley Mixed Riparian (35.58 ac.)
- Open Water (329.64 ac.)



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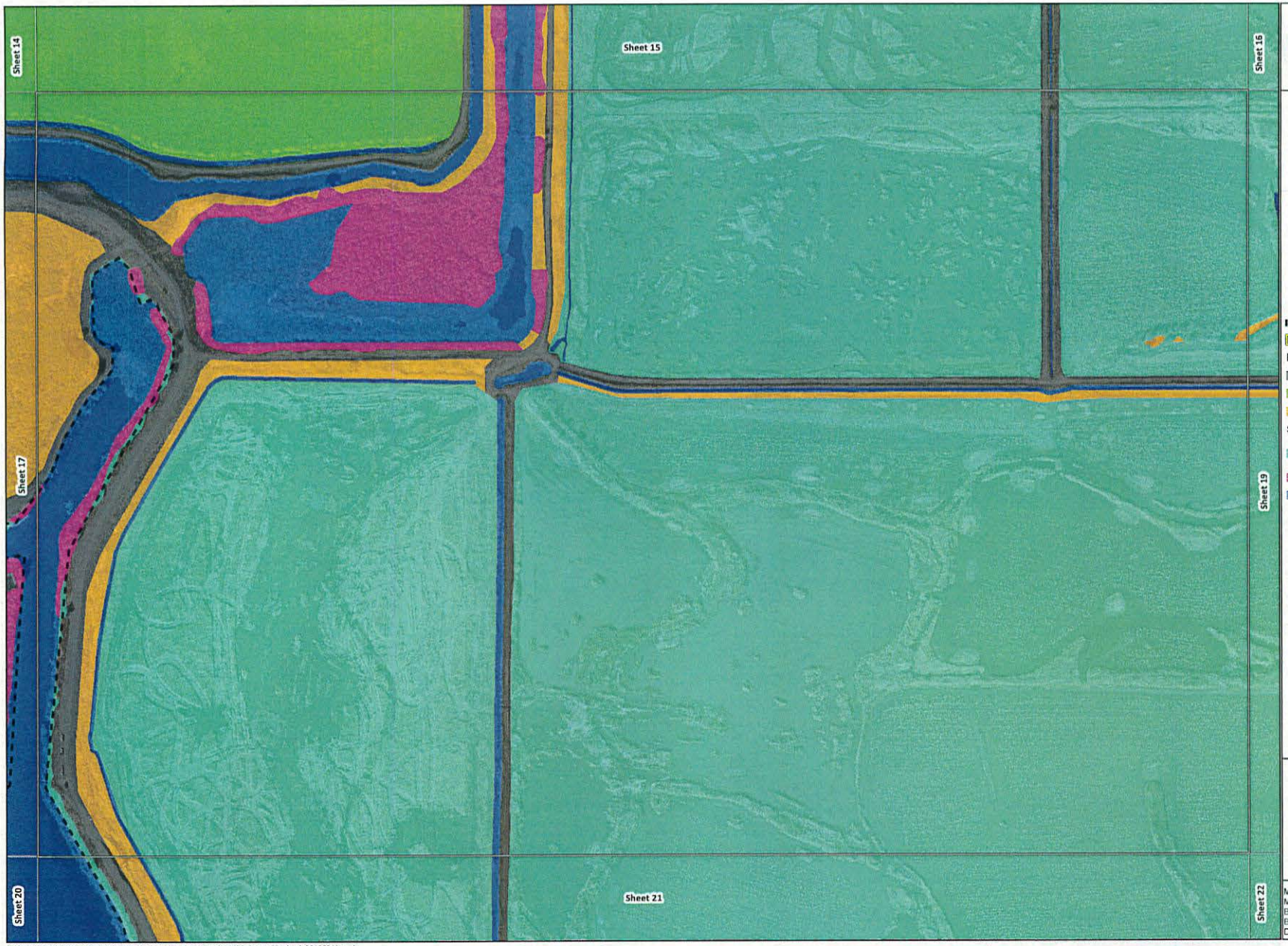

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Figure 2.
Biological Communities within the Study Area
Map Sheet 18

Lookout Slough Restoration Project

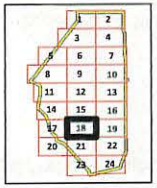
- Property Boundary (3,377.98 ac.)
- Study Area (3,637 ac.)

