

Mendota Pool Bypass and Reach 2B Improvements Project

Draft

**Technical Memorandum on Existing Environmental
Conditions: Data Needs and Survey Approach**

SAN JOAQUIN RIVER
RESTORATION PROGRAM

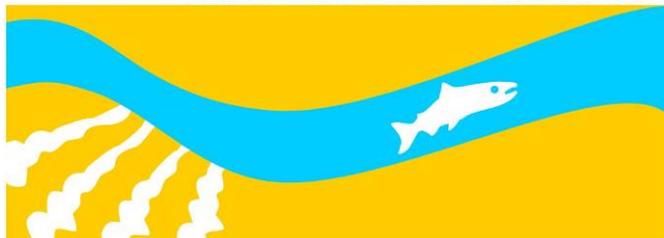


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- A Special Status Vegetation Alliances with Potential to Occur in the Project Area

List of Abbreviations and Acronyms

°C	degrees centigrade
Act	San Joaquin River Restoration Settlement Act
bgs	below ground surface
CAD	Computer Aided Design
CARB	California Air Resources Board
CDFG	California Department of Fish and Game
CEQA	California Environmental Quality Act of 1970
CESA	California Endangered Species Act
CFR	Code of Federal Regulations
cfs	feet per second
cm/s	centimeters per second
CNDDDB	California Natural Diversity Database
CNPS	California Native Plant Society
CSU	California State University
CVHM	Central Valley Hydrologic Model
Delta	Sacramento–San Joaquin Delta
dS/m	decisiemens per meter
DWR	California Department of Water Resources
EIS/R	Environmental Impact Statement/Report
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
FAC	facultative plants
FACU	facultative upland plants
FACW	facultative wetland plants
FR	Federal Register
GIS	Geographic Information System
GPS	Global Positioning System
LOC	levels of concern
NEPA	National Environmental Policy Act of 1969
NMFS	National Marine Fisheries Service
NRCS	Natural Resource Conservation Service
OBL	obligate plants
OHWM	ordinary high water mark

Project	Mendota Pool Bypass and Reach 2B Improvements Project
Reclamation	U.S. Department of the Interior, Bureau of Reclamation
RM	river mile
Settlement	Stipulation of Settlement
SJRRP	San Joaquin River Restoration Program
SJVAPCD	San Joaquin Valley Air Pollution Control District
State	State of California
TM	technical memorandum
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WBWG	Western Bat Working Group
WUS	waters of the United States

This Draft Technical Memorandum (TM) was prepared by the San Joaquin River Restoration Program (SJRRP) Team as a draft document in support of preparing an Environmental Impact Statement/Report (EIS/R) for the Mendota Pool Bypass and Reach 2B Improvements Project (Project). The purpose for circulating this document at this time is to facilitate early coordination regarding initial concepts and approaches currently under consideration by the SJRRP Team with the Settling Parties, Third Parties, other stakeholders, and interested members of the public. Therefore, the content of this document may not necessarily be included in the Project EIS/R.

This Draft TM does not present findings, decisions, or policy statements of any of the Implementing Agencies. Additionally, all information presented in this document is intended to be consistent with the Stipulation of Settlement (Settlement). To the extent inconsistencies exist, the Settlement should be the controlling document and the information in this document will be revised before its inclusion in future documents. While the SJRRP Team is not requesting formal comments on this document, all comments received will be considered in refining the concepts and approaches described herein to the extent possible.

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1.0 Summary

Purpose

The purpose of this technical memorandum (TM) is to identify environmental data and surveys needed to complete the resource area sections in the Mendota Pool Bypass and Reach 2B Improvements Project (Project) Environmental Impact Statement/Report (EIS/R) and to support the permit applications necessary to implement the Project. The Project includes the construction, operation, and maintenance of the Mendota Pool Bypass and improvements in the San Joaquin River channel in Reach 2B to convey at least 4,500 cubic feet per second (cfs). This TM is intended to facilitate discussion with the appropriate permitting/approval agency and to obtain input on the proposed scope and approach to data collection. Resource areas addressed include biological resources; groundwater; hydro-geomorphology; land use, agriculture, and socioeconomics and environmental justice; and air quality, noise, and traffic.

Background Information

The San Joaquin River is California's second longest river and it historically supported a rich and diverse ecosystem guided by seasonal runoff patterns. Operation of Friant Dam, beginning in 1945, ceased flow in some portions of the river, which ultimately led to the extirpation of salmon runs in the San Joaquin River upstream from its confluence with the Merced River. In 1988, a coalition of environmental groups filed a lawsuit challenging the manner in which the dam and its water diversions were operated. On September 13, 2006, this lawsuit, known as *NRDC, et al., v. Kirk Rodgers, et al.*, was settled. The Settlement establishes a Restoration Goal and a Water Management Goal for the San Joaquin River, as well as a framework for accomplishing the goals that will require National Environmental Policy Act and California Environmental Quality Act review and environmental compliance. The Settlement includes a detailed timeline for developing and implementing San Joaquin River Restoration Program (SJRRP) actions, which will be implemented by a group of State of California (State) and Federal agencies.

Methods

The methods used to prepare this TM included identifying existing data sources, including databases, literature, and unpublished reports; evaluating their adequacy to support the Project EIS/R and permitting documents; and developing an approach for obtaining additional data needed to adequately support those documents, including field surveys, where necessary.

Existing Data and Evaluation

Existing data related to biological resources includes SJRRP documents, as well as numerous unrelated sources such as peer reviewed publications, resource occurrence databases, and unpublished reports prepared for nearby or related projects and studies. For fish and other aquatic resources, existing data may be sufficient to support the Project EIS/R and permitting documents. Under present conditions, there is limited aquatic habitat in Reach 2B and most of that habitat is within or associated with Mendota Pool. Based on prior surveys, Mendota Pool is expected to support numerous nonnative fish species (which arrive in Mendota Pool from the Delta-Mendota Canal), and few to no native fishes.

A relatively large number of special status wildlife species, other than fishes, have potential to occur in wetlands and uplands in the Project area. While information describing the life history and habitat requirements of these species is generally available, in many cases additional information regarding habitat conditions and species occurrences in the Project area is needed to support the Project EIS/R and permitting documents. Much of this information could be gathered during a habitat assessment survey, which would also allow further evaluation of the need for species specific, focused (or protocol) surveys.

Federally jurisdictional wetlands and other waters of the United States are present in the Project area. Wetlands and other waters of the United States would be delineated in Project areas potentially affected by Project implementation. A number of special status plant species also have potential to occur in the Project area, and protocol surveys would be conducted to determine presence of those species.

The primary groundwater-related issue for the Project EIS/R is the potential for raising shallow groundwater levels due to recharge from Restoration Flows. No existing data indicates that there are areas in the vicinity of Reach 2B that have a present or recent shallow water table.

Existing hydrology data relevant to the Project includes a flow loss curve for the reach between Friant Dam and Gravelly Ford. Some data are also available to estimate the geomorphically-based stable channel in the Project area, for use in hydraulic analyses, and for sediment transport estimates.

Existing land use data will be utilized and spatially evaluated using Geographic Information Systems to assess potential impacts associated with the Project. This data includes maps published by the California Department of Water Resources Land Use Survey program and County level data from the California Department of Conservation's Farmland Mapping and Monitoring Program, and parcel level data from the Fresno County and Madera County Assessor's Offices. Economic information related to agriculture also is available. Data regarding socioeconomic and environmental justice characteristics for the Project area and vicinity are available from the 2000 Census of Population and Housing. More current information is available from Fresno and Madera Counties, the California Employment Development Department, the California

Department of Finance Demographic Research Unit, and the California Department of Finance Demographic Research Unit.

Data Needs and Survey Approach

Based on the evaluation of existing data, existing aquatic habitat and the management of that habitat, fish surveys in the Project area are not needed for environmental documents or permits, but may be valuable to the restoration effort, as a baseline data point to which future monitoring data can be compared. With the exception of flood years and recent Interim Flows, the upper half of Reach 2B had been dry from the Chowchilla Bifurcation Structure to San Mateo Avenue. At San Mateo Avenue, the river channel is backwatered by the Mendota Pool to Mendota Dam. Mendota Pool is a managed water-supply distribution reservoir and is the last water distribution point for the Delta-Mendota Canal. Consequently, about half the length of Reach 2B has been dry and the other half is under the near-constant influence of water deliveries from the Delta Mendota Canal. Existing data and any additional observations from site visits would be sufficient to support the Project EIS/R and permitting documents.

Wildlife surveys in the Project area are recommended to support Project environmental documents and permitting, before initiation of preconstruction surveys and activities. Surveys recommended at this point include a reconnaissance survey and a habitat assessment survey. A reconnaissance survey would be conducted in March 2010, and a more extensive habitat assessment survey would be conducted in spring 2010. In many cases data collected and observations made during the habitat assessment, and/or existing data, would be sufficient to support the Project EIS/R and permitting documents. Focused, or protocol surveys may be required for some wildlife species, but those decisions would generally best be made with the benefit of the reconnaissance and habitat assessment survey results, and potentially following further refinement of the Project area limits.

Wetland delineation in the Project area would be conducted in accordance with the methodology presented in the US Army Corps of Engineers' Wetlands Delineation Manual as well as the Arid West Regional Supplement to the Corps of Engineers' Wetland Delineation Manual. Botanical surveys would be conducted in accordance with CDFG's Protocols for Surveying and Evaluating Impacts to Special Status Native Plant Populations and Natural Communities.

SJRRP has developed a multistep process to identify areas susceptible to increases in seepage infiltration and subsequent impacts from rising groundwater, and SJRRP has defined the monitoring and action thresholds for minimum depth to water and soil salinity (SJRRP unpublished data). A total of seven SJRRP monitoring wells and two piezometers have been constructed along Reach 2B to characterize groundwater conditions and monitor water levels (SJRRP 2010). In addition, as part of the 2010 Interim Flow Releases Monitoring Program, a water quality station is being constructed at the San Mateo Road crossing that will monitor stage, discharge, temperature, conductivity, dissolved oxygen, and turbidity. If groundwater modeling were determined

to be necessary to evaluate the potential for seepage from the river to create waterlogging conditions along Reach 2B, the USGS Central Valley Hydrologic Model (CVHM) has been selected for use. No additional data needs or surveys other than the ongoing and anticipated future monitoring being implemented by the SJRRP are recommended.

Some hydro-geomorphology data collection is recommended to support ongoing modeling and concept refinement, and subsequently inform the alternatives evaluation. A “future conditions” flow duration curve for the Project should be developed and made available for analysis. Along with a sediment transport function, the flow duration curve can be used to predict the most effective discharges and help determine the active channel design dimensions. Flow losses from river bed seepage should also be addressed. As new Interim Flow data becomes available, it can be used to refine the existing flow loss curve. Field measurements of the amount of sediment being transported by the San Joaquin River could support ongoing sediment transport modeling.

This memorandum describes data needs for land use, agriculture, and socioeconomic and environmental justice measurements relative to the Reach 2B alternatives. This memorandum also includes recommendations on the collection of the requisite data for analyzing the alternatives by use of the analytical tools which will be discussed in a separate TM.

The Project is expected to result in permanent removal of agricultural land from production. Impact analysis will require detailed information on the affected lands. In addition to literature and map review, it may be necessary to contact agencies, such as the water districts within whose service areas impacted lands are located, and/or landowners directly to obtain other data.

2.0 Introduction

The San Joaquin River Restoration Program (SJRRP) was established in late 2006 to implement the Stipulation of Settlement (Settlement) in *NRDC, et al., v. Kirk Rodgers, et al.* The U.S. Department of the Interior, Bureau of Reclamation (Reclamation), as the Federal lead agency under the National Environmental Policy Act of 1969 (NEPA), and the California Department of Water Resources (DWR), as the State lead agency under the California Environmental Quality Act (CEQA), prepared this technical memorandum (TM) on the Reach 2B Data Needs/Survey Approach as an initial step in preparation of a Mendota Pool Bypass and Reach 2B Improvements Project (Project) Environmental Impact Statement/Report (EIS/R), which is required to implement certain components of the Settlement. Federal authorization for implementing the Settlement is provided in the San Joaquin River Restoration Settlement Act (Act) (Public Law 111-11).

2.1 Background Information

2.1.1 Pre-Settlement Historical Context

Originating high in the Sierra Nevada Mountains, the San Joaquin River carries snowmelt from mountain meadows to the valley floor before turning north and becoming the backbone of tributaries draining into the San Joaquin Valley. The San Joaquin River is California's second longest river and discharges to the Sacramento–San Joaquin Delta (Delta) and, ultimately, to the Pacific Ocean through San Francisco Bay.

Historically, the San Joaquin River supported a rich and diverse ecosystem influenced by seasonal runoff patterns. During winter and spring months, runoff from Sierra Nevada streams would spread over the valley floor and slowly drain to the Delta, providing rich habitat supporting numerous aquatic and wildlife species, including Chinook salmon.

Over the past two centuries, water resources development changed the state of the San Joaquin River. In the late 1880s, settlers in the Central Valley drained large areas of valley floor lands and put these lands into agricultural production, supported by small and seasonal diversion dams on the river and a series of water conveyance and drainage canals. Hydroelectric project development in the upper portions of the San Joaquin River associated with the Big Creek Project occurred between 1912 and the late 1920s with the enlargement or construction of three reservoirs: Shaver Lake, Huntington Lake and Florence Lake. About the same time, two PG&E reservoirs, Bass Lake and Kerchoff Reservoir, were also constructed. Three other reservoirs in the watershed were completed after Friant Dam was built, including Redinger, Lake Thomas A. Edison, and Mammoth Pool. Collectively these reservoirs in the upper watershed harnessed power from the river and modified the natural flow patterns.

In 1945, Reclamation completed construction of Friant Dam on the San Joaquin River. Friant Dam diverted most of the San Joaquin River water supplies to over 1 million acres of highly productive farmland along the eastern portion of the San Joaquin Valley.

Operation of the dam ceased flow in some portions of the river and extirpated salmon runs in the San Joaquin River upstream from the confluence with the Merced River.

2.1.2 Stipulation of Settlement

In 1988, a coalition of environmental groups, led by the Natural Resources Defense Council (NRDC), filed a lawsuit, known as *NRDC, et al., v. Kirk Rodgers, et al.*, challenging the renewal of long-term water service contracts between the United States and the Central Valley Project Friant Division contractors. On September 13, 2006, after more than 18 years of litigation, the Settling Parties, including NRDC, Friant Water Users Authority, and the U.S. Departments of the Interior and Commerce, agreed on the terms and conditions of a settlement subsequently approved by the U.S. Eastern District Court of California on October 23, 2006. The Act, included in Public Law 111-11 and signed into law on March 30, 2009, authorizes and directs the Secretary of the Interior to implement the Settlement. The Settlement establishes two primary goals:

- **Restoration Goal:** To restore and maintain fish populations in “good condition” in the main stem San Joaquin River below Friant Dam to the confluence of the Merced River, including naturally reproducing and self-sustaining populations of salmon and other fish.
- **Water Management Goal:** To reduce or avoid adverse water supply impacts on all of the Friant Division long-term contractors that may result from the Interim and Restoration flows provided for in the Settlement.

To achieve the Restoration Goal, the Settlement calls for releases of water from Friant Dam to the confluence of the Merced River (referred to as Interim and Restoration flows), a combination of channel and structural modifications along the San Joaquin River below Friant Dam, and reintroduction of spring- and fall-run Chinook salmon. To achieve the Water Management Goal, the Settlement calls for recirculation, recapture, reuse, exchange or transfer of the Interim and Restoration flows for the purpose of reducing or avoiding impacts to water deliveries to all of the Friant Division long-term contractors caused by the Interim and Restoration flows. In addition, the Settlement establishes a Recovered Water Account and recovered water program to make water available to all of the Friant Division long-term contractors who provide water to meet Interim or Restoration flows for the purpose of reducing or avoiding the impact of the Interim and Restoration flows on such contractors. Restoration Flows are specific volumes of water to be released from Friant Dam during different year types according to Exhibit B of the Settlement; Interim Flows began in 2009 and would continue until full Restoration Flows are initiated, with the purpose of collecting relevant data concerning flows, temperatures, fish needs, seepage losses, recirculation, recapture, and reuse.

The Settlement and the Act authorize and direct specific physical and operational actions that could potentially directly or indirectly affect environmental conditions in the Central Valley. Areas potentially affected by Settlement actions include the San Joaquin River and associated flood bypass system, tributaries to the San Joaquin River, the Delta, and water service areas of the Central Valley Project and State Water Project, including the Friant Division. Settlement Paragraphs 11 through 16 describe physical and operational actions (see Table 2-1).

Table 2-1
Restoration and Water Management Framework in Key Settlement Paragraphs

Settlement Paragraph	Description of Constraint or Assumption
11	Identifies specific channel and structural improvements considered necessary to achieve the Restoration Goal. Includes a reach-by-reach list of improvements.
12	Acknowledges that additional channel or structural improvements not identified in Paragraph 11 may be needed to achieve the Restoration Goal.
13	Identifies specific volumes of water to be released from Friant Dam during different year-types (Critical-Low to Wet, as specified in flow schedules provided in Exhibit B of the Settlement), and provisional water supplies to meet the Restoration Flow targets as provided in Exhibit B of the Settlement.
14	Stipulates that spring-run and fall-run Chinook salmon be reintroduced to the San Joaquin River between Friant Dam and the confluence of the San Joaquin River with the Merced River no later than December 31, 2012. Assigns priority to wild spring-run Chinook salmon over fall-run Chinook salmon.
15	Specifies that Interim Flows begin no later than October 1, 2009, and continue until full Restoration Flows can begin.
16	Requires that the Secretary of the Interior develop and implement a plan for recirculation, recapture, reuse, exchange, or transfer of the Interim and Restoration flows to reduce or avoid impacts to water deliveries for all Friant Division long-term contractors. This paragraph also calls for establishment of a Recovered Water Account and program to make water available to the Friant Division long-term contractors who provide water to meet Interim or Restoration flows.

2.1.3 San Joaquin River Restoration Program Overview

The SJRRP comprises several Federal and State agencies responsible for implementing the Settlement. Implementing Agencies include the U.S. Department of the Interior, Reclamation; U.S. Fish and Wildlife Service (USFWS), National Marine Fisheries Service (NMFS); California DWR; and the California Department of Fish and Game (CDFG). Reclamation and DWR initiated the NEPA and CEQA processes August 2007 to analyze implementation of the Settlement. Reclamation is the lead NEPA agency, and DWR is the lead CEQA agency in preparing the Project EIS/R.

2.1.4 Overview of Mendota Pool Bypass and Reach 2B Improvements Project

The Project includes the construction, operation, and maintenance of the Mendota Pool Bypass and improvements in the San Joaquin River channel in Reach 2B to convey at least 4,500 cubic feet per second (cfs). Paragraph 11(a)(1) of the Settlement stipulates the creation of a bypass channel around the Mendota Pool to ensure conveyance of at least 4,500 cfs from Reach 2B downstream to Reach 3. Paragraph 11(a)(2) of the Settlement stipulates modifications in channel capacity, incorporating new floodplain habitat and related riparian habitat, to ensure conveyance of at least 4,500 cfs between the Chowchilla Bypass Bifurcation Structure and the new Mendota Pool Bypass. Because the functions of these channels may be inter-related, the design, environmental compliance, and construction of the two are being addressed as one project. The Project shall be implemented consistent with the Settlement and the Act, Public Law 111-11.

The Mendota Pool Bypass would include bypassing the Pool to convey at least 4,500 cfs from Reach 2B to Reach 3, and a method to direct immigrating adult salmon into the bypass channel. This action could also include constructing a bifurcation structure in Reach 2B to divert up to 2,500 cfs to the Pool. The bifurcation structure would be designed to direct fish into the bypass channel and minimize or avoid fish entrainment to the Pool. Specific bypass alignments and facilities locations will be determined through the course of this site-specific study.

Improvements to Reach 2B would include modifications to the San Joaquin River channel from the Chowchilla Bypass Bifurcation Structure to the new Mendota Bypass Bifurcation Structure to provide a capacity of at least 4,500 cfs, with integrated floodplain habitat. New levees would be constructed along Reach 2B to increase the channel capacity while allowing for new floodplain habitat. Because of the uncertainty of life history behavior of salmon in the San Joaquin River, modifications in Reach 2B may or may not emphasize floodplain habitat for juvenile salmon rearing.

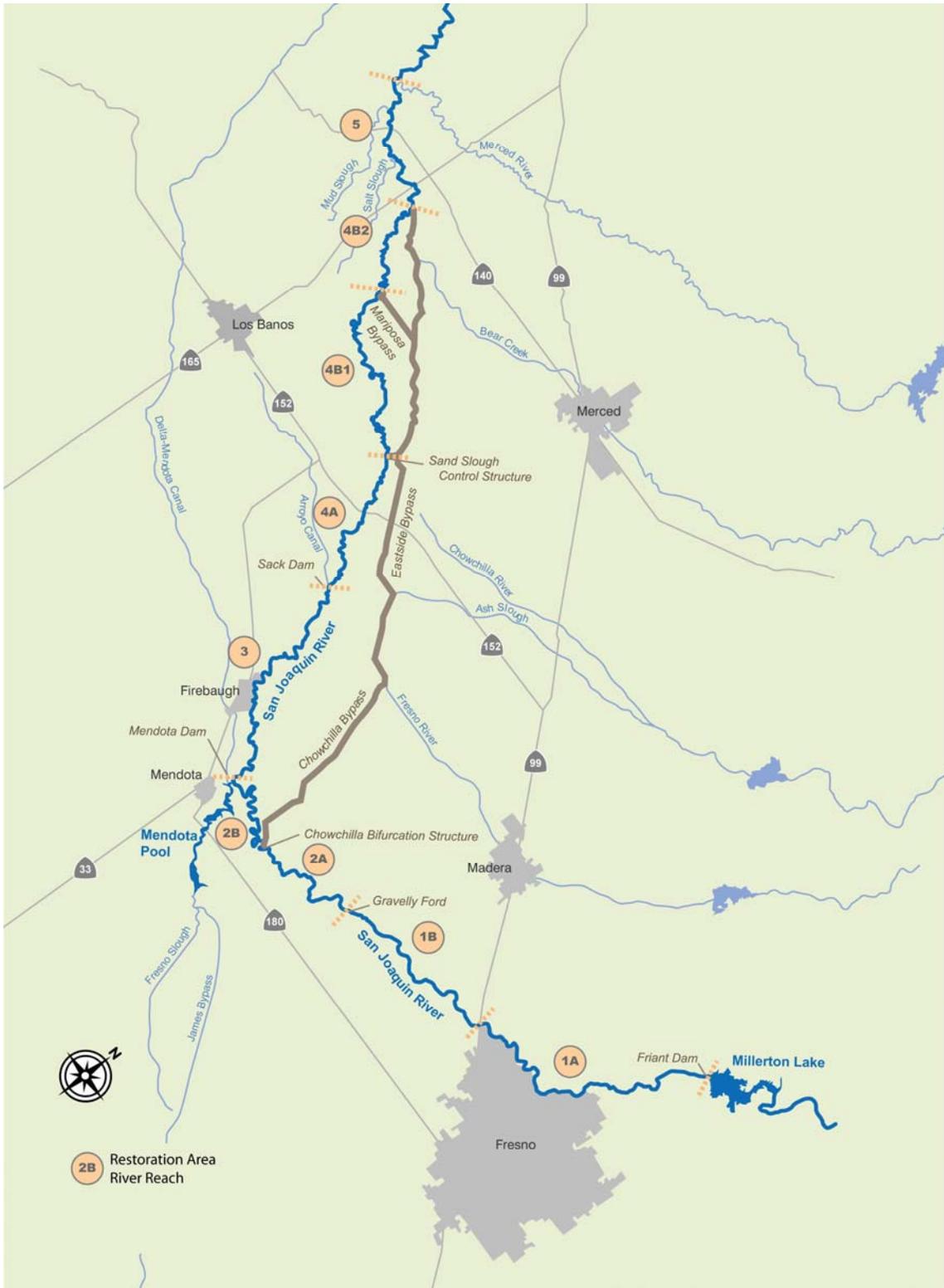
The Project area is shown on Figure 2-1; the Project area extends from the Chowchilla Bypass Bifurcation Structure to approximately 1 mile below Mendota Dam. The extent of the Project area boundaries will depend on the final alternatives considered. The Project area is located in Fresno and Madera counties, near the town of Mendota.

2.2 Purpose

The purpose of this TM is to identify environmental data and surveys needed to complete the resource area sections in the Project EIS/R and obtain permits and approvals necessary to implement the Project.

2.3 Scope

Using the Initial Options TM and other readily available data sources, this TM describes the data needed to identify and evaluate the existing and future environmental conditions and the approach to data collection. Existing environmental data sources are identified and briefly summarized. The description of environmental data needs emphasizes those data needed for preparation of the Project EIS/R and Project environmental permitting that cannot be filled from existing sources. Data needs that cannot be filled from existing sources would be acquired by conducting field surveys. This TM describes the field surveys that are needed to collect additional data and the approach to the field surveys, including survey timing and suggested survey protocols. This TM is intended to facilitate discussion with the appropriate permitting/approval agency and to obtain input on the proposed scope and approach to data collection.



Source: Reclamation 2010

Figure 2-1
Overview of SJRRP Restoration Area and Project Area.

2.4 Organization of Technical Memorandum

This section describes the organization of the memorandum.

- **Section 1 Summary** – provides a summary of the information in this TM.
- **Section 2 Introduction** – introduces the TM, presenting background information, and describing its purpose and organization.
- **Section 3 Methods** – presents the methods used to prepare this TM.
- **Section 4 Existing Data and Evaluation** – presents summaries of existing data and evaluation of those data organized by resource area.
- **Section 5 Data Needs and Survey Approach** – describes additional data needs and outlines a field survey approach designed to support future Project environmental documents and permitting.
- **Section 6 Acknowledgements.**
- **Section 7 References** – lists alphabetically all references cited in this TM.

3.0 Methods

This section discusses the methods used to prepare this TM, including background data reviewed and the process by which data needs were identified and a survey approach was developed. Although the SJRRP Program Environmental Impact Statement/Program Environmental Impact Report had not been completed at the time that this document was prepared, information and approaches presented in this TM are anticipated to be consistent with that document. As presented in this section, database searches were among the methods used to identify specific resources addressed in some of the resource area sections.

3.1 Project Area

An overview of the Project is presented in Section 2.1.4. This TM only identifies the data and survey needs for the Project area as described in Section 2.1.4.

This TM was prepared concurrently with the Initial Options TM, intended to further develop the initial Project options. The extent of the Project area boundaries will depend on the final alternatives considered, and this extent will continue to be developed as the environmental documentation (or EIS/R) process progresses. References to the Project area in this TM refer to the general extent and vicinity of options currently under investigation. Therefore, only the general locations of Project components are delineated on the Project components map (Figure 3-1). The maximum Project extent is expected to lie entirely within the Mendota Dam U.S. Geological Survey (USGS) 7.5-minute quadrangle.

Mendota Pool Bypass and Reach 2B Improvements Project

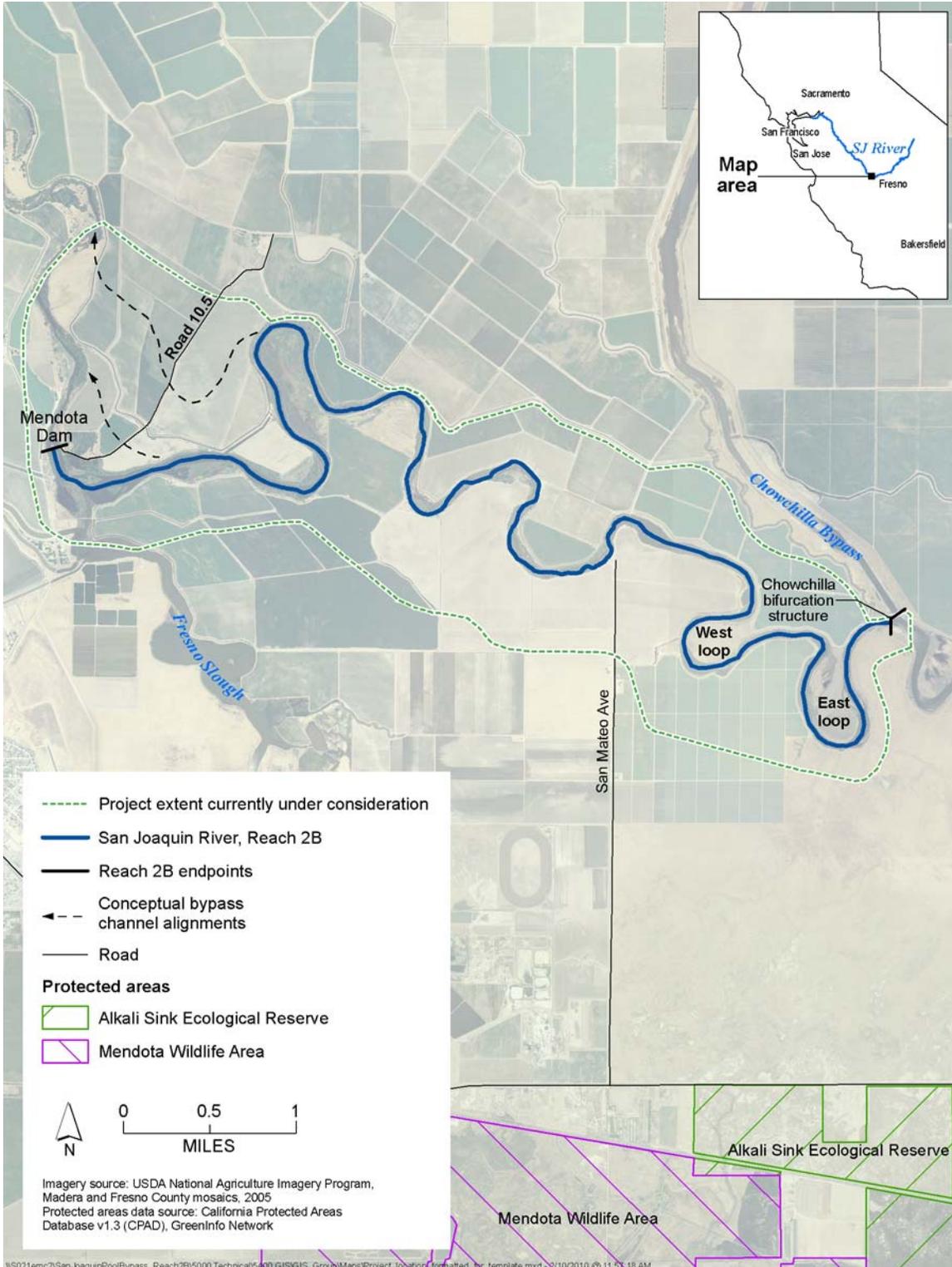


Figure 3-1
Approximate Locations of Project Components.

3.2 Biological Resources Area Methods

This section presents the methods used to identify data needs and develop a survey approach. It is organized by resource area, including fish and aquatic resources, special-status wildlife species, wetlands and other waters of the United States, special-status plant species, and special-status vegetation alliances. This section describes the process that was used to develop the survey methods described in Section 5. Section 5 also describes proposed methods for future field surveys.

Temporary Entry Permits that will be used to obtain legal access to private property in the Project area are anticipated to contain language limiting how data collected on private property can be used and distributed. Biological resources field survey data will be documented in a Biological Resources Inventory Report kept on file with Reclamation and the California DWR. The report will also be provided to USFWS, NMFS, CDFG, and other regulatory agencies with jurisdiction or regulatory authority over biological resources, but only as is necessary to obtain required permits and approvals for activities. Any information provided to the public and/or reported in subsequent environmental documents as part of the SJRRP will be general in nature and will not identify [assessor's parcel numbers](#), addresses, owner names, or specific locations of resources, unless otherwise required by law.

To facilitate discussion of existing resources in the Project vicinity, database searches were conducted extending up to 10 miles from a line drawn between the endpoints of Reach 2B along the San Joaquin River channel, from the Chowchilla Bifurcation Structure to Mendota Dam (Figure 3-1). The line was used because at the time of the database searches the Project area had not been defined, and a 10-mile buffer was used because species that occur within this 10-mile range are expected to be more likely to occur within the Project area. Throughout this TM, when distances are reported as “from the Project area,” they are typically measured from this line.

3.2.1 Fish and Other Aquatic Resources

This section describes the criteria for defining and including special status fish species in this TM, and the sources used to determine fish species with potential to occur in the Project area. The sources used to describe the species that may be found in Reach 2B include both database searches and literature reviews.

Status Criteria for Inclusion

For the purposes of identifying data needs and a survey approach, fish species with any of the following special status designations that may be found in the Project area are addressed in this memorandum:

- Federally listed as endangered or threatened, proposed for Federal listing, or Federal candidate for listing
- State listed as endangered or threatened, proposed for State listing, or State candidate for listing

- State fully protected
- CDFG Species of Special Concern and Watch List species

Database Search

Database searches and a literature review were conducted to identify the special status fish and aquatic resources that could potentially occur in the Project area. Two primary databases were reviewed:

- California Natural Diversity Database (CNDDDB) (CDFG 2009a): All records from the Mendota Dam USGS 7.5-minute quadrangle in this database, maintained by CDFG, as well as all records from the upstream and downstream quadrangles were reviewed. All species with records from these quadrangles and meeting the above status criteria for inclusion are addressed in this memorandum.
- USFWS Sacramento Field Office Species List (USFWS 2009a): All species on this list generated at the Sacramento USFWS website for the Mendota Dam quadrangle are addressed in this memorandum.

Literature Review

Information regarding aquatic resources and potential habitat conditions found in Reach 2B is contained in the sources identified below. The extent of information in the San Joaquin Valley for aquatic resources includes surveys done over a wide area along the San Joaquin River and its tributaries. Most of the sampling conducted did not include any of Reach 2 with the exception of the Mendota Pool. Sources of existing data include the following:

- Brown, L.R. and P.B. Moyle. 1993. Distribution, Ecology, and Status of the Fishes of the San Joaquin River Drainage, California. California Fish and Game 79: 96-114
- CDFG. 2007. San Joaquin River fishery and aquatic resources inventory. Final report, September 2003-September 2005.
- CH2MHILL. 2003, Upper San Joaquin River Conceptual Restoration Phase 1 Planning Document. Prepared for the San Joaquin River Resource Management Coalition August 2003.
- CH2MHILL. 2005, Upper San Joaquin River Conceptual Restoration Phase 2 Planning Document. Prepared for the San Joaquin River Resource Management Coalition December 2005.
- Jones and Stokes. 1986. White Bass Sampling Program Final Report. Prepared by Jones and Stokes, Sacramento, CA for the California Department of Fish and Game, Rancho Cordova, CA
- McBain & Trush, Inc. (eds.), 2002, San Joaquin River Restoration Study Background Report, prepared for Friant Water Users Authority, Lindsay, Calif., and Natural Resources Defense Council, San Francisco, Calif., Chapter 7: Fish Resources.

- Moyle, Peter B. 2002. *Inland Fishes of California*, University of California Press.
- Saiki, M.K. 1984. Environmental conditions and fish faunas in low elevation rivers on the irrigated San Joaquin Valley floor, California. *California Fish and Game* 70: 145-157.

Potential to Occur and Recommendations

The potential for occurrence in the Project area of species meeting the above status criteria for inclusion and identified during the database search was evaluated using the database information and literature sources, based on three factors:

- Historic and current range
- Presence of suitable habitat
- Documented occurrences from water ways connected with or with the potential to become connected with the Project reach

Using the above information, fishery biologists assessed the likelihood for the occurrence of each species in the Project area. Based on the likelihood of presence in the Project area, biologists developed a recommendation intended to provide any additional data needed to develop Project environmental documents and to obtain regulatory agency permits for Project activities. Standard fishery assessment protocols were reviewed to determine the appropriate survey methods and techniques to determine which fish species may be found in adjacent waters.

3.2.2 Special Status Wildlife Species

This section describes the methods used to identify data needs and the survey approach for special status wildlife species.

Status Criteria for Inclusion

For the purposes of identifying data needs and a survey approach, wildlife species of the following special status designations and potential to occur in the Project area are addressed in this TM:

- Federally listed as endangered or threatened, proposed for Federal listing, or Federal candidate for listing
- State listed as endangered or threatened, proposed for State listing, or State candidate for listing
- State fully protected species
- USFWS Bird of Conservation Concern species
- CDFG Species of Special Concern and Watch List species

Database Search

Database searches were conducted to identify the special status wildlife species that potentially occur in the Project area. Three primary databases were reviewed to obtain special status wildlife species occurrence data from within 10 miles of the Project area:

- CNDDDB (CDFG 2009a): All records from the Mendota Dam USGS 7.5-minute quadrangle in this database, maintained by CDFG, and all records from the surrounding eight quadrangles (Jamesan, Tranquility, Coit Ranch, Firebaugh, Poso Farm, Firebaugh NE, Bonita Ranch, and Gravelly Ford) were reviewed. All species with records from these quadrangles and meeting the status criteria for inclusion (described below) are addressed in this TM.
- USFWS Sacramento Species List (USFWS 2009a): All species on this list generated at the Sacramento USFWS website for the Mendota Dam quadrangle are addressed in this TM.
- Audubon Society Important Bird Area species list for the Mendota Wildlife Area (Audubon Society 2009): All species reportedly observed at the Mendota Wildlife Area and meeting status criteria for inclusion are addressed in this TM.

Literature Review

The following reports or data sources were identified as particularly relevant to this TM, and were reviewed before and referenced during its preparation:

- San Joaquin River Restoration Study Background Report (McBain and Trush, Inc. 2002)
- California Interagency Wildlife Task Group, California Wildlife Habitat Relationships species accounts (CDFG 2005)
- Endangered Species Recovery Program species profiles (ESRP 2006)

For the majority of species, specific literature was reviewed in addition to the sources listed above. References not listed here but cited in this TM are provided in Section 7.

Potential to Occur and Recommendations

The potential that species meeting the status criteria for inclusion occur in the Project area was evaluated using the database information and literature sources. Potential presence of the species was evaluated based primarily on three parameters:

- Historic and current range
- Presence of suitable habitat
- Documented occurrences from within 10 miles of the Project area

Based on the potential for occurrence in the Project area, a recommendation was developed for each species, intended to provide any additional data needed to develop Project environmental documents and obtain regulatory agency permits for Project construction.

Protocol Surveys

An effort was made to identify protocol survey methods for each special status wildlife species addressed in this TM. These survey protocols have been identified, when available, to facilitate informed discussions of the recommendation proposed in this document. Survey protocols developed by USFWS, CDFG, the Western Bat Working

Group, and others were reviewed and considered while developing the recommendations presented in Section 4.

3.2.3 Wetlands and Other Waters

For the purpose of this document and to determine data needs and a survey approach, wetlands and other aquatic resources, e.g., rivers, streams and natural basins, are a subset of waters of the United States (WUS) and are protected under Section 404 of the Clean Water Act. The U.S. Army Corps of Engineers (USACE) has the primary federal responsibility for administering regulations that concern waters and wetlands. In this regard, USACE acts under two statutory authorities: the Rivers and Harbors Act (Sections 9 and 10), which governs specified activities in “navigable waters,” and the Clean Water Act (Section 404), which governs specified activities in WUS, including wetlands.

Database Search

To evaluate where wetlands and other WUS could potentially occur in the Project area, all records from the Mendota Dam USGS 7.5-minute quadrangle (DWR quadrangle 381D) in the National Wetlands Inventory database, maintained by USFWS (USFWS 2009b), and all records from the surrounding eight quadrangles (Jamesan, Tranquillity, Coit Ranch, Firebaugh, Poso Farm, Firebaugh NE, Bonita Ranch, and Gravelly Ford) were reviewed. Similarly, the Natural Resource Conservation Service (NRCS) soil maps (UCDSRL 2008) were reviewed for hydric and partially hydric soils. All potential wetlands and other WUS identified in the NWI are addressed in this memorandum.

Literature Review

The San Joaquin River Restoration Study Background Report (McBain and Trush, Inc. 2002) was identified as particularly relevant to this TM, and was reviewed before and referenced during its preparation.

Potential to Occur and Recommendations

Based on the presence of wetlands and other WUS in the Project area and its 10-mile vicinity, wetland specialists developed a methodology for wetland and other WUS field surveys, intended to provide sufficient data needed to develop Project environmental documents and obtain regulatory agency permits for Project construction.