Non-Sensitive Communities

- Developed (293.00 ac.)
- Irrigated Pasture (1,364.19 ac.)
- Non-Native Grassland (487.00 ac.)

Sensitive Communities

- Coastal and Valley Freshwater Marsh (1,127.13 ac.)
- Great Valley Mixed Riparian (35.58 ac.)
- Open Water (329.64 ac.)



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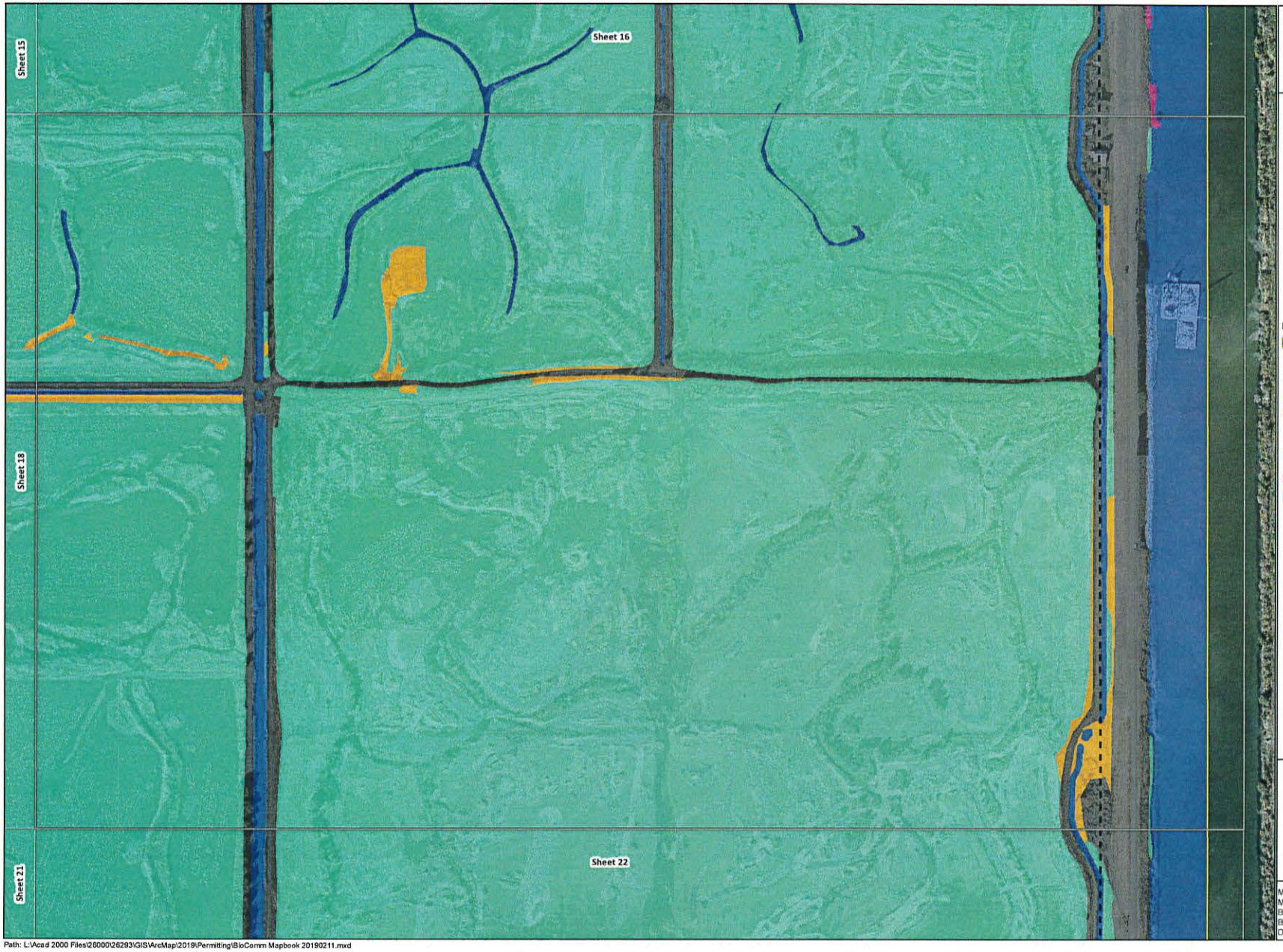

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Figure 2.
Biological Communities within the Study Area
Map Sheet 19

Lookout Slough Restoration Project

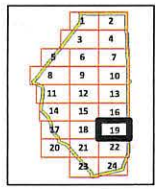
- Property Boundary (3,377.98 ac.)
- Study Area (3,637 ac.)

Non-Sensitive Communities

- Developed (293.00 ac.)
- Irrigated Pasture (1,364.19 ac.)
- Non-Native Grassland (487.00 ac.)

Sensitive Communities

- Coastal and Valley Freshwater Marsh (1,127.13 ac.)
- Great Valley Mixed Riparian (35.58 ac.)
- Open Water (329.64 ac.)



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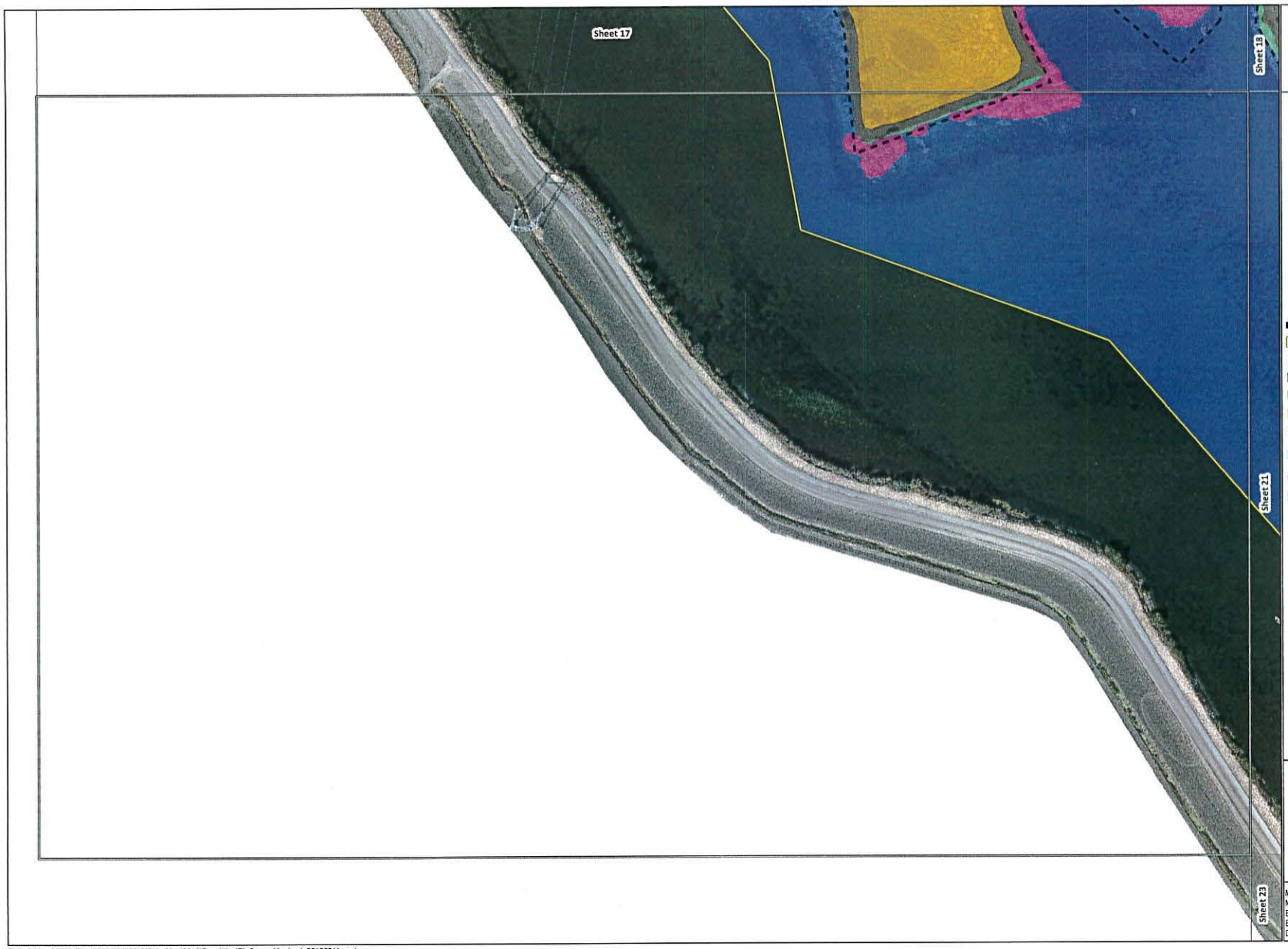