3.2.4 Special Status Plant Species

Status Criteria for Inclusion

For the purpose of this document special-status plant species are defined as species that are legally protected under the federal Endangered Species Act (ESA), the California Endangered Species Act (CESA), or other regulations, and species that are considered sufficiently rare or endangered by the scientific community to qualify for such listing. Special-status plants are species in the following categories:

- Listed or proposed for listing as threatened or endangered under the federal ESA or candidates for possible future listing as threatened or endangered under the federal ESA (50 CFR §17.12)

- Listed or candidates for listing by the State of California as threatened or endangered under CESA (Fish and Game Code §2050 et seq.)¹
- Listed as rare under the California Native Plant Protection Act (Fish and Game Code §1900 et seq.)²
- Meet the definition of rare or endangered under CEQA §15380(b) and (d). Species that may meet the definition of rare or endangered include the following:
 - Species considered by the California Native Plant Society (CNPS) to be “rare, threatened or endangered in California” (Lists 1A, 1B and 2)
 - Species that may warrant consideration on the basis of local significance or recent biological information
 - Some species included on the CNDDDB Special Plants, Bryophytes, and Lichens List (CDFG 2008)

Database Search

To evaluate which special status plants could potentially occur in the Project area, database searches and a literature review were conducted. Three primary databases were reviewed to obtain special status plant occurrence data from within 10 miles of the Project area:

- CNDDDB (CDFG 2009a): All records from the Mendota Dam USGS 7.5-minute quadrangle (DWR quadrangle 381D) in this database, maintained by CDFG, and all records from the surrounding eight quadrangles (Jamesan, Tranquillity, Coit Ranch, Firebaugh, Poso Farm, Firebaugh NE, Bonita Ranch, and Gravelly Ford) were reviewed. All species with records from these quadrangles and meeting the above status criteria for inclusion are addressed in this memorandum.
- USFWS Sacramento Species List (USFWS 2009a): All species on this list generated at the Sacramento USFWS website for the Mendota Dam quadrangle are addressed in this memorandum.
- CNPS species list for Mendota Dam USGS 7.5-minute quadrangle (DWR quadrangle 381D): All plants in this database, maintained by CNPS, and all records from the surrounding eight quadrangles (Jamesan, Tranquillity, Coit Ranch, Firebaugh, Poso Farm, Firebaugh NE, Bonita Ranch, and Gravelly Ford) were reviewed. All CNPS species with records from these quadrangles and meeting the above status criteria for inclusion are addressed in this memorandum.

¹ A species, subspecies, or variety of plant is endangered when the prospects of its survival and reproduction in the wild are in immediate jeopardy from one or more causes, including loss of habitat, change in habitat, over-exploitation, predation, competition, disease, or other factors (Fish and Game Code §2062). A plant is threatened when it is likely to become endangered in the foreseeable future in the absence of special protection and management measures (Fish and Game Code §2067).

² A plant is rare when, although not presently threatened with extinction, the species, subspecies, or variety is found in such small numbers throughout its range that it may be endangered if its environment worsens (Fish and Game Code §1901).

Literature Review

The following reports or data sources were identified as particularly relevant to this TM, and were reviewed before and referenced during its preparation:

- San Joaquin River Restoration Study Background Report (McBain and Trush, Inc. 2002)
- Jepson Online (The Jepson Online Interchange, California Floristics), University of California, Berkeley. Most recent additions: September 2, 2009
- The Jepson Manual (Hickman 1993)
- Endangered Species Recovery Program species profiles (ESRP 2006)

For the majority of plant species, specific literature was reviewed in addition to the sources listed above. References not listed here but cited in this memorandum are provided in Section 7.

Potential to Occur and Recommendations

The potential that species meeting the above status criteria occur in the Project area was evaluated using the database information and literature sources. The evaluation was based on three parameters:

- Historic and current distribution
- Presence of suitable habitat
- Documented occurrences from within 10 miles of the Project area

Biologists developed a recommendation for each plant species based on the likelihood of presence in the Project area. The recommendations are intended to provide any additional data needed to develop Project environmental documents and obtain regulatory agency permits for Project construction.

3.2.5 Special Status Vegetation Alliances

For the purpose of this document, special status vegetation alliances are defined as natural communities that are of limited distribution statewide or within a county or region and are often vulnerable to environmental impacts of projects. These natural communities may or may not contain special status species or their habitat. The current version of the List of California Vegetation Alliances (CDFG 2009b) indicates vegetation alliances of high inventory priority as globally or State ranked 1-3 (critically imperiled, imperiled and vulnerable) for conservation status. Most types of wetlands and riparian communities are considered special status vegetation alliances due to their limited distribution in California. These high-priority vegetation alliances often contain special status plants (defined under “Special-Status Plant Species” [see Section 3.2.4]).

CDFG and its collaborators use a suite of factors to assess the conservation ranking of vegetation alliances. These assessments lead to the designation of a conservation status rank. All California vegetation alliances are described, ranked, and assembled into a list. CDFG then issues the ranked list of California vegetation alliances for the public’s use, for CNDDDB mapping efforts, and for project impact assessment. Until fall 2009 the basis

for determination of a plant community's rank was CDFG's List of California Terrestrial Natural Communities (CDFG 2003a). In December 2009, a new, substantially revised List of California Vegetation Alliances (CDFG 2009b) was introduced. It is based on the extensive work of several authors – John Sawyer, Todd Keeler-Wolf and Julie Evens. Their vegetation classification and mapping effort throughout California culminated in the publication of *A Manual of California Vegetation – 2nd Edition* in 2009 (Sawyer, Keeler-Wolf, Evans 2009). Based on this publication, the term “natural community” closely translates to “vegetation alliance” under the new National Vegetation Classification (FGDC 2008).

CDFG currently requires that the vegetation alliance nomenclature based on both the old (CDFG 2003a) and the current (CDFG 2009b) systems be used when evaluating project impacts, however, only the most recent ranking list should be used to determine conservation status (Hickson, pers. comm., 2009). Conservation ranks in this list provide an estimate of the risk of elimination for vegetation alliances. They are based on a one to five scale rank (NatureServe Explorer 2009), ranging from critically imperiled (1) to demonstrably secure (5). Status is assessed and documented at three distinct geographic scales of the assessment (G = Global, N = National, and S = Subnational or State). The numbers have the following meaning:

- 1 = critically imperiled
- 2 = imperiled
- 3 = vulnerable
- 4 = apparently secure
- 5 = secure.

For example, G1 would indicate that vegetation alliance is critically imperiled across its entire range (i.e., globally). In this sense the natural community/vegetation alliance as a whole is regarded as being at very high risk of extirpation. A rank of S3 would indicate the natural community/vegetation alliance is vulnerable and at moderate risk within a particular state or province, even though it may be more secure elsewhere.

Database Search

To evaluate which special status vegetation alliances could potentially occur in the Project area, database searches and a literature review were conducted. The following sources of information were reviewed to obtain special status vegetation alliance occurrence data from the Project area and its 10-mile vicinity:

- CNDDDB (CDFG 2009a): All records from the Mendota Dam USGS 7.5-minute quadrangle (DWR quadrangle 381D) in this database, maintained by CDFG, and all records from the surrounding eight quadrangles (Jamesan, Tranquillity, Coit Ranch, Firebaugh, Poso Farm, Firebaugh NE, Bonita Ranch, and Gravelly Ford) were reviewed. All high-priority inventory vegetation alliances (CDFG 2009b) (terrestrial plant communities [CDFG 2003a]) with records from these quadrangles and meeting the above rank criteria for inclusion are addressed in this memorandum.

Literature Review

The following reports or data sources were identified as particularly relevant to this TM, and were reviewed before and referenced during its preparation:

- A Manual of California Vegetation (Sawyer, Keeler-Wolf, Evans 2009): All high priority vegetation alliances with a potential to occur in the Project area and its 10-mile vicinity are addressed in this TM
- The most recent version (December 7, 2009) of the List of California Vegetation Alliances (CDFG 2009b)
- Terrestrial Vegetation of California (Barbour, Keeler-Wolf, Schoenherr 2007)
- San Joaquin River Restoration Study Background Report (McBain and Trush, Inc. 2002)
- California Interagency Wildlife Task Group, California Wildlife Habitat Relationships species accounts (CDFG 2005)
- Endangered Species Recovery Program species profiles (ESRP 2006)

For the majority of special status vegetation alliances, specific literature was reviewed in addition to the sources listed above. References not listed here but cited in this TM are provided in Section 7.

Potential to Occur and Recommendations

The potential for occurrence in the Project area of a special status vegetation alliance meeting the above status criteria for inclusion and identified during the database search was evaluated using the database information and literature sources, based on four criteria:

- Historic and current range
- Presence of suitable environmental conditions (elevation, soil type, distance from water bodies and others)
- Documented occurrences from within 10 miles of the Project area
- Aerial photographs and photographs taken during previous reconnaissance surveys conducted in the San Joaquin River riparian corridor

Using the above information biologists assessed the likelihood that each special status vegetation alliance may occur in the Project area. Based on the likelihood of presence in the Project area, biologists developed a recommendation for each special status vegetation alliance, intended to provide data needed to develop Project environmental documents and obtain regulatory agency permits for Project construction.

3.3 Groundwater

This section describes the methods used to identify data needs and survey approach for groundwater.

Data Needs

The primary groundwater-related issue for the Project EIS/R is the potential for raising shallow groundwater levels due to recharge from Restoration Flows. Rising shallow water table elevations are a concern for agricultural areas because high water tables can reduce crop productivity if root zones are inundated and can cause increases in soil salinity due to increased shallow groundwater evaporation rates. Related potential issues are the disturbance of the natural drainage patterns of existing irrigated lands due to construction of levees for the bypass corridors and levee stability issues as a result of seepage or increased groundwater levels.

Literature Review

The following reports or data sources were identified as particularly relevant to this TM, and were reviewed before and referenced during its preparation:

- The California Department of Water Resources Water Data Library (<http://www.water.ca.gov/waterdatalibrary>) was reviewed to obtain high-water-table occurrences within 2 miles of the Project area.
- McBain and Trush, Inc. (eds.). 2002. San Joaquin River Restoration Study Background Report, Chapter 4: Shallow Groundwater Hydrology. Prepared for Friant Water Users Authority, Lindsay California, and Natural Resources Defense Council, San Francisco, California.
- SJRRP. 2010. San Joaquin River Restoration Program. Reach 2B Preliminary Monitoring Well Data Maps. Available at: www.restoresjr.net/activities/if/
- U.S. Geological Survey (USGS). 2009. Groundwater Availability of the Central Valley Aquifer, California. Faunt, C. (ed). Professional Paper 1766.
- DWR. 2003. California's Groundwater, Bulletin 118, Update 2003

Specific literature, including unpublished SJRRP data, was reviewed in addition to the sources listed above, and the U.S. Geological Survey and DWR staff was consulted. References not listed here but cited in this TM are provided in Section 7.

3.4 Hydro-Geomorphology

Natural channel design requires the integration of hydrology, hydraulics, sediment transport, and geomorphology. The data needed to perform these analyses are available to some extent from studies that have been performed in the past as part of the San Joaquin River Riparian Habitat Restoration Program. Under the current program (SJRRP), this TM focuses on the hydro-geomorphic data needs to refine and update existing models/tools to specifically refine and evaluate the ability of the initial options to establish a functioning channel in Reach 2B, including the proposed bypass channel.

Natural channel design is based on the principles of dynamic equilibrium, which requires a balance between stream flow energy, incoming sediment load, and channel resilience for stream channels to remain stable. True geomorphic solutions involve determining the optimum geometry, slope, planform, and vegetation characteristics that together balance

the imposed hydraulic forces with the channel boundary materials resistant to these forces. Site constraints limit the ability to provide full geomorphic solutions, and as a result, can require engineering structures to maintain long-term stability. These structures include such things as grade control, drop structures, or various forms of armoring (e.g., biotechnical bank stabilization)³. The purpose of the hydro-geomorphic analyses is to identify the appropriate design features that will re-establish, to the extent possible, some level of geomorphic process; as well as limit the need for engineered structures.

Data Needs

The analytical process involves: determining design discharges, defining an “active” channel form using reference/field data and/or hydraulic geometry relationships, using Computer Aided Design (CAD) to lay out the active channel inside the planned corridor (incorporating floodplain topography and levees), using hydraulic and sediment transport models, evaluating hydraulic and transport performance based on design criteria, and refining the Project design until sediment continuity is achieved.

Data needs that feed into that process include the following:

1. Design discharge and flow loss relationships upstream and within the Project reach.
2. Active channel form (width, depth, slope, and planform) - typically derived from a reference reach (existing), a reference river (nearby) or historical conditions (historical aerial photos).
3. Hydraulic Model Input – In addition to channel geometry and topographic data, analytical modeling also requires vegetation densities and roughness coefficients, bed material characterization and boundary conditions. Boundary conditions for water and sediment are required at the upstream and downstream ends of the modeled (Project) reach.
4. Water surface elevations for a range of flows to help calibrate the hydraulic models. These data should include measurements throughout the Project reach.
5. Sediment Model Input – In addition to the data needs above, data on bed material (size, gradation, pebble count and bulk samples) and bank material (soil type, cohesiveness, slope stability) are needed.
6. Sub-surface exploration and geotechnical data for structural foundations and channel excavation earth work. Soil borings and laboratory tests could potentially include engineering properties and strength and shear tests for the purposes of channel and structure design.

Hydraulic and sediment transport modeling evaluates the initial configuration and refines the alternative so that long-term stability can be achieved given the future hydrologic and sediment regimes.

³ The expected geomorphic structures are passive in that they do not have operation rules. For example, a weir controls sediment and flow simply by being present at its design elevation. There are other hydraulic structures for the control of river flows not related to geomorphology.

Literature Review

The following resources were reviewed to assess the extent of available information.

- Jones and Stokes Associates and Mussetter Engineering Inc. 1998. Analysis of Physical Processes and Riparian Habitat Potential of the San Joaquin River – Friant Dam to the Merced River, Calif. Prepared for the San Joaquin River Restoration Program. October.
- Mussetter Engineering, Inc. 2000. Hydraulic and Sediment Continuity Modeling of the San Joaquin River From Friant Dam to Mendota Dam. Prepared for the United States Department of the Interior, Bureau of Reclamation, Contract No. 98-CP-20-20060.
- McBain and Trush, Inc. 2002. San Joaquin River Restoration Study Background Report. Prepared for Friant Water Users Authority, Lindsay California, and Natural Resources Defense Council, San Francisco, California.

3.5 Land Use, Agriculture, and Socioeconomics and Environmental Justice

3.5.1 Land Use and Agriculture

The assessment of Project impacts on land use, agriculture, and socioeconomics and environmental justice measures necessitates the use of many data sources available from several federal, state, and local government agencies, including water districts and, potentially, other special districts. This section discusses the methods used to assess existing data and identify data needs.

Data Needs

All land in Reach 2B is privately owned. Most of the land that would be affected by the Reach 2B alternatives is in agricultural production. Agricultural and other land uses generate economic and financial impacts to landowners, businesses linked directly and indirectly to the uses of land, and to the regional economy within which the land is located.

The estimation of land use and agricultural impacts requires a detailed tabulation of the types and quantities of each land use that will be affected by the Reach 2B alternatives. For instance:

1. Data on soil quality and irrigation status of land are needed to determine the classification of the specific land parcels which may be affected i.e., prime farmland, farmland of local or statewide importance, or unique farmland.
2. Data on the acreages and ages of trees or vines are needed to estimate the impacts of the Reach 2B alternatives on land planted to such permanent crops as almonds or pistachios. To estimate impacts on land planted to annual crops, it will be necessary to acquire data on the acreages and rotations of crops grown.

Literature Review

Existing available data was reviewed to assess the adequacy of that data to meet the Project data needs. The following resources were identified for use in the existing data assessment:

- California Department of Water Resources Land Use Survey.
- California Department of Conservation Farmland Mapping and Monitoring Program.
- Fresno County Agricultural Commissioner - Agricultural Crop and Livestock Report.
- Madera County Department of Agriculture – Agricultural Crop Report.
- U.S. Department of Agriculture (USDA)/NRCS Soil Survey, Western Fresno County (2008a).
- University of California Cooperative Extension Service - Sample costs to produce or to establish and produce various crops.

3.5.2 Socioeconomics and Environmental Justice

The extent and significance of socioeconomic and environmental justice impacts attributed to any project alternative depend directly on the economic structure of the regional economy within which the project area is located.

Data Needs

The socioeconomic and environmental justice impacts of the Project alternatives depend on the uses of the affected land and the relative importance of those land uses within the affected regional economy. The estimation of socioeconomic and environmental justice impacts relies on the translation of those land use impacts to common economic measures such as output, employment, and income.

Literature Review

Existing available data from the 2000 Census of Population and Housing was reviewed to assess the adequacy of that data to meet the Project data needs.

3.6 Air Quality, Noise and Traffic

To assess the impact of the Project on air quality, noise and traffic, an assessment of existing and background conditions is needed. Estimated conditions for the Project will be compared to background conditions to determine site specific impacts.

A review of available data in the vicinity of the Project area will be completed, and an evaluation will be made as to the adequacy of that data to evaluate the impacts of the Project relative to background and existing conditions. Based on the quality of the available data and the schedule of ongoing monitoring program data, site specific monitoring activities may be proposed.

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4.0 Existing Data and Evaluation

This section briefly evaluates existing data used to identify the data needs and survey approach presented in Section 5. The information is organized by resource area, including Fish and Aquatic Resources; Special Status Wildlife Species; Wetlands; Special Status Plant Species; Special Status Vegetation Alliances; Groundwater; Hydro-Geomorphology; Land Use, Agriculture, and Socioeconomics and Environmental Justice; and Air Quality, Noise, and Traffic .

4.1 Fish and Other Aquatic Resources

This section identifies existing data sources and presents a brief evaluation of the data for aquatic resources and special status fish species. Fish and aquatic resources are discussed generally in Section 4.1.1, and information related to special status fish species is presented in Section 4.1.2.

4.1.1 Aquatic Resources

Fish communities in the upper San Joaquin River basin have changed markedly in the last 112 years as a result of human settlement (Table 4-1). Changes in historical habitat conditions, combined with the introduction of non-native fish species, are thought to have resulted in a general decline in both the abundance and distribution of native fishes (Moyle 1976 and 2002), with several species extirpated from the system. Specific information on the abundance and distribution of native fishes in the Project area are lacking, but surveys have been conducted upstream and downstream of Reach 2B and document the range of fish species that would possibly occupy Reach 2B. Recent historic changes in the fish fauna below Friant Dam (Reach 1) are shown in Table 4-1 adapted from CH2MHILL (2003).

Table 4-1
Changes in the Fish Fauna in the San Joaquin River Below Friant Dam (Reach 1)

Species	1898	1934	1941	1971	1985	2005
Native Species						
Sacramento splittail	X	—	—	—	—	—
Hitch	X	X	X	—	—	—
California roach	X	X	X	—	—	—
Hardhead	X	X	X	—	—	—
Sacramento pikeminnow	X	X	X	—	—	X
Sacramento blackfish	X	X	X	—	—	—
Chinook salmon	X	X	X	—	—	—
Tule perch	X	X	X	—	—	—
Sacramento sucker	X	X	X	X	X	X
Rainbow trout	X	X	X	X	X	X
Prickly sculpin	X	X	X	X	X	X
Threespine stickleback	X	X	X	X	X	X
Kern brook lamprey	N	N	N	X	X	X
Pacific lamprey	N	N	N	—	—	—
Introduced Species						
Brown trout	—	X	X	X	X	—
Common carp	—	X	X	X	X	X
Goldfish	—	—	—	—	—	X
Golden shiner	—	—	—	—	—	X
Bluegill	—	X	X	X	X	X
Green sunfish	—	—	—	X	X	X
Redear sunfish	—	—	—	—	—	X
Black crappie	—	—	—	—	—	X
Smallmouth bass	—	X	X	N	X	—
Spotted bass	—	—	—	—	—	X
Largemouth bass	—	—	—	X	X	X
Channel catfish	—	—	—	—	—	X
Brown bullhead	—	—	—	X	X	X
Mosquitofish	—	—	—	X	X	X
Total Number of Species	14	17	17	13	13	18
Percent Native Species	100	77	77	38	38	33

Modified and updated from CH2MHILL2003 (Table 5.2.1-1), Moyle, 2002 (Table 9), CDFG 2007

N = not recorded, but probably present

X = present

— = not present

Anadromous fish have complex lifecycles, using freshwater rivers and tributaries for adult spawning, egg incubation, and early juvenile rearing, followed by an extended rearing and maturation period in estuaries and the ocean. Anadromous salmonids, including Chinook salmon (*Oncorhynchus tshawytscha*) and steelhead (*O. mykiss*)

historically migrated through the San Joaquin River to spawning areas in the tributaries and the mainstem. Spring-run Chinook salmon and steelhead migrated to the upper reaches of the watershed (above Friant Dam) and spawned. Hence, these species, at least seasonally, occupied or passed through all four fish zones denoted by Moyle (1976, 2002) as well as through the Project reach. Fall-run Chinook salmon likely also used the San Joaquin River system when flows were sufficient for upstream passage during the fall.