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Figure 2.
Biological Communities within the Study Area
Map Sheet 20

Lookout Slough Restoration Project

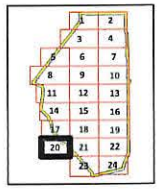
- Property Boundary (3,377.98 ac.)
- Study Area (3,637 ac.)

Non-Sensitive Communities

- Developed (293.00 ac.)
- Irrigated Pasture (1,364.19 ac.)
- Non-Native Grassland (487.00 ac.)

Sensitive Communities

- Coastal and Valley Freshwater Marsh (1,127.13 ac.)
- Great Valley Mixed Riparian (35.58 ac.)
- Open Water (329.64 ac.)



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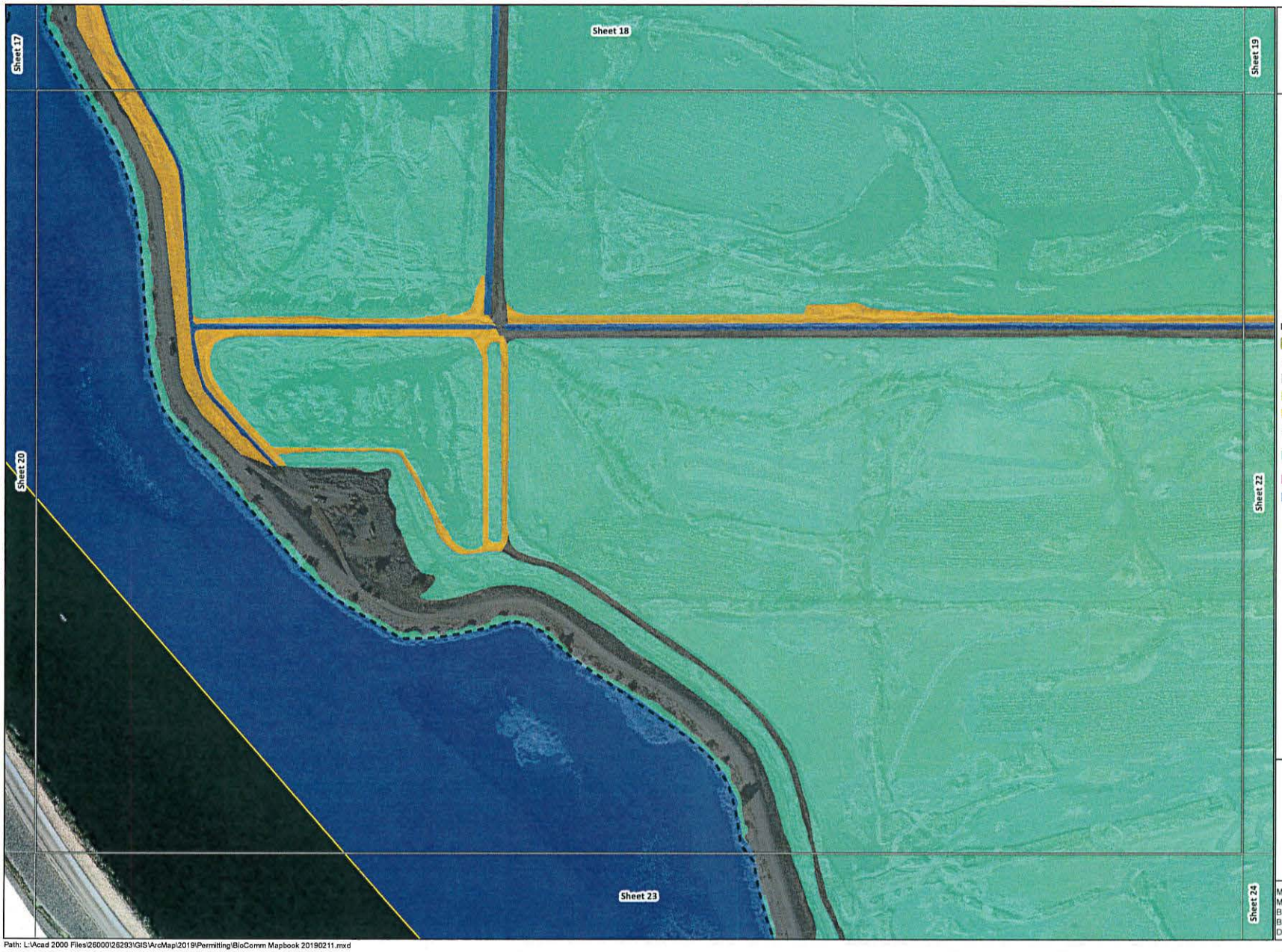