Under present conditions, fall-run Chinook salmon and steelhead are occasionally found moving into the San Joaquin River upstream of the Merced River hence the Hills Ferry Barrier is seasonally installed to prevent movement of adult salmonids into areas that presently do not provide any spawning habitat.

Prior to the initiation of Interim Flows, the section of Reach 2B between the Chowchilla Bifurcation Structure and San Mateo Avenue has mostly been dry. Downstream of San Mateo Avenue, Reach 2B is backwatered by the Mendota Pool. Aquatic habitat in Reach 2B is either limited by a dry channel or affected by an impounded water body. Surface flows throughout Reach 2B have only occurred during very wet periods. Water delivered to the Mendota Pool from the Delta Mendota Canal is withdrawn at seven canal or pump locations in the pool and an additional amount is released downstream to other contractors. Downstream of the last diversion point, the river is typically dry.

A few surveys focused on fish were conducted in the San Joaquin River or in the major tributaries on the floor of the San Joaquin Valley (Jones and Stokes 1986, Brown and Moyle 1993, Ford and Brown 2001, and CDFG 2007). The most relevant surveys for Reach 2B are the Jones and Stokes and CDFG surveys because of the location of sampling and recent data collection, respectively. Brown and Moyle (1993) surveyed the San Joaquin River system in 1985-1986 focusing on the tributaries (including the Fresno River and Berenda Slough) and Reach 1 of the San Joaquin River. Ford and Brown (2001) summarized fishes collected from the Tuolumne River, an eastside tributary to the San Joaquin River along with the Merced and Stanislaus Rivers.

Jones and Stokes (1986) conducted a fish survey in the San Joaquin River in 1986 in search of white bass. During the survey sampling was conducted in three reaches of the river; between Friant Dam and Mendota Pool, within Mendota Pool, and from Mendota Dam downstream to Mossdale. The survey used several collecting techniques including gillnets, seines, fyke traps, boat electrofishing, and underwater observation. Not all methods were employed at all locations. The study collected two native species (hitch [*Lavinia exilicauda*] and Sacramento sucker [*Catostomus occidentalis*]), and twenty introduced species from the Mendota Pool in Reach 2B. The following introduced species were also collected from Mendota Pool and are presented in order of abundance (from most abundant to least abundant). Scientific and common names have been updated from Jones and Stokes (1986) to be consistent with current nomenclature (Nelson et al. 2004).

- Threadfin shad (*Dorosoma petenense*)
- Black crappie (*Pomoxis nigromaculatus*)

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- Inland silverside (*Menidia beryllina*)
- Striped bass (*Morone saxatilis*)
- Channel catfish (*Ictalurus punctatus*)
- Bluegill (*Lepomis macrochirus*)
- White crappie (*Pomoxis annularis*)
- Goldfish (*Carassius auratus*)
- Common carp (*Cyprinus carpio*)
- Green sunfish (*Lepomis cyanellus*)
- Black bullhead (*Ameiurus melas*)
- Largemouth bass (*Micropterus salmoides*)
- White catfish (*Ameiurus catus*)
- Pumpkinseed (*Lepomis gibbosus*)
- American shad (*Alosa sapidissima*)
- Warmouth (*Lepomis gulosus*)
- Golden shiner (*Notemigonus crysoleucas*)
- Brown bullhead (*Ameiurus nebulosus*)
- Western mosquitofish (*Gambusia affinis*)
- Bigscale logperch (*Percina macrolepida*)

In addition to suckers, four other native species were found in the San Joaquin River between Mendota Pool and Mossdale:

- Sacramento blackfish (*Orthodon microlepidotus*)
- Hitch (*Lavinia exilicauda*)
- Sacramento pikeminnow (*Ptychocheilus grandis*)
- California roach (*Hesperoleucus symmetricus*)

Two introduced species not found in Mendota Pool were also collected in the river between Mendota Pool and Mossdale:

- Smallmouth bass (*Micropterus dolomieu*)
- Spotted bass (*Micropterus punctulatus*)

Over the last 24 years, additional introduced aquatic species have appeared in the Delta and the suite of species found in Mendota Pool likely has shifted as well. CDFG (2007) documents several new species during surveys of Reaches 1, 3 and 5 during 2004 and 2005.

In the CDFG study, five native fish species and four introduced fish species were collected from Reach 1 (native fish collected were rainbow trout, Sacramento sucker, threespine stickleback, sculpin spp., and lamprey spp.). Four native species and twelve

introduced species were collected from Reach 1 downstream of Highway 41. Rainbow trout and stickleback were absent from this reach, but native Sacramento pikeminnow were collected from this section of the river along with suckers, sculpin, and lamprey. Only one native fish and eight introduced species were collected from Reach 1B downstream of Highway 99. The only native species present in this reach was Sacramento sucker.

No sampling occurred between Gravelly Ford and Mendota Dam because the channel was dry, and no sampling was conducted in Mendota Pool. Sampling occurred in Reaches 3 and 5, but not in Reach 4. One native species (Sacramento sucker) and nine introduced species were found in Reach 3. A total of six native species and 18 introduced species were collected from Reach 5. Native species included Sacramento blackfish, Sacramento splittail, tule perch, Sacramento sucker, Sacramento pikeminnow, and prickly sculpin. The suite of species collected in Reach 5 by CDFG (2007) was similar to the suite of species collected from the Mendota Pool by Jones and Stokes (1986).

In general, the number of species detected during the CDFG survey increased with distance downstream from Friant Dam (with the exception that total species declined in Reach 1B) and the composition of fish assemblages shifted from dominance by native species to dominance by non-native species. Except for suckers, native species were absent between Highway 41 and Reach 4. Sacramento suckers were present in all reaches sampled (CDFG 2007). Introduced fishes in Reach 1 were mostly sunfishes (largemouth bass, redear, and green sunfish), and western mosquitofish. Reach 1B also supported spotted bass, bluegill, black crappie, channel catfish, brown bullhead, and three species of introduced minnows; carp, goldfish and golden shiners.

Reach 3 was similar in species composition to Reach 1 with the addition of threadfin shad and red shiner. Many more species typically found in the Delta were collected in Reach 5, the likely consequence of fish moving upstream through the perennially flowing sections of the San Joaquin River. Introduced species found in this reach include threadfin shad, inland silverside, striped bass, white crappie, white and channel catfish, brown bullhead, red shiner, golden shiner, fathead minnow, and big scale logperch, in addition to species found in Reach 3.

Reaches 1 and 3 and the Mendota Pool likely would be sources of fishes that will initially colonize Reach 2B once flows are restored to the San Joaquin River. Under existing conditions, the Mendota Pool is drained about every 2 years to repair boils that occur along the base of Mendota Dam. Draining the reservoir essentially cuts off all downstream flow into Reach 3 and substantially reduces the amount of permanent aquatic habitat in the pool upstream of the dam. There are, however, locations in the pool that retain water during the drawdown. Future plans call for construction of a Mendota Pool Bypass channel and there is the potential to construct a new Mendota Dam. Either or both options will change how the river has been managed into the future.

Although not within the Project area as it is currently defined, Reach 3 will also provide an initial source population of fish for Reach 2B once the river reaches are hydraulically

reconnected. When Mendota Pool is dewatered flow into Reach 3 is disrupted but the reach appears to hold standing water during the dewatering.

The San Joaquin Hatchery, located in Reach 1 near Friant Dam and operated by CDFG, is a production hatchery that began operation in 1956. The hatchery spawns and raises rainbow trout for planting in the San Joaquin River below Friant Dam and other waters in Fresno and Madera counties. The hatchery has a production capacity of approximately 380,000 pounds annually and releases approximately 20,000 pounds of catchable rainbow trout into the San Joaquin River below Friant Dam each year (Lindsay 2003, as cited in CH2MHill 2003). Stocking of “catchable” (about 10 to 12 inches long) rainbow trout from the hatchery maintains a rainbow trout fishery in Reach 1 (CH2MHill 2003). The hatchery operations and facilities will likely be altered to assist in re-establishing runs of salmon and steelhead in the San Joaquin River.

4.1.2 Special Status Fishes

Four special status fish species were identified by the database search as having potential to occur in the Project area, and are presented in this section.

Delta smelt

Status: Federally listed as threatened, State listed as endangered

Species Description. Delta smelt (*Hypomesus transpacificus*) are slender bodied fish about 2 to 3 inches long, in the Osmeridae family (smelts). The species is endemic to the Sacramento-San Joaquin Delta. Delta smelt are euryhaline fish that typically rear in shallow (< 10 feet), open waters of the estuary (Moyle 2002). They are mostly found within a salinity range of 2 to 7 parts per thousand and have been collected from the estuarine waters up to 14 parts per thousand. This is mostly an annual species with adults that move into the interior Delta before spawning, beginning in December. Spawning occurs from February through May with larval and juvenile fish developing during spring and summer and moving westward into Suisun Bay. USFWS has defined four primary constituent elements of delta smelt habitat, including: 1) shallow freshwater to slightly brackish sites for spawning; 2) protected channels and rivers to provide transport of larvae to downstream rearing sites; 3) estuary rearing habitat that provides a shallow, protective, food-rich environment; and, 4) unrestricted access to spawning sites between December and July (59 FR 65260).

Known Occurrences. CNDDDB describes no known occurrences within 10 miles of the study area. Delta smelt have been found in the San Joaquin River as far upstream as Mossdale and above, but still within the legal boundaries of the Delta. Delta smelt could be found in Mendota Pool since water from the Delta is pumped into the Delta Mendota Canal, but the likelihood of delta smelt surviving the trip in the canal system is very low. Delta smelt reaching the Mendota Pool would be unlikely to survive since this is unlike the tidally dominated habitat they use in the Delta. Potential Project-related flow volume, timing or water quality changes from the San Joaquin River into the Delta may affect delta smelt. Changes in the timing or magnitude of the diversion of water into the Delta Mendota Canal may also occur as a result of the Project and may affect delta smelt. These impacts would have to be analyzed.

Recommendation. Based on the available data and existing habitat conditions, the potential for delta smelt to occur within the Project area is extremely low. The Project area is over 100 miles from the nearest occupied delta smelt habitat. No focused surveys are recommended for this species.

Protocol Surveys. No surveys are recommended. Typical methods for collecting delta smelt in the Delta include otter and beam trawls or tow nets to capture juvenile and larval forms. Focused surveys for this species would need to be permitted through a NMFS Section 10(a)(1)(A) permit and would also require a California State Scientific Collecting Permit.

Central Valley Steelhead

Status: Federally listed as threatened.

Species Description. Central Valley steelhead (*Oncorhynchus mykiss*) Distinct Population Segment consists of naturally spawned anadromous populations of *O. mykiss* downstream of natural and man-made impassable barriers in the Sacramento and San Joaquin rivers and their tributaries. Steelhead can be divided into two life history types, winter (ocean-maturing) and summer (river-maturing), based on their sexual maturity at river entry and duration of their spawning migration. Only winter run types are presently found within the Central Valley. Two artificial propagation programs are considered part of the Distinct Population Segment; the Coleman National Fish Hatchery and the Feather River Fish Hatchery steelhead hatchery programs. The San Joaquin Hatchery, located downstream of Friant Dam, rears rainbow trout for planting into Reach 1 and other locations above Millerton Lake in Fresno and Madera counties. The hatchery operations and facilities would be modified as necessary to support restoring runs of salmon and steelhead to the San Joaquin River.

Central Valley steelhead generally leave the ocean from August through April and move upstream into Central Valley rivers. Spawning takes place from December through April with a peak between January and March. Steelhead are iteroparous, capable of spawning more than once over several years – so post-spawn adults (called kelts during this life stage) can return to the ocean where they will mature and possibly migrate inland to spawn again. Juvenile steelhead rear in cold water streams in riffles, runs and pools. Most steelhead will rear for at least a full year before they begin migrating downstream to the ocean. Outmigration occurs when fish reach 6-8 inches in size and begin to transform from a resident juvenile form to a smolt. Outmigration can occur from fall through spring with a peak from February through April.

NMFS has defined six primary constituent elements of Central Valley steelhead habitat, including: 1) freshwater spawning sites; 2) freshwater rearing sites with sufficient shade, foraging areas, and space for growth and movement; 3) freshwater migration corridors with sufficient areas of cover; 4) estuarine areas that provide areas for foraging and cover; 5) near shore marine areas that allow for juvenile transition from natal streams to offshore environments; and, 6) off-shore marine areas with sufficient forage (70 FR 52521, September 2, 2005).

Known Occurrences. Steelhead or resident rainbow trout have been captured in the three main tributaries of the San Joaquin River including the Stanislaus, Tuolumne and Merced rivers. They are not present in the typically dry sections of Reach 2B. It is possible, but highly unlikely that juvenile steelhead would be present in the Mendota Pool because water from the Delta is delivered to the pool via the Delta Mendota Canal. Aquatic habitat in Mendota Pool is unsuitable for steelhead during the warm summer months. It is likely that when flows are restored to the San Joaquin River, steelhead may move upstream and occupy Reach 2B seasonally when water temperatures and habitat is suitable. They could reside year round in Reach 1. If steelhead do become established in the San Joaquin River, they would use Reach 2B as a migration corridor.

Recommendation. Based on the occurrence data and available information, there is extremely low potential for Central Valley steelhead to be present within the Project area. No focused surveys are recommended for this species.

Protocol Surveys. No surveys are recommended. Typical methods for collecting juvenile steelhead include downstream fyke nets or rotary screw traps, seines and electrofishing. Focused surveys for this species would need to be permitted through a NMFS Section 10(a)(1)(A) permit and would also require a California State Scientific Collecting Permit.

Hardhead (Mylopharodon conocephalus)

Status: CDFG Species of Special Concern.

Species Description. Hardhead are endemic to the Sacramento–San Joaquin Province and occur in sections of the larger low- and mid-elevation streams of the Sacramento-San Joaquin watershed (Moyle 2002). They can reach 30 cm standard length in 4 to 6 years in the larger rivers but rarely exceed 28 cm standard length in the smaller streams. The maximum size for hardhead is believed to be around 1 m total length (TL) and they may live longer than 10 years. Adult hardhead are bottom-feeding omnivores in deep pools. Juveniles may take insects from the surface. Prey items may include insect larvae, snails, algae and aquatic plants, crayfish, and other large invertebrates. Hardhead prefer water temperatures above 20°C with optimal temperatures around 24 to 28°C. In the colder Pit River system, they prefer the warmest available water where temperatures that peak at 17 to 21°C. Their distribution is limited to well-oxygenated streams and the surface water of impoundments. They are often found in clear deep pools (greater than 80 cm) and runs with slower water velocities of 20 to 40 centimeters per second (cm/s). Hardhead distribution in streams appears to be limited by their poor swimming ability in colder waters. Larvae and post-larvae may occupy river edges or flooded habitat before seeking deeper low-velocity habitat once they have grown larger.

Known Occurrences. CNDDDB (CDFG 2009a) described no known occurrence of the species within 10 miles of the Project area. Occurrences of hardhead were noted in the San Joaquin River between Mendota Pool and Mossdale, and also in Reach 1 (Jones and Stokes 1986). EA Engineering (1990, as cited in Brown and Moyle 1993) noted small numbers of hardhead in the Tuolumne River. Ford and Brown (2001) also documented hardhead in the Tuolumne River. Saiki (1984) found hardhead in reaches upstream of

Mendota Pool, although the fish were rare, and in the Merced River, where hardhead were abundant. It is likely that when flows are restored to the San Joaquin River, hardhead may utilize Reach 2B when suitable habitat exists. Hardhead are ecologically associated with the Pikeminnow-Hardhead-Sucker native fish assemblage, which historically occurred along mainstem portions of the San Joaquin River flowing through the lower foothills (corresponding to areas upstream of Reach 1) (Moyle 2002). As such, if hardhead occupy Reach 2B after restoration, it may be as a movement corridor between the San Joaquin River and other Central Valley tributaries.

Recommendation. Based on the occurrence data and available information, there is low potential for hardhead to occur within the Project area. No focused surveys are recommended for this species.

Protocol Surveys. No surveys are recommended. Typical methods for collecting hardhead include direct observation (snorkel surveys), electrofishing, downstream fyke nets, rotary screw traps, seines and angling. Focused surveys for this species would require a California State Scientific Collecting Permit.

Sacramento splittail (*Pogonichthys macrolepidotus*)

Status: CDFG Species of special Concern.

Species Description. Sacramento splittail are endemic to the Sacramento and San Joaquin river systems of California, including the Delta and the upper parts of the San Francisco Bay (McBain and Trush 2002). Adults move upstream beginning in late November to late January, foraging in flooded areas along the main rivers, bypasses, and tidal freshwater marsh areas before spawning. Spawning typically takes place on inundated floodplains from February through June, with peak spawning in March and April. Available information indicates that splittail spawn in open areas with moving, turbid water less than 5 feet deep, amongst dense annual vegetation and where water temperatures are less than about 15 °C.

After emergence, most larval splittail remain in flooded riparian areas for 10 to 14 days, most likely feeding among submerged vegetation before moving off floodplains into deeper water as they become stronger swimmers (McBain and Trush 2002). Although juvenile splittail are known to rear in upstream areas for a year or more, most move to tidal waters after only a few weeks, often in response to flow pulses. The majority of juveniles apparently move downstream into shallow, productive estuarine waters from April to August. Because splittail have a high tolerance for variable environmental conditions, and are generally opportunistic feeders (prey includes mysid shrimp, clams, copepods, amphipods, and some terrestrial invertebrates), reduced prey abundance will not likely have major population-level impacts. Year class success appears dependent on high outflow, and wet years along with access and availability of floodplain spawning and rearing habitats.

It is likely that when flows are restored to the San Joaquin River, splittail could occupy Reach 2B when suitable habitat exists. Splittail are ecologically associated with the Deep-bodied native fish assemblage, which historically occurred along low gradient,

valley-bottom portions with slower water and warmer temperatures than upstream reaches (Moyle 2002). These conditions historically existed along much of the mainstem San Joaquin River and correspond to reaches 3 to 5.

Known Occurrences. CNDDDB (CDFG 2009a) found no known occurrence of the species within 10 miles of the Project area. Saiki (1984) observed Sacramento splittail along the San Joaquin River downstream of the Merced River confluence, although occurrence was rare, and CDFG 2007 notes a recent occurrence within Reach 5. During wet years, they have also been observed in the Tuolumne River (Ford and Brown 2001).

Recommendation. Based on the occurrence data and available information, there is low potential for splittail to currently occur within the Project area. No focused surveys are recommended for this species.

Protocol Surveys. Typical methods for collecting small splittail life stages in the Delta and mainstem Central Valley rivers include otter and beam trawls or tow nets to capture juvenile and larval forms. Beach seines, boat electrofishing and angling with worms are successful methods to collect larger juveniles and adults. Focused surveys for this species would need to be permitted through a California State Scientific Collecting Permit. Angling would only require a California State Fishing License.

4.2 Special Status Wildlife Species

This section identifies existing data sources and presents a brief evaluation of the data for special status wildlife species. State and Federally listed or CDFG fully protected species are addressed in Section 4.2.1; other special-status wildlife species identified during the CNDDDB search (CDFG 2009a) are addressed in Section 4.2.2. Similar information for special status bird species reportedly observed at Mendota Wildlife Area but not included in the USFWS species list for the Mendota Dam quadrangle and lacking CNDDDB documented occurrences from within 10 miles of the Project area is presented in Section 4.2.3. Although not specifically addressed in the following sections, common bird species protected under the Migratory Bird Treaty Act likely occur in the Project area.

Throughout this section reference is made to a reconnaissance survey and a general habitat assessment survey, both of which are described in detail in Section 5.1.2.

4.2.1 Listed and Fully Protected Wildlife

Federally and State listed and fully protected wildlife species addressed in this TM are presented in Table 4-2. Existing data and evaluation for Federally and State listed and fully protected species are presented in this section in the same taxonomic order as presented in the table.

**Table 4-2
Federally and State-Listed or Fully Protected Wildlife Species**

Scientific Name Common Name	Federal /State Status	Preferred Habitat	Recommendation
Invertebrates			
<i>Branchinecta longiantenna</i> longhorn fairy shrimp	FE/--	Found in vernal pools, particularly clear to turbid grass-bottomed pools and clear-water pools in sandstone depressions.	Further evaluate habitat suitability during habitat assessment surveys. If no suitable habitat, assume absent from Project area. If suitable habitat, assume presence or conduct focused surveys.
<i>Branchinecta lynchi</i> vernal pool fairy shrimp	FT/--	Found in vernal pools, particularly small, clear-water sandstone depression pools and grassy swale, earth slump, or basalt-flow depression pools.	Further evaluate habitat suitability during habitat assessment surveys. If no suitable habitat, assume absent from Project area. If suitable habitat, assume presence or conduct focused surveys.
<i>Desmocerus californicus dimorphus</i> Valley elderberry longhorn beetle	FT/--	Elderberry shrubs with stem diameters of 2-8 inches. Species always found close to host plant. Larvae may remain in stems for up to 2 years.	Use exiting data for avoidance where possible during design. Map plants in unsurveyed segments of Reach 2B spring 2010. Delay stem counts and exit hole searches until Project design is further developed.
Amphibians			
<i>Ambystoma californiense</i> California tiger salamander	FT/SC	Grasslands and understory of valley-foothill hardwood habitats. Require vernal pools or other seasonal water sources for breeding and mammal burrows or other underground refuges.	Confirm lack of suitable breeding habitat during general habitat assessment.
<i>Rana draytonii</i> California red-legged frog	FT/SSC	Pools with emergent vegetation, typically without predatory fish, and upland hibernacula, such as small mammal burrows or moist leaf litter.	Assume absent from the Project area and vicinity. No additional data or surveys required.
Reptiles			
<i>Gambelia sila</i> blunt-nosed leopard lizard	FE/SE and FP	Sparsely vegetated alkali and desert scrub habitats, in areas of low topographic relief. Seek cover in mammal burrows, under shrubs or structures such as fence posts.	Identify suitable habitat during general habitat assessment. Avoid suitable habitat, where possible. Conduct protocol surveys of unavoidable habitat.

**Table 4-2
Federally and State-Listed or Fully Protected Wildlife Species**

Scientific Name Common Name	Federal /State Status	Preferred Habitat	Recommendation
<i>Thamnophis gigas</i> giant garter snake	FT/ST	Marshes, low-gradient streams, canals, and irrigation ditches with dense emergent vegetation, water persisting throughout the active period, open areas along water margins, and access to upland habitat for hibernation and escape from flooding.	Assume presence in suitable habitat, expected primarily in area that backs up water behind Mendota Dam. Habitat would be identified based both on extent of typical summer inundation upstream of Mendota Dam and observations made during a general habitat assessment.
Birds			
<i>Aquila chrysaetos</i> golden eagle	MBTA, GBEPA/FP	Found in rolling hills, mountain areas, sage-juniper flats, or deserts. Forages in open areas with low vegetation. Nests on cliff faces or in large trees.	May occur during foraging or wintering but nesting not expected. Presence of eagles would be noted and habitat would be evaluated during habitat assessment.
<i>Buteo swainsoni</i> Swainson's hawk	MBTA/ST	Nests in riparian areas, oak woodlands, and isolated and roadside trees close to grassland or agricultural foraging habitat.	Assume Swainson's hawk nests and forages in Project area. Identify nest sites during reconnaissance and habitat assessment surveys.
<i>Coccyzus americanus occidentalis</i> western yellow-billed cuckoo	FC,BCC, MBTA/SE	Large blocks of riparian habitats (particularly woodlands with willow and cottonwood) along floodplains of larger river systems. Dense understory foliage important.	Low potential for occurrence and difficult to detect with focused surveys. Reassess potential for occurrence following habitat assessment. Protocol surveys not recommended.
<i>Elanus leucurus</i> white-tailed kite	MBTA/FP	Prefers grasslands, oak woodlands, riparian scrub, and savannas. Forages in wetland and grassland areas.	Low potential to occur. Reassess following habitat assessment. No focused surveys recommended.
<i>Grus canadensis tabida</i> greater sandhill crane	MBTA/FP	Nests in wet meadows and emergent marshes. Forages in wet meadows, marshes, freshwater margins, and less frequently grasslands and croplands.	Assume occasional presence during non-nesting season.
<i>Riparia riparia</i> bank swallow	MBTA/ST	Colonial nester primarily in riparian and other lowland habitats west of the desert. Requires vertical banks/cliffs with fine-textured/sandy soils near water to dig nest cavity.	Identify suitable nesting habitat and search for sign of nesting swallows during habitat assessment survey.

**Table 4-2
Federally and State-Listed or Fully Protected Wildlife Species**

Scientific Name Common Name	Federal /State Status	Preferred Habitat	Recommendation
Mammals			
<i>Ammospermophilus nelsoni</i> Nelson's antelope squirrel	--/ST	Merced County south to Kings, Tulare and Kern counties, at elevations ranging from 200-1,200 feet. Dry sparsely vegetated loam soils with widely scattered shrubs, forbs, and grasses in broken terrain with gullies and washes.	Likely absent from the Project area. During habitat assessment, observations of California ground squirrels and/or their burrows, combined with a lack of observations of this species would further support that assumption.
<i>Dipodomys nitratooides exilis</i> Fresno kangaroo rat	FE/SE	Restricted to native grasslands in Fresno County within the San Joaquin Valley; nearly level, light, friable soils in chenopod scrub and grassland communities.	Identify potential habitat during general habitat assessment. If habitat and sign is present where disturbance is unavoidable, trapping may be warranted.
<i>Vulpes macrotis mutica</i> San Joaquin kit fox	FE/ST	Grassland or grassy open stages with scattered shrubby vegetation; requires loose-textured sandy soils for burrowing; requires suitable prey base of small rodents.	Occasional presence would be assumed in suitable habitat, as the species may use the Project area during dispersal events or migration. Identify suitable dispersal or foraging habitat and potential denning habitat during habitat assessment.

Key:

U.S. Fish and Wildlife Service and Federal Listing Categories:

BCC = Bird of Conservation Concern

FC = Candidate for Federal Listing

FD = Federally Delisted

FE = Federally Listed as Endangered

FT = Federally Listed as Threatened

GBEPA = Protected under the Golden and Bald Eagle Protection Act

MBTA = Protected under the Migratory Bird Treaty Act

California Department of Fish and Game State Listing Categories:

FP = Fully Protected

SC = Candidate for State Listing

SE = State Listed as Endangered

SSC = Species of Special Concern

ST = State Listed as Threatened

Longhorn Fairy Shrimp

Status: Federally listed as endangered.

Species Description. The longhorn fairy shrimp (*Branchinecta longiantenna*) is found in vernal pool and swale habitats from Alameda and Contra Costa counties south to San Luis Obispo County. USFWS has defined four primary constituent elements of longhorn fairy shrimp habitat: (1) complexes of mounds, swales, and upland with continuous or intermittent water flow to allow for dispersal; (2) depressional features that become

inundated during winter rains to form pools that hold water for a minimum of 23 days; (3) food sources, such as detritus; and, (4) organic/inorganic structures within pools that provide shelter (71 FR 7136). Detailed descriptions of the current distribution, habitat requirements, and foraging behaviors can be found in the following documents:

- San Joaquin River Restoration Study Background Report (McBain and Trush, Inc. 2002), Chapter 9, “Special-Status Plants and Wildlife,” Section 9.5.3.2
- Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon (USFWS 2005a), Chapter II, “Biology of Covered Species,” Section C, “Federally Listed Animal Species,” No. 3, “Longhorn Fairy Shrimp (*Branchinecta longiantenna*),” pp. 186-190

Known Occurrences. No recorded occurrences of longhorn fairy shrimp are reported in the CNDDDB from within 10 miles of the Project area (CDFG 2009a). The species was recently observed within 2 miles of the Project area, however, in vernal pool and seasonal wetland habitat at the proposed Alkali Sink Conservation Bank, just south of the Project area (Davis, pers. comm., 2010). Although critical habitat for longhorn fairy shrimp is not included in the Project area (71 FR 7135–7141), the Project area does lie within the San Joaquin Valley Recovery Unit for this species (USFWS 2005a). Krista Tomlinson, CDFG Ecological Reserve Biologist, is currently sampling the Alkali Sink Ecological Reserve for vernal pool–associated species and this information could be potentially available and useful to the SJRRP (Battistoni, pers. comm., 2010). This work may provide additional information on occurrences of longhorn fairy shrimp in the vicinity of the Project area.

Potential to Occur. Vernal pool complexes have been mapped just south of the Project area, as near as approximately 0.2 miles at the closest point, based on aerial photo-interpretation by Holland (2009), and longhorn fairy shrimp have been documented south of the Project area (Davis, pers. comm., 2010). However, preliminary vegetation maps prepared for the SJRRP do not identify any vernal pool habitat within the Project area (Moise and Hendrickson 2002). Vernal pool and seasonal wetlands suitable for this species are not likely to be present in the San Joaquin River corridor (i.e., between the existing levees), and a review of aerial photography suggests that vernal pool habitat is also absent from uplands in the Project area that are adjacent to the river corridor. Soils in the Project area are sandy and well drained, are not expected to hold rainwater on the surface for extended periods, and appear to lack areas with micro-topography and soils typically associated with fairy shrimp. Because of the lack of suitable habitat, as described by the first two primary constituent elements identified above, longhorn fairy shrimp have low potential to occur within the Project area.

Recommendation. During a general habitat assessment, the presence of suitable vernal pool or seasonal wetland habitat will be noted. If suitable habitat is not present, longhorn fairy shrimp will be assumed absent from the Project area. If suitable habitat is found, avoidance of that habitat would be the primary strategy. Otherwise, the Project team would evaluate the costs and benefits of assuming presence in suitable habitat versus conducting protocol surveys. Currently, no focused surveys are recommended for this species.

Protocol Surveys. Although focused surveys are not recommended for this species, USFWS has developed a survey protocol for vernal pool branchiopods, including the longhorn fairy shrimp (USFWS 1996). The survey requirements and timing outlined by USFWS are summarized below:

- Surveys must be conducted by a biologist who is permitted by the USFWS.
- A complete survey consists of either:
 - Two full wet season surveys done within a 5-year period; or
 - Two consecutive seasons of one full wet season survey and one dry season survey (or one dry season survey and one full wet season survey).
- For wet season surveys, surveyors should visit sites after initial storm events to determine when pools/swales have been inundated, holding greater than 3 cm of standing water for 24 hours after a rain event.
- During wet season surveys, sites should be sampled according to USFWS procedures once every 2 weeks, beginning no later than 2 weeks after their initial inundation and continuing until they are no longer inundated or until they have experienced 120 days of continuous inundation.
- Permission to survey within the dry season requires the completion of both the full wet season survey and the dry season survey, including the complete analysis of all dry soil samples.

Vernal Pool Fairy Shrimp

Status: Federally listed as threatened.

Species Description. The vernal pool fairy shrimp (*Branchinecta lynchi*) is a vernal pool branchiopod distributed through the grasslands of California, from Shasta County south to Riverside County. USFWS has defined four primary constituent elements of vernal pool fairy shrimp habitat: (1) complexes of mounds, swales and upland with continuous or intermittent water flow to allow for dispersal; (2) depressional features that become inundated during winter rains to form pools that hold water for a minimum of 18 days; (3) food sources, such as detritus; and, (4) organic/inorganic structures within pools that provide shelter (71 FR 7142). Detailed descriptions of the current distribution, habitat requirements, and foraging behaviors can be found in the following documents:



Vernal pool fairy shrimp, Dwight Harvey/USFWS

- San Joaquin River Restoration Study Background Report (McBain and Trush, Inc. 2002), Chapter 9, “Special-Status Plants and Wildlife,” Section 9.5.3.3
- Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon (USFWS 2005a), Chapter II, “Biology of Covered Species,” Section C, “Federally Listed Animal Species,” No. 4, “Vernal Pool Fairy Shrimp (*Branchinecta lynchi*),” pp. 191-203

Known Occurrences. A review of those documents containing species accounts for the vernal pool fairy shrimp listed above, as well as the CNDDDB (CDFG 2009a), revealed no reported occurrences of the species from within 10 miles of the Project area. Those sources document occurrences near Reach 1, approximately 37 miles northeast of Reach 2B, and near reaches 4B, 5, and the Eastside Bypass, approximately 12 miles northwest of the Project area (McBain and Trush, Inc. 2002). The species was recently observed within 2 miles of the Project area, however, in vernal pool habitat at the proposed Alkali Sink Conservation Bank, just south of the Project area (Davis, pers. comm., 2010). Although critical habitat for vernal pool fairy shrimp is not included in the Project area (50 FR 7118–7167), the Project area does lie within the San Joaquin Valley Recovery Unit for this species (USFWS 2005a). Krista Tomlinson, CDFG Ecological Reserve Biologist, is currently sampling the Alkali Sink Ecological Reserve for vernal pool associated species and this information could be potentially available and useful to the SJRRP (Battistoni, pers. comm., 2010). This work may provide additional information on occurrences of vernal pool fairy shrimp in the vicinity of the Project area.

Potential to Occur. Just south of the Project area, as near as approximately 0.2 miles at the closest point, Holland (2009) mapped an existing vernal pool complex based on aerial photo-interpretation, and vernal pool fairy shrimp have been documented from this vicinity (Davis, pers. comm., 2010). However, preliminary vegetation maps prepared for the SJRRP do not identify any vernal pool habitat within the Project area (Moise and Hendrickson 2002). Vernal pool and seasonal wetlands suitable for this species are not likely to be present in the San Joaquin River corridor (i.e., between the existing levees), and a review of aerial photography suggests that vernal pool habitat is also absent from uplands in the Project area, adjacent to the river corridor. Soils in the Project area are sandy and well drained, are not expected to hold rainwater on the surface for extended periods, and appear to lack areas with micro-topography and soils typically associated with vernal pool fairy shrimp. Because of the lack of suitable habitat, as described by the first two primary constituent elements identified above, vernal pool fairy shrimp have low potential to occur within the Project area.

Recommendation. During a general habitat assessment conducted for the Project, it would be confirmed that seasonally ponded wetlands that are potentially suitable for this species are not present. The general habitat assessment would specifically evaluate uplands adjacent to the river corridor where proposed levees or other ground disturbance might occur. If suitable habitat is not identified during the habitat assessment, this species would be assumed absent from the Project area. If suitable habitat is present, avoidance of that habitat would be the primary strategy. Otherwise, the Project team would evaluate the costs and benefits of assuming presence in suitable habitat versus conducting protocol surveys. Currently, no focused surveys are recommended for this species.

Protocol Surveys. Although focused surveys are not recommended, USFWS has developed a survey protocol for vernal pool branchiopods, including the vernal pool fairy shrimp (USFWS 1996). The survey requirements and timing outlined by USFWS are summarized immediately before this discussion of vernal pool fairy shrimp, under the heading “Longhorn Fairy Shrimp.”

Valley Elderberry Longhorn Beetle

Status: Federally listed as threatened.

Species Description. Valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*) is endemic to the Central Valley and ranges from southern Shasta County south to Fresno County. It is dependent on elderberry shrubs (*Sambucus* spp.) in which it lays its eggs. Elderberry shrubs are typically found within riparian habitats. Detailed descriptions of the current distribution, habitat requirements, and foraging behaviors of the valley elderberry longhorn beetle can be found in the following documents:

- San Joaquin River Restoration Study Background Report (McBain and Trush, Inc. 2002), Chapter 9, “Special-Status Plants and Wildlife,” Section 9.5.3.5
- Valley Elderberry Longhorn Beetle (*Desmocerus californicus dimorphus*), 5-Year Review: Summary and Evaluation (USFWS 2006)

Known Occurrences. The following sources describe occurrences of the valley elderberry longhorn beetle within the vicinity of the Project area:

- CNDDDB (CDFG 2009a) reports no occurrences within 10 miles of the Project area.
- The San Joaquin River Restoration Study Background Report (McBain and Trush 2002), Chapter 9, “Special-Status Plants and Wildlife,” Section 9.5.3.5 states that a population of valley elderberry longhorn beetle is known from near Reach 1A of the San Joaquin River, and that elderberry host plants east of Mendota and near the Chowchilla Canal showed evidence of potential beetle presence.



Elderberry shrub with evidence of valley elderberry longhorn beetle presence, Jonathan Stead/URS

- Much of the San Joaquin River Restoration Area, including portions of Reach 2B, was surveyed for valley elderberry longhorn beetle in 2004 and 2005. These surveys are described in the report titled “Valley Elderberry Longhorn Beetle Surveys, San Joaquin River, 2004–2005” (Kucera et al. 2006).

Potential to Occur. The valley elderberry longhorn beetle has potential to occur within the Project area. According to vegetation maps prepared for the SJRRP and included in the report, Riparian Vegetation of the San Joaquin River, there are several areas of elderberry savanna in the Project area (Moise and Hendrickson 2002). Many of the elderberry plants present in these areas were surveyed in 2004 and 2005. In Reach 2 (including reaches 2A and 2B) 177 shrubs or clumps of elderberry were examined (Kucera et al. 2006). Two of the shrubs in Reach 2B contained a total of three old valley elderberry longhorn beetle exit holes.

Recommendation. In the Project area, impacts to elderberry shrubs greater than 1 inch in diameter at ground level would be considered an adverse effect on valley elderberry longhorn beetle (USFWS 1999a). Therefore, knowing elderberry shrub locations during the design process could help avoid impacts to this species during Project construction. Protocol surveys can be used to quantify impacts and plan for minimization measures (conservation planting). Protocol survey results are typically considered valid for 2 years. Although some existing data are available and could be used to advise future surveys, the data may not be sufficient for planning purposes at this time. Because of these considerations, protocol surveys and stem counts for Valley elderberry longhorn beetle and their host plants, conducted according to Conservation Guidelines for the Valley Elderberry Longhorn Beetle (USFWS 1999a), are recommended.

The Bureau of Reclamation is planning a flight to collect aerial photographs of the Project area for spring 2010; subsequently, Reclamation plans to use that imagery to map elderberry shrubs, which should be visible in the imagery, which is intended to capture the spring bloom. The elderberry survey would be conducted before the plants enter winter dormancy (November) (USFWS 1999a), and would take advantage of Reclamation's aerial imagery and elderberry mapping if it is available when the surveys are conducted. Protocol surveys are recommended for sometime between when right-of-entry to private property in the Project area is available and the end of October in 2010.

Protocol Surveys. Protocol survey requirements and standard minimization measures for impacts to valley elderberry longhorn beetle are described in Conservation Guidelines for the Valley Elderberry Longhorn Beetle (USFWS 1999a). Implementation of these guidelines requires the following general actions:

- Identify elderberry shrubs on or adjacent to the Project area that have a 1 inch or greater diameter at ground level.
 - Qualifying shrubs must be examined for exit holes that suggest beetle presence, and all stems must be tallied by diameter size.
 - Survey results are valid for up to 2 years.
- If elderberry shrubs are found, they must first be avoided, where possible, and transplanted and mitigated when avoidance is not an option.
 - Avoidance:
 - Complete avoidance typically requires maintenance and post-construction restoration of a 100 foot buffer around all shrubs, although encroachment to within 20 feet of the drip line of each elderberry plant may be approved in some cases.
 - Mitigation:
 - Shrubs that cannot be avoided must be transplanted when dormant (November through February).
 - Each shrub that is adversely affected must be replaced at a 1:1 to an 8:1 ratio based on location (riparian versus non-riparian), stem diameter of affected elderberry plants at ground level, and presence or absence of exit holes.

- Monitoring:
- Planted and transplanted shrubs must be monitored for 10 consecutive years or for seven years over a 15-year period.

California Tiger Salamander

Status: Federally listed as threatened, CDFG Species of Special Concern, and Candidate for State listing as endangered.

Species Description. The California tiger salamander (*Ambystoma californiense*) inhabits grasslands and open oak woodlands in central and northern California. The primary constituent elements of California tiger salamander habitat involve three components: (1) freshwater ponds, vernal pools, and other ephemeral or permanent water bodies that ponds water at least until May; (2) adjacent uplands with small mammal burrows that are used for shelter during most of the animal's life; and (3) upland movement corridors (70 FR 49390). The range of the California tiger salamander is currently restricted to the Central Valley and the South Coast Ranges of California from Butte County south to Santa Barbara County. More detailed life history and species descriptions can be found in the following documents:



California tiger salamander, Matthew Bettleheim/URS

- San Joaquin River Restoration Study Background Report (McBain and Trush, Inc. 2002), Chapter 9, “Special-Status Plants and Wildlife,” Section 9.5.4.1
- “Life history and demographic variation in the California tiger salamander (*Ambystoma californiense*)” (Trenham et al. 2000)
- California Interagency Wildlife Task Group, California Wildlife Habitat Relationships species accounts (CDFG 2005)

Known Occurrences. A review of those documents containing species accounts for the California tiger salamander listed above, as well as the CNDDDB (CDFG 2009a), revealed no reported occurrences of the species from within 10 miles of the Project area. There is no designated or proposed critical habitat for California tiger salamander within 10 miles of the Project area (70 FR 49379-49458).