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Figure 2.
Biological Communities within the Study Area
Map Sheet 21

Lookout Slough Restoration Project

- Property Boundary (3,377.98 ac.)
- Study Area (3,637 ac.)

Non-Sensitive Communities

- Developed (293.00 ac.)
- Irrigated Pasture (1,364.19 ac.)
- Non-Native Grassland (487.00 ac.)

Sensitive Communities

- Coastal and Valley Freshwater Marsh (1,127.13 ac.)
- Great Valley Mixed Riparian (35.58 ac.)
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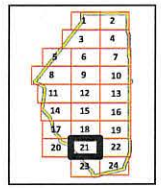

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Figure 2.
Biological Communities within the Study Area
Map Sheet 22

Lookout Slough Restoration Project

- Property Boundary (3,377.98 ac.)
- Study Area (3,637 ac.)

Non-Sensitive Communities

- Developed (293.00 ac.)
- Irrigated Pasture (1,364.19 ac.)
- Non-Native Grassland (487.00 ac.)

Sensitive Communities

- Coastal and Valley Freshwater Marsh (1,127.13 ac.)
- Great Valley Mixed Riparian (35.58 ac.)
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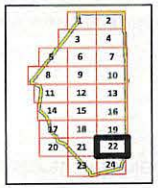

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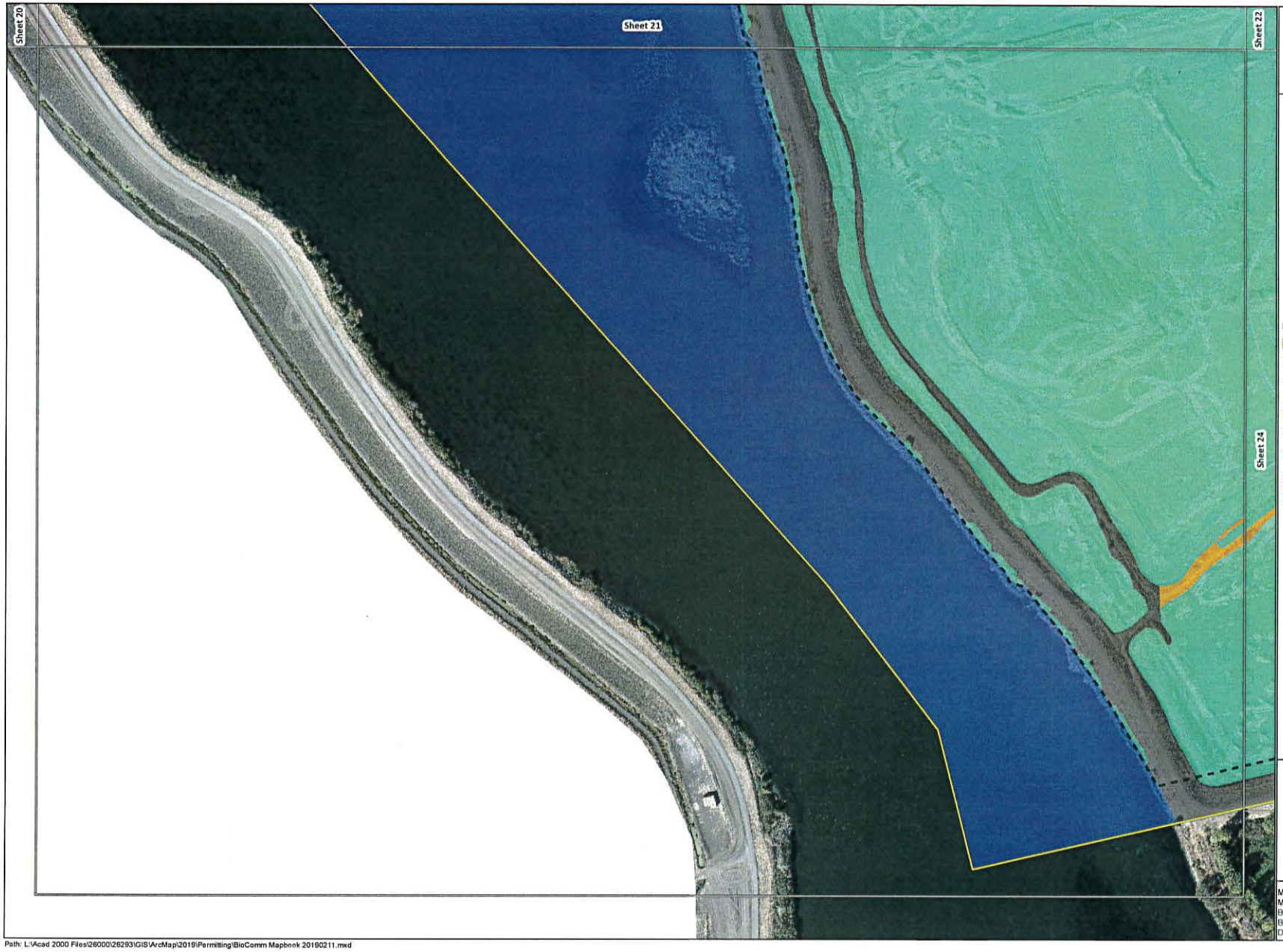