H.T. Harvey and Associates observed egg masses suggestive of California tiger salamander on February 26, 2009, at the proposed Alkali Sink Conservation Bank less than 2 miles south of the Project area (Davis, pers. comm., 2010). Site monitoring revealed the presence of western spadefoot tadpoles in some pools where the egg masses were observed, but presence of California tiger salamander was not confirmed. Because of the lack of prior California tiger salamander records from the Valley floor in this area and a lack of conclusive evidence, potential for occurrence of California tiger salamander at the proposed Alkali Sink Conservation Bank is considered “possible,” as opposed to

“likely” or “present” (Davis, pers. comm., 2010). Follow-up sampling may be conducted this year.

Krista Tomlinson, CDFG Ecological Reserve Biologist, is currently sampling the Alkali Sink Ecological Reserve for vernal pool–associated species and this information could be potentially available and useful to the SJRRP (Battistoni, pers. comm., 2010). This work may provide additional information on occurrences of California tiger salamander in the Project vicinity.

Potential to Occur. Although potential breeding habitat and suitable upland habitat are present within a 10-mile vicinity of the Project area, there are no confirmed populations of California tiger salamander within that vicinity, which includes protected lands south of the Project area. California tiger salamander was not detected in a 2004 herpetological inventory of the nearby Alkali Sink Ecological Reserve (Sousa, pers. comm., 2010), although western spadefoot toad was detected (CDFG 2009a; Sousa pers. comm., 2010). Survey methods included using dip nets, visual encounters, cover boards, and night-time area searches to sample vernal pools and nearby habitat (Sousa, pers. comm., 2010). Similarly, California tiger salamander was not detected at the nearby Mendota Wildlife Area during searches, though the searches did confirm the presence of western spadefoot (Dickert, pers. comm., 2010). These were not protocol surveys, however, and the lack of California tiger salamander detections does not conclusively demonstrate that they are absent.

Western spadefoot breeds in similar vernal pool habitats to those required by California tiger salamander. Therefore, surveys that resulted in western spadefoot detections at these nearby wildlife reserves presented opportunities for detecting California tiger salamander, if present. In several instances, the surveyors noted that the breeding habitat where western spadefoot were detected did not remain inundated for long enough to allow for California tiger salamander metamorphosis during the year surveys were conducted (Davis, pers. comm., 2010; Dickert, pers. comm., 2010; Sousa, pers. comm., 2010). Western spadefoot has a markedly shorter larval (aquatic) phase to its life cycle than California tiger salamander and can breed in pools that are much shorter-lived than those needed for California tiger salamander to grow through metamorphosis. Duration of ponding (which is controlled by factors such as rainfall, soil permeability, and ambient temperature) may explain why western spadefoot has been detected in the Project vicinity but the presence of California tiger salamander has not been confirmed.

Krista Tomlinson, CDFG Ecological Reserve Biologist, has noted that sandy soils at Alkali Sink Ecological Reserve may lead to higher percolation rates than in other nearby areas with vernal pools (Battistoni, pers. comm., 2010). Ms. Tomlinson will be sampling CDFG-owned lands along the ephemeral Tin Can Slough, which runs through portions of the Mendota Wildlife Area, Alkali Sink Ecological Reserve, and the proposed Alkali Sink Conservation Bank, all of which are south of the Project area. Tin Can Slough may hold water longer than other potential California tiger salamander breeding habitat in the vicinity of the Project area. This slough has not been surveyed to date.

Although there are grasslands within the Project area, aquatic habitats suitable for California tiger salamander breeding, a primary constituent habitat element (70 FR 49390), appears to be absent (Moise and Hendrickson 2002). Aquatic habitat in the Project area is primarily limited to Mendota Pool, and the San Joaquin River which flows through the upstream portion of the Project area during periods of flooding. Mendota Pool contains many nonnative, predatory fish species (see Section 4.1), a condition that is not compatible with California tiger salamander breeding (Shaffer et al. 1994). When the river flows these species disperse throughout Reach 2B, rendering that habitat unsuitable as well. Based on the lack of suitable breeding habitat, and the lack of occurrence data from potentially suitable habitats in the Project vicinity, there is low potential for this species to occur in the Project area.

Recommendation. The general habitat assessment of the Project area would identify any habitats that are potentially suitable for California tiger salamander using the primary constituent elements identified above. If suitable habitat is not identified this species would be assumed absent from the Project area.

Protocol Surveys. Although focused surveys are not proposed, CDFG has developed a protocol for California tiger salamander surveys (CDFG 2003b). The survey requirements, timing and procedures outlined by CDFG are summarized below:

- A site assessment of the recorded occurrences within a 3.1-mile radius and the habitat characteristics should be recorded within a 1.24-mile radius of the Project boundary before field surveys.
- Field surveys, which consists of aquatic larval and upland habitat surveys, should be conducted by a biologist who is permitted by CDFG (with an active Scientific Collecting Permit) and USFWS (with a Section 10(a)(1)(A) Recovery Permit).
- Aquatic larval surveys should be performed at all potential breeding sites for two calendar years before a negative finding can be supported and should be conducted between March, April and May, with at least 10 days between surveys.
- Upland habitat surveys using drift nets should be conducted during fall and winter.
- Once a California tiger salamander has been observed surveys may cease.

California Red-Legged Frog

Status: Federally listed as threatened and CDFG Species of Special Concern.

Species Description. The California red-legged frog (*Rana draytonii*) is typically found near aquatic features with emergent vegetation, such as pools in marshes, streams, and ponds. USFWS has defined four primary constituent elements of California red-legged frog habitat, including: 1) aquatic breeding habitat



California red-legged frog, Matthew Bettleheim/URS

characterized by standing bodies of fresh water that hold water for at least 20 weeks per year; 2) non-breeding aquatic habitat including fresh water environments that provide for foraging, shelter, predator avoidance, and aquatic dispersal; 3) upland habitat that provides for foraging, shelter and predator avoidance and is within 200 ft of a riparian area; 4) riparian or upland habitat with no barriers, such as large areas of dense development or large bodies of water, that allows for dispersal between other suitable habitat types (71 FR 19261–19263). California red-legged frog is believed to have historically occurred from the California coast near Marin County, inland towards Shasta County, California, and southward to northwestern Baja California, Mexico (USFWS 2002). The frog has been extirpated over much of its historic range, including the floor of California's Central Valley, and is believed to be extirpated from 24 of the 46 California Counties in which it was originally present. More detailed species descriptions can be found in the following documents:

- San Joaquin River Restoration Study Background Report (McBain and Trush, Inc. 2002), Chapter 9, "Special-Status Plants and Wildlife," Section 9.5.3.6
- Recovery Plan for the California Red-Legged Frog (*Rana aurora draytonii*) (USFWS 2002)

Known Occurrences. The following sources describe occurrences of California red-legged frog from the vicinity of the Project area:

- CNDDDB (CDFG 2009a): There are no recorded occurrences within 10 miles of the Project area.
- Critical Habitat (61 FR 25813; USFWS 2008): There is no designated or proposed critical habitat within 10 miles of the Project area.
- Recovery Area (USFWS 2002): The Project area is within Recovery Area 1: Sierra Nevada Foothills and Central Valley. Recovery Area 1 is considered a low recovery area status because it has few existing populations, high threat levels and, in general, medium habitat suitability.

Potential to Occur. While habitat in the Project area might otherwise be suitable for California red-legged frog, an abundance of introduced predators severely limits the current suitability of that habitat. Introduced bullfrogs (*R. catesbiana*) and predatory fish have been a significant factor in the decline of California red-legged frog (USFWS 2002). Bullfrog larvae have been observed by the hundreds in San Joaquin River Reach 2A (ESRP 2001), immediately upstream of Reach 2B, and are expected to be equally abundant in the Project area. Predatory fish are also expected to be abundant in the Project area (see Section 4.1). The habitat value of Mendota Pool, which otherwise would probably satisfy California red-legged frog primary constituent element number 1 (above), is severely compromised by the presence of these species. Due to the abundance nonnative, predatory species present in aquatic habitat in the Project area, the lack of known occurrences within 10 miles of the Project area (CDFG 2009a), and the fact that California red-legged frog is thought to have been extirpated from the floor of the Central Valley before 1960 (USFWS 2002), this species is not expected to occur in the Project area.

Recommendation. The California red-legged frog is assumed to be absent from the Project area and vicinity based on the absence of habitats that are likely to support breeding. No additional data collection or focused surveys are recommended specifically for this species.

Protocol Surveys. Although surveys for this species are not recommended, USFWS has developed a protocol for California red-legged frog site assessment and surveys (USFWS 2005b). The requirements, timing and procedures described by USFWS are summarized below:

- A site assessment of the recorded occurrences and the habitat characteristics should be conducted within a 1-mile radius of the Project boundary.
- If required, field surveys may begin between January and September. Eight surveys are recommended to determine presence. Each survey must be at least 7 days apart, over a minimum of 6 weeks. At least 1 survey must be completed before August 15. The specifications are defined as follows:
 - I. January: July 1, 8 surveys during the breeding season including 2 day and 2 night surveys.
 - II. July 1: September, 2 surveys, including 1 day and 1 night survey.
- Field surveys should be conducted under clear to partly cloudy skies, when air temperature is at least 10°C. Wind must not exceed 5 miles per hour during the survey.
- If California red-legged frogs are identified at any time during the course of surveys, no additional surveys will be conducted in the area.

Blunt-nosed Leopard Lizard

Status: Federally and State listed as endangered, and CDFG Fully Protected.

Species Description. The blunt-nosed leopard lizard (*Gambelia sila*) inhabits alkali and desert scrub communities within the San Joaquin Valley of California and adjacent foothills. It is found at elevations ranging from 100 to 2,400 feet. More detailed life history and species descriptions can be found in the following documents:

- San Joaquin River Restoration Study Background Report (McBain and Trush, Inc. 2002), Chapter 9, “Special-Status Plants and Wildlife,” Section 9.5.3.7
- Recovery Plan for the Upland Species of the San Joaquin Valley (USFWS 1998), Section L, “Blunt-nosed leopard lizard (*Gambelia sila*),” pp. 113–122



Blunt-nosed leopard lizard, Jessie Golding/URS

- Endangered Species Recovery Program Species Profile for the blunt-nosed leopard lizard (ESRP 2006)
- California Interagency Wildlife Task Group, California Wildlife Habitat Relationships species accounts (CDFG 2005)

Known Occurrences. In addition to general information on range and occurrences provided in the species descriptions referenced above, the following sources describe occurrences of blunt-nosed leopard lizard in the Project vicinity:

- The CNDDDB (CDFG 2009a) describes five occurrences of blunt-nosed leopard lizard within 5 miles of Reach 2B:
 - Occurrence No. 4: 1979: Museum of Vertebrate Zoology specimen collected, approximately 2.5 miles southwest of the Project area
 - Occurrence No. 208: 2004: species observed during CDFG survey of ecological reserve in annual grassland/iodine bush series, approximately 2 miles south of the Project area
 - Occurrence No. 110: 1988: four individuals observed by D. Williams of USFWS in alkali grassland with scattered clumps of alkali sacaton and woody shrubs, approximately 4 miles north of the Project area
 - Occurrence No. 207: 1976: essential habitat for the species was observed, subsequent surveys in 1998, 1999 and 2003 failed to detect the species, approximately 5 miles southeast of the Project area
 - Occurrence No. 392: 1988: one adult observed by N. Nicolai in open, sparse alkali grassland, approximately 4.8 miles north of the Project area
- The CNDDDB (CDFG 2009a) also describes an additional 19 occurrences within 5 to 10 miles of the Project area.

Potential to Occur. Based on the proximity and abundance of known occurrences to the Project area, there is potential for the blunt-nosed leopard lizard to occur where habitat is suitable. Although alkali sink vegetation was not mapped in the Project area, grassland, scrub (willow and riparian), and elderberry savannah habitat occur within the Project area and could potentially provide suitable habitat for the species (Moise and Hendrickson 2002). Blunt-nosed leopard lizard is not expected to occur in the San Joaquin River corridor (i.e., between existing levees) because of regular inundation during seasonal flood flow (SJRRP 2009), but adjacent uplands may provide suitable habitat, particularly where native topography has been preserved.

Recommendation. During the general habitat assessment conducted for this Project, specific areas of suitable blunt-nosed leopard lizard habitat would be identified. Particular attention would be paid to the area near the eastern end of Reach 2B, where there appears to be a continuous band of relatively undisturbed habitat contiguous with the Alkali Sink Ecological Reserve (where the species has been observed [CNDDDB occurrence No. 208, CDFG 2009a]) (Figure 3-1). Habitat suitability would be assessed in areas not subject to periodic inundation based on lack of regular disturbance such as crop rotation, disking, and tilling; lack of dense vegetation; abundance of small mammal burrows (primarily

ground squirrel burrows and kangaroo rat tunnels) for refuge; and abundance of prey species such as grasshoppers and other lizard species.

If suitable habitat is identified during the reconnaissance or habitat assessment surveys and complete avoidance of those potentially occupied habitats is not possible, protocol surveys would be required. CDFG is not able to issue any form of “take” permit for the blunt-nosed leopard lizard (Fish and Game Code § 5050). Protocol-level survey requirements are summarized below; they require a very high level of effort.

Protocol Surveys. Protocol level surveys for blunt-nosed leopard lizard in accordance with the revised 2004 CDFG guidelines (CDFG 2004) require 12 survey days between April 15 and July 15, and 5 survey days between August 1 and September 15. The USFWS previously provided the SJRRP with protocol survey guidelines for blunt-nosed leopard lizard specific to water year 2010 Interim and Restoration flow projects (USFWS 2009c). The primary difference between the USFWS and CDFG guidelines is that the USFWS guidelines require protocol level surveys in adjacent areas that are actual or potential BNLL habitat, up to 330 feet from the project footprint boundary. The USFWS guidelines are summarized below; however, if protocol surveys are deemed necessary for this Project Reclamation will seek USFWS and CDFG input on the specific survey protocol used prior to implementation:

- Surveys should be conducted in separate seasons for adults and hatchlings/sub-adults. The periods are defined as follows:
 - I. April 15–July 15: Conduct 12 adult surveys with no more than 4 consecutive survey days and no more than 8 survey days within a 30-day period.
 - II. August 1–September 15: Conduct 5 additional hatchling/sub-adult surveys.
- Surveys should be conducted by two or more Level I or Level II blunt-nosed leopard lizard researchers, with no more than three Level I researchers for every Level II researcher.
- Surveys should be conducted when air temperature is between 25°C and 35°C between sunrise and 1400 hours.
- Surveys should not be conducted on overcast days, or when sustained wind velocity exceeds 10 miles per hour.
- Surveys must be conducted on foot. Researchers should walk parallel, 10- to 30-meter transects (depending on vegetation density) across the entire area to be surveyed.
- In addition to recording the location of blunt-nosed leopard lizards observed, the presence of habitat features, the time of day, air temperature, and soil temperature should also be recorded during surveys.
- Once a blunt-nosed leopard lizard has been observed, the USFWS and CDFG should be notified immediately. Surveys should continue until completed.
- Survey results are valid for up to 1 year.

Giant Garter Snake

Status: Federally and State listed as threatened.

Species Description. Giant garter snake (*Thamnophis gigas*) is found within the Central Valley, from Butte Creek south to the Mendota Wildlife Area, 10 miles west of Fresno (Fisher et al. 1994), although its previous range extended much further south (Hansen and Brode 1980). The species occurs in tributaries, freshwater marshes and floodplains, and other freshwater wetland habitats within the Central Valley of California. Detailed descriptions of the current distribution, habitat requirements, and foraging behaviors of giant garter snake can be found in the following documents:



Giant garter snake, Kelly Hornaday/USFWS

- San Joaquin River Restoration Study Background Report (McBain and Trush, Inc. 2002), Chapter 9, “Special-Status Plants and Wildlife,” Section 9.5.3.8
- Endangered Species Recovery Program Species Profile for the giant garter snake (ESRP 2006)
- Draft Recovery Plan for the giant garter snake (USFWS 1999b)

Known Occurrences. In addition to general information on range and occurrences provided in the species descriptions referenced above, the following sources describe occurrences of giant garter snake in the Project vicinity:

- The CNDDDB (CDFG 2009a) describes one occurrence within the Project area:
 - Occurrence No. 3: 1976: A specimen was collected from a slough near the San Joaquin River in the Mendota Pool area and deposited into the Museum of Vertebrate Zoology.
- The CNDDDB (CDFG 2009a) describes five additional occurrences within 5 miles of the Project area:
 - Occurrence No. 1: 1976, observed at Fresno Slough, approximately 3 miles south of the Project area.
 - Occurrence No. 2: 1974, specimens were collected by the Museum of Vertebrate Zoology and CDFG at Mendota Wildlife Area, approximately 2.5 miles south of the Project area.
 - Occurrence No. 5: 1974, a specimen was collected southeast of Mendota and north of railroad tracks, approximately 3.5 miles south of the Project area.
 - Occurrence No. 16: 1972, two specimens were collected by the Fischer Museum, Los Angeles Zoo in an area west of Fresno Slough, north of railroad tracks between Mendota and Whites bridge, approximately 2.6 miles south of the Project area.

- Occurrence No. 159: 2001, observed within a sensitive, suppressed location along a wide, slow-moving slough within 1 to 9.5 miles south of the Project area. The habitat is reportedly threatened by drainage of Mendota Pool for dam construction.
- The CNDDDB (CDEFG 2009a) describes one additional occurrence between 5 and 10 miles from the Project area:
 - Occurrence No. 7: 1976, observed along Highway 33, at Douglas Ave., approximately, 9.6 miles northeast of the Project area.

Potential to Occur. The distribution of giant garter snake is currently limited to 13 populations (USFWS 1999b). The primary habitat of one of the remnant populations is Mendota Wildlife Area, located roughly three miles south of the Project area and hydrologically connected to Mendota Pool via Fresno Slough. Given the continuous nature of suitable habitat between known occurrences of giant garter snake and Mendota Pool, as well as the historic occurrence from the pool itself, occasional presence of this species in portions of the Project area associated with Mendota Pool, including upland hibernacula, is likely.

Recommendation. Presence of giant garter snake would be assumed in habitats that are potentially suitable for this species in the Project area. There is no formal protocol survey for this species, and focused surveys have a low probability of detecting the snake when present unless trapping is conducted. Suitable habitat is expected to be found primarily in the portion of the Project area that backs up water in the summertime behind Mendota Dam and adjacent uplands with potential hibernacula. Preliminary information suggests that water typically backs up the San Joaquin River, upstream of Mendota Dam, to San Mateo Avenue (Figure 3-1). Suitable habitat is not expected to be found in portions of the Project area that are dry much of the year, including during the giant garter snake's primary active period from March through October (USFWS 1999b).

Suitable habitat would be identified based both on records of the extent of typical summer inundation upstream of Mendota Dam (aerial photographs or other sources), as well as observations made during a general habitat assessment for wildlife in the Project area. During the general habitat assessment areas of suitable habitat for the giant garter snake would be identified based on indicators such as vegetation (emergent wetland vegetation), and geomorphic and hydrologic indicators of the typical extent of inundation. Essential habitat components that would be noted include (USFWS 1999b):

1. Adequate water during the snake's active season to maintain dense prey populations
2. Emergent, herbaceous wetland vegetation such as cattails (*Typha* spp.) and bulrushes (*Scirpus* spp.) for escape cover and foraging habitat
3. Upland habitat with grassy banks or openings in waterside vegetation for basking
4. Higher elevation upland habitats with cover and refuge from flood waters during the snake's inactive season

Golden Eagle

Status: Protected under the Golden and Bald Eagle Protection Act, CDFG Fully Protected, and CDFG Watch List.

Species Description. The golden eagle (*Aquila chrysaetos*) occurs throughout California as a resident, migrant or wintering species. It does not breed on the floor of the Central Valley, but it does occur there as a wintering species. It is typically found in rolling foothills, mountainous areas, sage-juniper flats, or deserts. It prefers open areas with low vegetation for foraging and nests on cliff faces or within large trees. Detailed descriptions of the current distribution, habitat requirements, and foraging behaviors of the golden eagle can be found in the following documents:



Golden eagle, George Gentry/USFWS

- San Joaquin River Restoration Study Background Report (McBain and Trush, Inc. 2002), Chapter 9, “Special-Status Plants and Wildlife,” Section 9.5.4.17
- California Interagency Wildlife Task Group, California Wildlife Habitat Relationships species accounts (CDFG 2005)

Known Occurrences. The following sources describe occurrences of the golden eagle within the vicinity of the Project area:

- Mendota Wildlife Area recorded sighting (eBird 2009)
- CNDDDB (CDFG 2009a) describes no occurrences from within 10 miles of the Project area

Potential to Occur. Golden eagles do not nest on the floor of the Central Valley. Therefore, there is a low potential that migrating or wintering golden eagles could occur within the Project area. Although tracked by the CNDDDB, there are no occurrences within the vicinity of the Project area, suggesting that even during the winter and migration this species is rare in the Project vicinity. The Project area may contain suitable open foraging habitat (grassland or agricultural areas) for this species.

Recommendation. During a general habitat assessment, site visits, and other reconnaissance activities the presence of golden eagles and the habitat type in which they occur would be recorded, if observed. No focused surveys are recommended.

Swainson’s Hawk

Status: Protected under the Migratory Bird Treaty Act and State listed as threatened.

Species Description. Swainson's hawk (*Buteo swainsoni*) is found within California almost exclusively during the breeding season, although a small population winters in the San Francisco Bay Delta region. Its breeding range includes the lower Sacramento and San Joaquin valleys, Klamath Basin, and Butte Valley.



Swainson's hawk,
John and Karen Hollingsworth/USFWS

It nests in single trees or riparian areas near open foraging habitats such as grasslands and agricultural areas. Detailed descriptions of the current distribution, habitat requirements, and foraging behaviors of Swainson's hawk can be found in the following documents:

- San Joaquin River Restoration Study Background Report (McBain and Trush, Inc. 2002), Chapter 9, "Special-Status Plants and Wildlife," Section 9.5.3.11
- California Interagency Wildlife Task Group, California Wildlife Habitat Relationships species accounts (CDFG 2005)

Known Occurrences. The following sources describe occurrences of Swainson's hawk within the vicinity of the Project area:

- CNDDDB (CDFG 2009a) describes the following six occurrences either from within or immediately adjacent to the Project area:
 - Occurrence No. 780: 1999, one adult was observed in a nest in a cottonwood tree surrounded by agricultural fields by Nikolle Brown, within 1 mile of the Project area, south of the San Joaquin River.
 - Occurrence Nos. 781–783: 1999, a total of four adults were observed nesting and one adult was observed soaring in riparian habitat along Reach 2B of the San Joaquin River by Nikolle Brown.
 - Occurrence No. 784: 1979, 1999, one adult and one fledgling were observed in 1979 by D. Gaines and one adult was observed nesting in a willow in 1999 by Nikolle Brown near the Mendota Pool.
 - Occurrence No. 830: 1999, 2000, four nests were observed in 1999 and one adult was seen nesting in 2000 along Reach 2B of the San Joaquin River by Nikolle Brown.
- CNDDDB (CDFG 2009a) also describes the following seven occurrences from between 4 and 10 miles of the Project area:
 - Occurrence No. 37: 1979, 1981, Adult birds but no nest was observed, approximately 8 miles northwest of the Project area.
 - Occurrence No. 277: 1979, 2000, two adults and three young were observed nesting in 1979 and two adults were observed in a nest and nearby snag in

2000 in a cottonwood tree by Nikolle Brown, approximately 6 miles northeast of the Project area.

- Occurrence No. 785: 1999, two adults were observed nesting in a cottonwood tree surrounded by agricultural fields by Nikolle Brown, along the San Joaquin River, approximately 8.5 miles northwest of the Project area.
- Occurrence No. 790: 1999, 2000, one adult was observed nesting in 1999 and one adult was observed soaring in a riparian area by Nikolle Brown, along the San Joaquin River, approximately 9 miles northwest of the Project area.
- Occurrence No. 37: 1979, two adults were observed, approximately 4 miles northwest of the Project area.
- Occurrence No. 938: 2001, two adults were observed soaring in a riparian area by Nikolle Brown, along the San Joaquin River, approximately 7 miles east of the Project area.
- Occurrence No. 1103: 2000, two adults were observed roosting in a pine by Geoffrey T. Gray, approximately 7 miles southwest of the Project area.
- The San Joaquin River Restoration Study Background Report (McBain and Trush 2002), Chapter 9, “Special-Status Plants and Wildlife,” Section 9.5.3.11 reports records of Swainson’s hawk near the Chowchilla Canal and the Mendota Pool.

Potential to Occur. Swainson’s hawk is known to nest within the Project area at multiple locations, as recently as 2000, and is expected to be present primarily during the nesting season (March–August [CDFG 1994, 2005]). Swainson’s hawk is typically monogamous and pairs often reuse nest sites during successive breeding seasons. Of 13 occurrences known from within 10 miles of the Project area, all but one includes sightings within the last 10 years. Additionally, the Project area contains riparian areas suitable for nesting, specifically cottonwood riparian forest, and grasslands/agricultural areas suitable for foraging (Moise and Hendrickson 2002).

Recommendation. It should be assumed that Swainson’s hawk nests in the Project area, and that uplands of a suitable nature provide Swainson’s hawk with foraging habitat. Identification of nest sites during the Project design phase could potentially allow for avoidance through design manipulations. For Swainson’s hawk and other raptor species, Project construction will require measures to avoid disturbance at active nest sites. Hawks may nest at new sites immediately before construction, so no level of survey effort now will eliminate the need for preconstruction surveys.

During the reconnaissance survey recommended for late February or early March 2010 (Section 5.1.2), raptor stick nests in the Project area would be mapped. While the reconnaissance survey will not likely allow for mapping of all stick nests in the Project area, the survey would be conducted before deciduous trees have fully leafed out, when existing nests are easy to observe. Nest sites and Swainson’s hawk activity would also be recorded during the habitat assessment survey in spring 2010. Areas of high nest concentration or potential nest tree concentration would be considered for avoidance during Project design. Later, during development of the Project EIS/R and permitting documents, a strategy for removing unavoidable trees during the non-nesting season,

preconstruction surveys, monitoring during construction, and mitigation of Project impacts would be developed.

Protocol Surveys. Swainson’s hawk nesting survey protocols are described in “Recommended Timing and Methodology for Swainson’s Hawk Nesting Surveys in California’s Central Valley” (Swainson’s Hawk Technical Advisory Committee 2000). These guidelines would be considered during development of the preconstruction survey plan. To meet the minimum level of protection, the guidelines recommend surveys as summarized below:

- Surveys should be conducted for a half-mile radius around all Project activities.
- Surveys should be conducted for at least two survey periods before Project initiation. The periods are defined as follows:
 - I. January–March 20 (recommended optional), one survey
 - II. March 20–April 5, three surveys
 - III. April 5–April 20, three surveys
 - IV. April 21–June 10, monitoring known nest sites only
 - V. June 10–July 30, three surveys

In addition to survey guidelines, CDFG also has mitigation guidelines for Swainson’s hawk. Those guidelines are described in the “Staff Report regarding Mitigation for Impacts to Swainson’s Hawks (*Buteo swainsoni*) in the Central Valley of California” (CDFG 1994). Standard minimization and mitigation measures include the following:

- A quarter-mile buffer (or half-mile buffer in rural areas) should be maintained around active nests between March 1 and September 15.
- A Management Authorization, which will specify tree removal period (typically October 1 through February 1), must be obtained for unavoidable tree removal.
- Necessary Project activities within the buffer zone require a biological monitor.
- Funding of recovery and hacking of nestlings will be required if nests are abandoned due to Project activities.
- To mitigate loss of foraging habitat, Habitat Management lands must be provided to CDFG at the following ratios:
 - For projects within 1 mile of an active nest site: 1:1 (if only 10 percent of land allows for active management) or 0.5:1 (if 100 percent of land allows active management)
 - For projects between 1 and 5 miles of an active nest site: 0.75:1
 - For projects between 5 and 10 miles of an active nest site: 0.5:1

Western Yellow-billed Cuckoo

Status: Candidate for Federal listing, protected under the Migratory Bird Treaty Act, and State listed as endangered.

Species Description. The western yellow-billed cuckoo (*Coccyzus americanus occidentalis*) breeds in North America and northern Mexico and winters in South America. Within California, its current nesting range includes the Sacramento Valley, the South Fork of the Kern River, the lower Colorado River Valley, and sometimes the Prado Basin in Riverside and San Bernardino counties. It breeds in large patches of densely vegetated riparian habitat. Detailed descriptions of the current distribution, habitat requirements, and foraging behaviors of the western yellow-billed cuckoo can be found in the following documents:



Photo by J. A. Spindelov
Western yellow-billed cuckoo,
J.A. Spindelov/USFWS

- San Joaquin River Restoration Study Background Report (McBain and Trush, Inc. 2002), Chapter 9, “Special-Status Plants and Wildlife,” Section 9.5.3.14
- California Interagency Wildlife Task Group, California Wildlife Habitat Relationships species accounts (CDFG 2005)

Known Occurrences. CNDDDB (CDFG 2009a) describes one historic occurrence (Occurrence No. 85) from within 10 miles of the Project area. This record reports that the Museum of Vertebrate Zoology collected two specimens from near Mendota Pool in 1918, and 3 birds were observed again in 1950. Although adjacent to or within the Project area, this occurrence is described as “possibly extirpated”.

Potential to Occur. Although the western yellow-billed cuckoo did occur in the area historically, it is unlikely to occur within the Project area. The Project area is not within its current range (CDFG 2005) and the only known occurrence within the vicinity is 59 years old and listed as possibly extirpated (CDFG 2009a). A 2001 habitat assessment of an adjacent 5 mile reach beginning immediately at the upstream end of Reach 2B found that the relatively open, young stands of cottonwoods and willows found there are not suitable for this species (ESRP 2001).

Recommendation. Given the extremely low likelihood for occurrence and the fact that cuckoos are very secretive and difficult to detect, focused surveys for this species are not recommended. Yellow-billed cuckoos inhabit dense, mature riparian forests composed of cottonwoods and willows, typically more than 300 feet wide and rarely less than 50 acres in area, with optimal stands greater than 200 acres (Laymon and Halterman 1989). Potential for occurrence would be reassessed following a general habitat assessment and vegetation mapping in the study area. Based on the results of the habitat assessment, this species would either be assumed absent from the Project area, or it would be assumed present and appropriate avoidance, minimization, and mitigation measures would be developed. At this time, no protocol surveys are recommended.

Protocol Surveys. Although protocol surveys are not recommended, a draft protocol for western-yellow billed cuckoo surveys can be found in “Yellow-billed Cuckoo (*Coccyzus americanus*): A Technical Conservation Assessment” Appendix B, “Draft Yellow-billed

Cuckoo Survey and Monitoring Protocol for California,” (Laymon 1998). That protocol is summarized below:

- Surveys should be conducted between June 15 and August 10.
- Surveys include two types: presence/absence and nest monitoring.
- Presence/absence surveys would require walking, with stops at every 200 m within suitable habitat at a rate of 4 kilometers per morning. At each stop, calls will be played. If the survey area is wider than 100 meters, then more transects would be necessary. No area within the patch should be greater than 100 meters from any survey point. Timing is also important for the survey. Specifications are as follows:
 - Surveys should be conducted between 6:30 AM and 12:00 PM. The hot part of the day should be avoided. Surveys on days exceeding 100 ° F in temperature should be avoided.
 - At each stop, 10 calls should be played with about 30 to 60 second pauses between each.
- Nest location and monitoring surveys require 4 person days while the parents are feeding the young, to prevent abandonment. Once nests are found, they should only be checked when parents are absent.

White-tailed Kite

Status: Protected under the Migratory Bird Treaty Act and CDFG Fully Protected.

Species Description. White-tailed kite (*Elanus leucurus*) is a year round resident of the Valley and coastal lowlands of California, ranging from the western Sierra Nevada Mountains to San Diego County. Its preferred nesting habitats include grasslands, oak woodlands, riparian scrub, and savannas. It forages in wetland and grassland areas. Detailed descriptions of the current distribution, habitat requirements, and foraging behaviors of white-tailed kite can be found in the following documents:



White-tailed kite, Greg Hoffman

- San Joaquin River Restoration Study Background Report (McBain and Trush, Inc. 2002), Chapter 9, “Special-Status Plants and Wildlife,” Section 9.5.4.15
- California Interagency Wildlife Task Group, California Wildlife Habitat Relationships species accounts (CDFG 2005)

Known Occurrences. The following sources describe occurrences of white-tailed kite within the vicinity of the Project area:

- Mendota Wildlife Area recorded sighting (eBird 2009)
- CNDDDB (CDFG 2009a) (describes no occurrences within 10 miles of the Project area)

Potential to Occur. The white-tail kite has a low potential to nest and forage within suitable habitat types within the Project area. Although it has reportedly been observed at Mendota Wildlife Area, the otherwise lack of known occurrences suggests that it is not common in the Project vicinity. Potential habitat found within the Project area includes grassland, riparian scrub and emergent wetland as mapped in the report Riparian Vegetation of the San Joaquin River (Moise and Hendrickson 2002).

Recommendation. A general habitat assessment would be sufficient to identify areas of potential nesting and foraging habitat within the Project area. During habitat assessment surveys, dense stands of willows and other deciduous trees would be inspected for signs of nests. CDFG has not developed survey protocols for this species, and no focused surveys are recommended. Measures that will be required during Project implementation to protect impacts to other nesting birds and raptors would also be sufficient to prevent take of white-tailed kite.

Greater Sandhill Crane

Status: Protected under the Migratory Bird Treaty Act, State listed as threatened, and CDFG Fully Protected.

Species Description. Greater sandhill crane (*Grus canadensis tabida*) is found throughout California. It nests in wet meadows and emergent marshes of northern California and winters in the Central and Imperial valleys. Its preferred foraging habitats include wet meadows, marshes, freshwater margins, and less frequently grasslands and croplands. Detailed descriptions of the current distribution, habitat requirements, and foraging behaviors of greater sandhill crane can be found in the following documents:



Sandhill cranes, USFWS

- San Joaquin River Restoration Study Background Report (McBain and Trush, Inc. 2002), Chapter 9, “Special-Status Plants and Wildlife,” Section 9.5.3.12
- California Interagency Wildlife Task Group, California Wildlife Habitat Relationships species accounts (CDFG 2005)

Known Occurrences. The following sources describe occurrences of greater sandhill crane within the vicinity of the Project area:

- Mendota Wildlife Area recorded sighting (eBird 2009)

- The San Joaquin River Restoration Study Background Report (McBain and Trush 2002), Chapter 9, “Special-Status Plants and Wildlife,” Section 9.5.3.12 reports records of greater sandhill crane along the San Joaquin River and specifically near Reach 2.
- CNDDDB (CDFG 2009a) describes no occurrences within 10 miles of the Project area.

Potential to Occur. Greater sandhill crane has potential to occur within the Project area during the non-breeding season. The Project area contains potentially suitable foraging habitats including emergent wetlands, grassland and agricultural areas as mapped in the report Riparian Vegetation of the San Joaquin River (Moise and Hendrickson 2002). Based on recent observations and known occurrences, this species is likely a rare visitor of the Project area.

Recommendation. During a general habitat assessment, areas that provide suitable foraging habitat would be identified. If the survey occurs during the winter, there is potential to confirm presence of the species within the area; however, such a survey would not be sufficient to confirm absence. Greater sandhill crane is not expected to nest within the Project area, and no focused surveys are recommended.

Bank Swallow

Status: Protected under the Migratory Bird Treaty Act and State listed as threatened.

Species Description. Bank swallow (*Riparia riparia*) breeds throughout the northern United States and Canada and winters in South America. Within California it is found primarily in the Central Valley, especially along the Sacramento River. It requires vertical banks or bluffs composed of soft, sandy soils near still or running water for nesting. Detailed descriptions of the current distribution, habitat requirements, and foraging behaviors of the bank swallow can be found in the following documents:



Bank swallow, unknown

- San Joaquin River Restoration Study Background Report (McBain and Trush, Inc. 2002), Chapter 9, “Special-Status Plants and Wildlife,” Section 9.5.3.16
- Recovery Plan: Bank Swallow (*Riparia riparia*) (CDFG 1992)

Known Occurrences. The following sources describe occurrences of bank swallow within the vicinity of the Project area:

- CNDDDB (CDFG 2009a) describes one occurrence, Occurrence No. 162, within approximately 10 miles of the Project area. In 1980, 30 birds were observed in a nesting colony near Mendota Pool, within the Project area.

- The San Joaquin River Restoration Study Background Report (McBain and Trush 2002), Chapter 9, “Special-Status Plants and Wildlife,” Section 9.5.3.16 reports records of bank swallow near Mendota Pool.

Potential to Occur. Although the CNDDDB occurrence near Mendota Pool, at the downstream end of the Project area, establishes that bank swallows occurred in the area historically, the database contains no evidence of any attempts to monitor the occurrence or confirm that it is extant. The Project area is not within the bank swallow’s current range (CDFG 2005), and major monitoring efforts for the species have been concentrated on the Sacramento River. One survey was conducted in a 5 mile reach of the San Joaquin River, immediately upstream of Reach 2B, in July and August of 2001, when all river banks potentially providing suitable habitat were surveyed on foot. No evidence of bank swallow presence, such as recently excavated burrows, was observed during those surveys despite the presence of suitable habitat at this location, roughly 5 linear miles from the historical occurrence recorded in the CNDDDB, upstream of the Project area (ESRP 2001). Because of these data, the potential for bank swallow occurrence in the Project area was assessed as low.

Recommendation. The general habitat assessment would be sufficient to identify areas of suitable habitat and potentially confirm presence within the Project area. Surveyors would look for steep banks that would be suitable for nesting. Surveyors would also assess the condition of the historical breeding location near Mendota Pool using GPS coordinates provided by CDFG. Swallows would be expected in the area starting in mid-March and persisting through the fall (McBain and Trush, Inc. 2002). Based on existing data and the species’ known current range, unless highly suitable nesting habitat or bank swallows are observed during the general habitat assessment it may be appropriate to assume this species is absent from the Project area.

If highly suitable bank-nesting habitat is identified during the habitat assessment, it would be searched for bank swallow sign. If no bank swallow sign is observed, this species would be assumed absent from the Project area.

Nelson’s Antelope Squirrel

Status: State listed as threatened.

Species Description. Nelson’s antelope squirrel (*Ammospermophilus nelsoni*) is found within the western and southern portions of the Tulare Basin, the San Joaquin Valley, and the contiguous areas to the west in the upper Cuyama Valley and on the Carrizo and Elkhorn plains. It prefers dry, open habitats with scattered shrubs. Detailed descriptions of the current distribution, habitat requirements, and foraging behaviors of Nelson’s antelope squirrel can be found in the following documents:

- San Joaquin River Restoration Study Background Report (McBain and Trush, Inc. 2002), Chapter 9, “Special-Status Plants and Wildlife,” Section 9.5.3.19
- Recovery Plan for the Upland Species of the San Joaquin Valley (USFWS 1998), Species Accounts, “State Listed, Federal Candidates and Other Animals Species of Concern,” Section II.M.2

Known Occurrences. In addition to general information on range and occurrences provided in the species descriptions referenced above, the following sources describe occurrences of Nelson’s antelope squirrel in the Project vicinity:

- CNDDDB (CDFG 2009a) describes two occurrences within 10 miles of the Project area:
 - Occurrence No. 81: 1918, the Museum of Vertebrate Zoology collected one specimen, approximately 2 miles south of the Project area.
 - Occurrence No. 296: 1920, the Museum of Vertebrate Zoology collected one specimen, approximately 9 miles west of the Project area.
- The Recovery Plan for the Upland Species of the San Joaquin Valley (USFWS 1998) reports that since 1979 Nelson’s antelope squirrel has disappeared from many of the smaller islands of habitat on the Valley floor, including Alkali Sink and Kerman ecological reserves in Fresno County.

Potential to Occur. Nelson’s antelope squirrel has a low potential to occur in the Project area. There have been no recorded occurrences within the vicinity of the Project area within the last 89 years, and the closest known occurrence (CNDDDB Occurrence No. 81 [CDFG 2009a]) is from an area where the species is no longer extant (USFWS 1998). Additionally, the Project area is at or beyond the eastern edge of the species’ documented historic range (USFWS 1998).