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Figure 2.
Biological Communities within the Study Area
Map Sheet 23

Lookout Slough Restoration Project

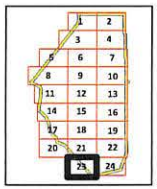
- Property Boundary (3,377.98 ac.)
- Study Area (3,637 ac.)

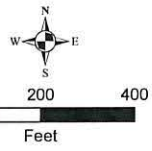
Non-Sensitive Communities

- Developed (293.00 ac.)
- Irrigated Pasture (1,364.19 ac.)
- Non-Native Grassland (487.00 ac.)

Sensitive Communities

- Coastal and Valley Freshwater Marsh (1,127.13 ac.)
- Great Valley Mixed Riparian (35.58 ac.)
- Open Water (329.64 ac.)





Map Prepared Date: 2/11/2019
Map Prepared By: pkobylarz
Base Source: Wood Rogers
Base Date: 10/24/17
Data Source(s): WRA

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Figure 2.
Biological Communities within the Study Area
Map Sheet 24

Lookout Slough Restoration Project

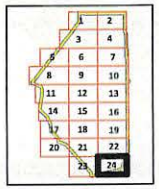
- Property Boundary (3,377.98 ac.)
- Study Area (3,637 ac.)

Non-Sensitive Communities

- Developed (293.00 ac.)
- Irrigated Pasture (1,364.19 ac.)
- Non-Native Grassland (487.00 ac.)

Sensitive Communities

- Coastal and Valley Freshwater Marsh (1,127.13 ac.)
- Great Valley Mixed Riparian (35.58 ac.)
- Open Water (329.64 ac.)



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Feet

Map Prepared Date: 2/11/2019
Map Prepared By: pkobylarz
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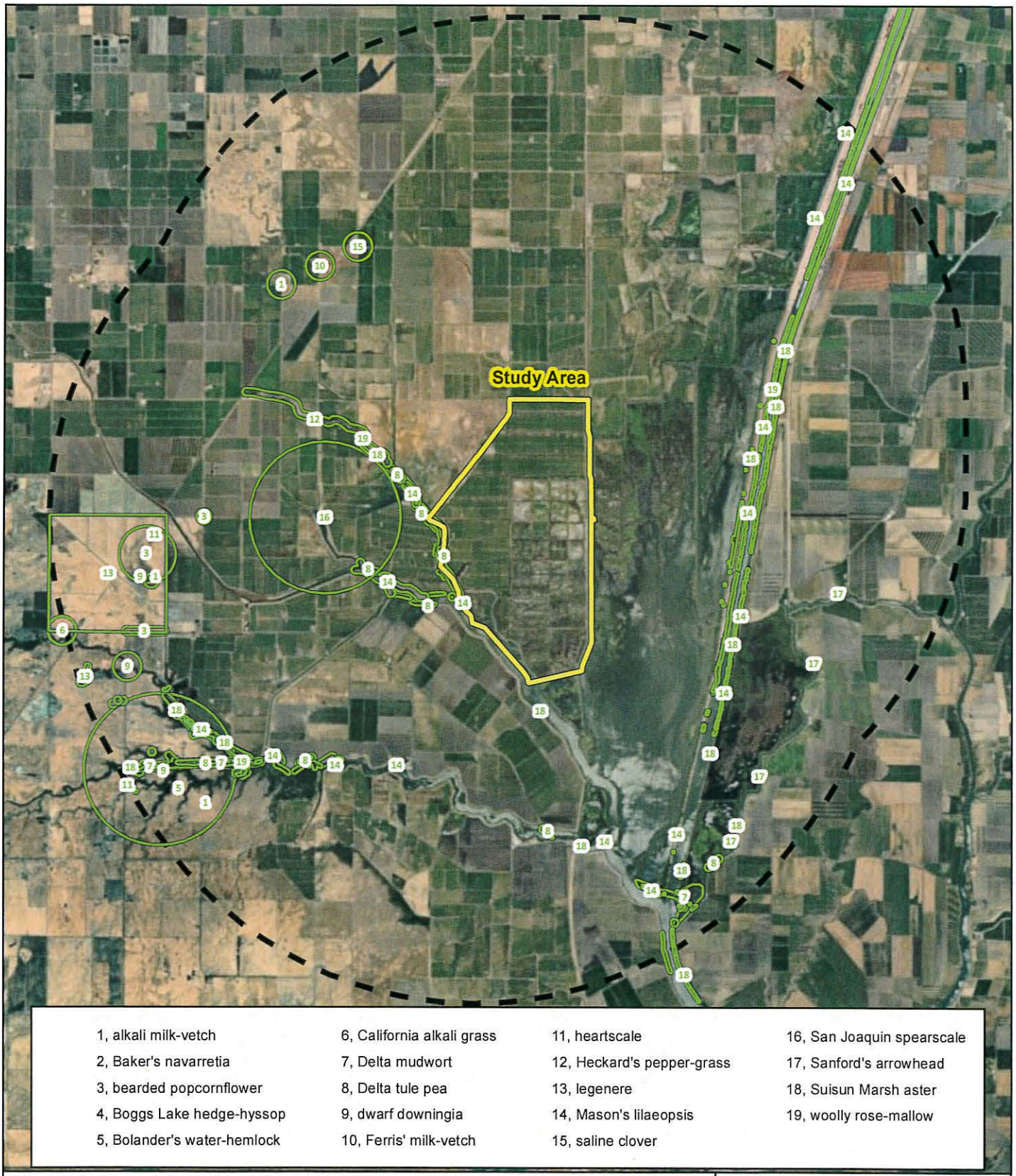

1, alkali milk-vetch	6, California alkali grass	11, heartscale	16, San Joaquin spearscale
2, Baker's navarretia	7, Delta mudwort	12, Heckard's pepper-grass	17, Sanford's arrowhead
3, bearded popcornflower	8, Delta tule pea	13, legenere	18, Suisun Marsh aster
4, Boggs Lake hedge-hyssop	9, dwarf downingia	14, Mason's lilaeopsis	19, woolly rose-mallow
5, Bolander's water-hemlock	10, Ferris' milk-vetch	15, saline clover	

Figure 3. Special-Status Plant Species
Documented within 5 miles of the Study Area

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0 1 2 4
Miles

Lookout Slough Restoration Project

Ecosystem Investment Partners

Prepared by:
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Map Prepared Date: 12/28/2018
Map Prepared By: pkobylarz
Base Source: Esri - Dig. Globe
Data Source(s): WRA, USDA

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Figure 4. Rare Plants Observed within Study Area

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0 0.25 0.5 1
Miles

Lookout Slough Restoration Project

Ecosystem Investment Partners

Prepared by:

Map Prepared Date: 12/28/2018
Map Prepared By: pkobylarz
Base Source: Wood Rogers
Base Date: 10/24/17
Data Source(s): WRA

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