Recommendation. During a general habitat assessment, attention would be paid to the presence of ground squirrels and their burrows. California ground squirrel (*Spermophilus beecheyi*) displaces and may restrict the range of Nelson’s antelope squirrel (USFWS 1998). During the general habitat assessment, observations of California ground squirrels and/or their burrows, combined with a lack of observations of Nelson’s antelope squirrel, would further support the recommendation to assume that this species is absent from the Project area.

Fresno Kangaroo Rat

Status: Federally and State listed as endangered.

Species Description. Fresno kangaroo rat (*Dipodomys nitratooides exilis*) occurred historically in Madera, Merced and Fresno counties. It has been found in alkali desert scrub habitat between 200 and 300 feet in elevation. Detailed descriptions of the current distribution, habitat requirements, and foraging behaviors of the Fresno kangaroo rat can be found in the following documents:



Fresno kangaroo rat, B. Moose Peterson

- San Joaquin River Restoration Study Background Report (McBain and Trush, Inc. 2002), Chapter 9, “Special-Status Plants and Wildlife,” Section 9.5.3.20
- Recovery Plan for the Upland Species of the San Joaquin Valley (USFWS 1998) Section I, pp. 96-105

Known Occurrences. The following sources describe occurrences of Fresno kangaroo rat within the vicinity of the Project area:

- CNDDDB (CDFG 2009a) describes the following occurrences from within 10 miles of the Project area:
 - Occurrence No. 1: 1934, 2001–2003, one male was collected in alkali sink scrub by A.E. Culbertson, approximately 1 mile south of the Project area. No individuals found during reconnaissance surveys in 2001-2003. Listed as possibly extirpated.
 - Occurrence No. 4: 1974–1975, 1981–1982, 2001, 2003, trappings in 1974–1975 resulted in 17 captures and trapping in 1981-1982, 2001, and 2003 resulted in zero captures within alkali sink habitat, approximately 4 miles southeast of the Project area. Listed as possibly extirpated.
 - Occurrence No. 21: 1934, two individuals were collected by A.E. Culbertson, approximately 7 miles southeast of the Project area.
 - Occurrence No. 22: 1934, one individual was collected by A.E. Culbertson, approximately 9 miles northeast of the Project area.
- Critical habitat for the Fresno kangaroo rat is designated in an area of alkali sink habitat, approximately 2 miles south of the Project area (50 FR 4222–4226).
- The San Joaquin River Restoration Study Background Report (McBain and Trush 2002), Chapter 9, “Special-Status Plants and Wildlife,” Section 9.5.4.5 reports that the last known detection at the Alkali Sink Ecological Reserve (which is about 2 miles south of the Project area) occurred in 1992 and that extensive trapping since 1993 in Madera and Fresno counties have resulted in no further trappings.
- The Proponent’s Environmental Assessment for the Gill Ranch Gas Storage Project (Entrix 2008), Chapter 4.4, “Biological Resources,” Section 4.4.1.3 summarizes Fresno kangaroo rat survey results from Alkali Sink Ecological Reserve from an unpublished CDFG report. According to this source a lone male Fresno kangaroo rat was trapped on the reserve in 1992 and before that capture it had been 13 years since the species had been trapped at the reserve. Since 1992 CDFG grid surveys and independent research efforts, including reconnaissance trapping of active burrows conducted systematically over large portions of the reserve at some of the locations where Fresno kangaroo rats are most likely to persist, have failed to detect this species.

Potential to Occur. The Fresno kangaroo rat has a low potential to occur in the Project area because the species is extremely rare and possibly extirpated from the area. The last confirmed sighting or trapping of a four-toed kangaroo rat in the range of the Fresno kangaroo rat was that described above, of a lone male, by Daniel Williams in November 1992, at the Alkali Sink Ecological Reserve (Kelly, pers. comm., 2009). Since then several trappings at that location have failed to detect the species (Entrix 2008). In 2001 trapping was conducted over a 5 mile stretch of the San Joaquin River corridor, primarily immediately upstream of the Project area, with the downstream-most trap lines extending into the Reach 2B portion of the Project area, near the Chowchilla Bifurcation Structure

(ESRP 2001). This effort consisted of 1,200 total trap nights but failed to detect the species, although 121 individual Heerman's kangaroo rats (*D. heermanni*) were captured. Trapping was also conducted in Reach 2 before the installation of groundwater monitoring equipment in 2001 and 2002, and Heerman's was the only kangaroo rat captured during that effort as well (Wolfe, pers. comm., 2009).

Although Fresno kangaroo rat has not been observed in the Project vicinity since 1992, despite focused survey efforts, the Project area is connected to Alkali Sink Ecological Reserve via a relatively undisturbed parcel that may provide suitable habitat and has not been surveyed. If there are extant populations of Fresno kangaroo rat, it may be they are most likely to be found between Alkali Sink Ecological Reserve, the land between the Project area and the Reserve, and in suitable habitat along the San Joaquin River between Gravelly Ford and Mendota (Kelly, pers. comm., 2009).

Recommendation. Potentially suitable Fresno kangaroo rat habitat in the Project area would be identified during a general habitat assessment, with emphasis on alkali sink habitat and areas where kangaroo rat sign is observed. If alkali sink or alkali scrub habitat with kangaroo rat sign is identified in portions of the Project area where disturbance is unavoidable, trapping to determine which species of kangaroo rat is present is warranted, and would require USFWS and CDFG review and approval of a specific trapping protocol. If potentially suitable habitat with sign of kangaroo rat activity is not found in the Project area, or could easily be avoided during Project construction, then focused surveys are not recommended.

San Joaquin Kit Fox

Status: Federally and State listed as endangered.

Species Description. The San Joaquin kit fox (*Vulpes macrotis mutica*) is a small fox endemic to the arid San Joaquin Valley of California. It prefers grasslands, oak savanna, and woodland habitats. Dens used by the San Joaquin kit fox are typically excavated from California ground squirrel burrows, although some will dig their own dens if loose, friable soils are available (DPR 2009). Detailed descriptions of the current distribution, habitat requirements, foraging and reproductive behaviors of the San Joaquin kit fox can be found in the following documents:



San Joaquin kit fox, USFWS

- San Joaquin River Restoration Study Background Report (McBain and Trush, Inc. 2002), Chapter 9, "Special-Status Plants and Wildlife," Section 9.5.3.22
- Recovery Plan for the Upland Species of the San Joaquin Valley (USFWS 1998), Section L, "San Joaquin Kit Fox (*Vulpes macrotis mutica*), pp. 122–136
- Endangered Species Recovery Program Species Profile for the San Joaquin kit fox (ESRP 2006)

Known Occurrences. In addition to general information on range and occurrences provided in the species descriptions referenced above, the following sources describe occurrences of San Joaquin kit fox in the Project vicinity:

- The CNDDDB (CDFG 2009a) describes one occurrence of San Joaquin kit fox within 5 miles of Reach 2B:
 - Occurrence No. 373 describes the collection of one male specimen from the vicinity of Mendota, approximately 2.5 miles south of the Project area, in 1947.
- The CNDDDB (CDFG 2009a) describes an additional seven occurrences within 10 miles of the Project area:
 - Occurrence No. 1117: 1990, two kit fox sighted by Gail Presley (CDFG) in Firebaugh, approximately 10 miles northwest of the Project area.
 - Occurrence No. 14: 1990, two adults sighted on the west side of Road 9 by Gail Presley (CDFG) during a spotlighting survey, approximately 7 miles north of the Project area.
 - Occurrence No. 92: 1990, a natal den was observed by Daniel Williams (California State University [CSU], Stanislaus), approximately 7 miles north of the Project area.
 - Occurrence No. 188: 1990, tracks and scat were observed by Daniel Williams (CSU Stanislaus) during field surveys, approximately 9 miles north of the Project area.
 - Occurrence No. 91: 1990, a natal den was observed by Daniel Williams (CSU Stanislaus), approximately 8 miles northeast of the Project area.
 - Occurrence No. 13: 1975, one kit fox was sited at a den, approximately 8 miles southeast of the Project area.
 - Occurrence No. 370: 1920, one male kit fox collected by Joseph Dixon and A. Oliver, approximately 10 miles northwest of the Project area.

Potential to Occur. All of the occurrences documented within 10 miles of the Project area are over 15 years old, and the one occurrence from 2.5 miles away from the Project area is over 60 years old, so these occurrences may not represent current populations. While the occurrences do suggest a historic presence in the Project vicinity, and are within dispersal distance of the species to the Project area, surveys conducted in 2001, 2003, and 2004 failed to confirm presence of the species in the Project vicinity (ESRP 2001, 2004). The 2001 effort took place in August and September and consisted of four night spotlighting surveys, scat investigation, and the use of five remote camera stations (ESRP 2001). The 2004 effort took place in June, September, October and December of 2003 and March and April of 2004 and consisted of spotlighting, 18 trackplate stations, and six remote camera stations. Both surveys took place along a 5 mile stretch of the San Joaquin River immediately upstream of Reach 2B, extending into the Project area at the Chowchilla Bifurcation structure, and neither resulted in positive detection of kit fox or kit fox sign.

Vegetation maps prepared for SJRRP and included in Riparian Vegetation of the San Joaquin River show areas of grassland/pasture and elderberry savannah (Moise and Hendrickson 2002), which may provide suitable denning or foraging habitat for San Joaquin kit fox. Areas mapped as agricultural uses, depending on the type of agriculture, may provide suitable foraging habitat for the species. Based on habitat and historic distribution, there is potential for San Joaquin kit fox to be present in the Project area. Based on current distributional records and recent surveys, however, if present, this species is expected to be very rare in the Project area and may only be present during dispersal events or migration.

Recommendation. Because focused surveys conducted adjacent to the Project area in 2001, 2003, and 2004 failed to detect this species, focused surveys are unlikely to detect kit fox in the Project area and are not recommended at this time. Based on the number and proximity of previously documented occurrences, however, occasional presence would be assumed, and measures to protect kit fox would be incorporated into the Project. During the general habitat assessment areas of suitable San Joaquin kit fox habitat would be identified. To evaluate habitat suitability for kit fox, meandering transects would be walked through areas of potentially suitable habitat not subject to periodic inundation, regular crop rotation, disking, or similar disturbance. Biologists would note burrows or other features that could provide shelter for kit fox, abundance of prey base, and any sign of kit fox use such as tracks, scat, or characteristic dens.

Protocol Surveys. While there is no specific survey protocol for San Joaquin kit fox in the southern portion of its range (the location of the Project), the survey protocol for the San Joaquin kit fox in its northern range recommends that an early evaluation of the Project area be prepared and presented to USFWS to determine the necessary measures for protection of the species (USFWS 1999c). Early evaluation in the northern range requires that the following information be submitted to USFWS:

- Project description and map (with potential kit fox habitat delineated)
- Recorded occurrences within a 10-mile radius
- Description of vegetation communities
- Description of continuity of vegetation communities within the Project area and 10-mile radius
- Habitat suitability based on one set of walking transects
- Analysis of adverse impacts of the Project on kit foxes
- Recommendations for mitigation
- Analysis of cumulative impacts

USFWS also recommends measures for protecting kit fox in the document titled “Standardized recommendations for the protection of the San Joaquin Kit Fox before or during ground disturbance” (USFWS 1999d). These measures are generally appropriate for this Project, and are summarized below:

- If kit fox dens occur within the Project area, take the following action, depending on the type of den:
 - Potential dens: Maintain 50-foot exclusion buffer; if necessary, and if permit has been acquired, destroy den appropriately.
 - Known dens: Maintain 100-foot exclusion buffer; if necessary, and if permit has been acquired, destroy den appropriately after 3-day monitoring period to ensure the den is unoccupied.
 - Atypical dens: Maintain 50-foot exclusion buffer.
 - Natal/pupping dens: Contact USFWS.
- Abide by construction and operational procedures to ensure the safety of potential kit fox on site, including:
 - Limit speed to 20 miles per hour within the Project area.
 - Limit, cover, and search den-like structures on site.
 - Reduce trash and chemical use in the Project area.
 - Do not permit pets or firearms on-site.
 - Educate employees about kit fox and important conservation measures.
 - Contact USFWS and CDFG if a dead, injured, or entrapped kit fox is found.

4.2.2 Other Special Status Wildlife

Special status wildlife species identified during the CNDDDB database search (CDFG 2009a) that lack Federal or State Endangered Species Act listing status or State fully protected status are addressed in this section. These species are listed in Table 4-3. Existing data and evaluation for species addressed in this section, which includes USFWS birds of conservation concern and CDFG species of special concern and watch list species, are presented the same order as presented in the table. An additional group of special status bird species that did not meet the criteria for inclusion in Section 4.2.1 or this section are also listed in Table 4-3, and are addressed in Section 4.2.3.

**Table 4-3
Other Special-Status Wildlife Species**

Scientific Name Common Name	Federal /State Status	Preferred Habitat	Recommendation
Amphibians			
<i>Spea hammondi</i> western spadefoot	--/SSC	Grassland and valley-foothill hardwood woodlands, vernal pools or seasonal wetlands are essential for egg laying.	Assume absent from the Project area following confirmation that suitable habitat is absent during general habitat assessment.
Reptiles			
<i>Actinemys marmorata</i> western pond turtle	--/SSC	Ponds, marshes, rivers, streams, irrigation ditches, and vernal pools; with basking sites and suitable upland habit for egg laying.	Evaluate habitat during habitat assessment and assume presence in suitable habitat.
<i>Anniella pulchra pulchra</i> silvery legless lizard	--/SSC	Sand dunes or sandy soil, with litter; also wooded stream edges, and occasionally desert-scrub. Bush lupine often indicates suitable conditions. Found in leaf litter, under rocks, logs, and driftwood.	Evaluate habitat during habitat assessment and assume presence in suitable habitat.
<i>Masticophis flagellum ruddocki</i> San Joaquin whipsnake	--/SSC	Open, dry, treeless areas, including grassland and saltbush scrub. Takes refuge in rodent burrows, under shaded vegetation, and under surface objects.	Evaluate habitat during habitat assessment and assume presence in suitable habitat.
<i>Phrynosoma blainvillii</i> coast horned lizard	--/SSC	Coastal sage, chaparral, and other brushy, shrubby vegetation habitats that provide a low shrub structure; Overwinter in small mammal burrows.	Evaluate habitat during habitat assessment and assume presence in suitable habitat.
Birds			
<i>Accipiter cooperii</i> * Cooper's hawk	MBTA /WL	Typically found in patchy woodlands. Nest and forages near open water and wetland vegetation.	Evaluate habitat during habitat assessment. Assume suitable habitat may be occupied currently or before Project implementation.
<i>Agelaius tricolor</i> tricolored blackbird	BCC, MBTA /SSC	Typically nests next to open water in freshwater marsh with extensive emergent or riparian vegetation. Breeding colonies also reported in grain fields. Forages in grasslands, wetland habitats, and some agricultural areas.	Evaluate habitat during habitat assessment. Assume suitable habitat may be occupied currently or before Project implementation.

**Table 4-3
Other Special-Status Wildlife Species**

Scientific Name Common Name	Federal /State Status	Preferred Habitat	Recommendation
<i>Anser albifrons elgasi</i> * greater white-fronted goose	MBTA /SSC	Prefers moist and wet environments, including freshwater wetlands, croplands, and pastures. Breeds in Alaska.	Assume occasional presence during wintering and migratory periods.
<i>Athene cunicularia</i> burrowing owl	BCC, MBTA /SSC	Open, dry, annual or perennial grasslands, deserts, and scrublands characterized by low-growing vegetation, with small mammal burrows for nesting and roosting.	Evaluate habitat during habitat assessment. Assume suitable habitat may be occupied currently or before Project implementation.
<i>Aythya americana</i> * redhead	MBTA /SSC	Nest near freshwater emergent wetlands and areas of deep, open water.	Evaluate habitat during habitat assessment. Assume suitable habitat may be occupied currently or before Project implementation.
<i>Charadrius montanus</i> mountain plover	BCC, MBTA /SSC	Roost and forage in short grasslands, freshly plowed fields, and bare ground with flat topography. Prefers fallow, grazed, or burned areas and alkali flats with burrowing rodents.	Evaluate habitat during habitat assessment. Assume suitable wintering habitat potentially present in the Project area may sometimes be used by this species.
<i>Circus cyaneus</i> * northern harrier	MBTA /SSC	Nest and forage in open habitats including freshwater marshes and weedy edges of rivers and streams. Also found in agricultural areas such as pastures and some croplands.	Evaluate habitat during habitat assessment. Assume suitable habitat may be occupied currently or before Project implementation.
<i>Falco columbarius</i> merlin	MBTA /WL	Occurs in coast, grasslands, savannas, woodlands, coniferous forests, wetlands, and occasionally desert habitats. Requires dense tree stands near bodies of water.	Assume occasional presence during wintering and migratory periods (does not nest in California).
<i>Grus canadensis canadensis</i> * lesser sandhill crane	MBTA /SSC	Forage in agricultural fields, pastures, and mowed to grazed grasslands. Roost in shallow water within wetland habitats.	Assume occasional presence during wintering and migratory periods.

**Table 4-3
Other Special-Status Wildlife Species**

Scientific Name Common Name	Federal /State Status	Preferred Habitat	Recommendation
<i>Lanius ludovicianus</i> * loggerhead shrike	BCC, MBTA /SSC	Breeds in shrubland or open woodlands. Require tall shrubs/trees for hunting perches and nests. Use riparian edges in the Central Valley.	Evaluate habitat during habitat assessment. Assume suitable habitat may be occupied currently or before Project implementation.
<i>Larus californicus</i> * California gull	MBTA /WL	Preferred inland habitat includes riverine, lacustrine, and cropland habitats.	Assume occasional presence during wintering and migratory periods.
<i>Numenius americanus</i> * long-billed curlew	BCC, MBTA /WL	Winters in upland herbaceous areas and croplands.	Assume occasional presence during wintering and migratory periods.
<i>Pandion haliaetus</i> * osprey	MBTA /WL	Found near large, open, fish-bearing waters. Nest and roost on large tree, snags, and cliffs.	Assume occasional presence during wintering and migratory periods.
<i>Pelecanus erythrorhynchos</i> * American white pelican	MBTA /SSC	Forage in shallow inland waters such as marshes, canals and lake or river edges.	Assume occasional presence during wintering and migratory periods.
<i>Phalacrocorax auritus</i> * double-crested cormorant	MBTA /WL	Found in riverine habitats within the Central Valley.	Assume occasional presence during wintering and migratory periods.
<i>Plegadis chihi</i> white-faced ibis (rookery site)	MBTA /WL	Forages in emergent freshwater wetlands and flooded croplands/pastures. Roosts in dense wetland vegetation.	Assume occasional presence of white-faced ibis in the Project area. Search for rookery sites during habitat assessment.
<i>Xanthocephalus xanthocephalus</i> yellow-headed blackbird *	MBTA /SSC	Nest in marshes with tall emergent vegetation and areas of relatively deep water.	Evaluate habitat during habitat assessment. Assume suitable habitat may be occupied currently or before Project implementation.
Mammals			
<i>Eumops perotis californicus</i> western mastiff bat	--/SSC	Roosts in crevices in cliff faces, high buildings, and tunnels; forages in arid, semi arid habitat-coniferous and deciduous woodlands, coastal scrub, grasslands, and chaparral.	Assume this species forages in the Project area. Search structures in the Project area for sign of bat roosts during habitat assessment.

**Table 4-3
Other Special-Status Wildlife Species**

Scientific Name Common Name	Federal /State Status	Preferred Habitat	Recommendation
<i>Lasiurus blossevillii</i> western red bat	--/SSC	Roosts primarily in trees, typically adjacent to open fields or streams, which are protected above and open below for foraging; prefers habitat edges and mosaics with trees.	Assume that this species roosts in trees in riparian forests that may occur in the Project area, and forages over much of the Project area.
<i>Taxidea taxus</i> American badger	--/SSC	Grasslands, savannas, and mountain meadows; require friable soils, and relatively open, uncultivated ground; requires suitable prey base of burrowing rodents.	Occasional presence would be assumed in suitable habitat. Identify suitable habitat and potential denning habitat during habitat assessment.

*Species addressed in Section 4.2.3.

Key:

U.S. Fish and Wildlife Service and Federal Listing Categories:

BCC = Bird of Conservation Concern

FC = Candidate for Federal Listing

FD = Federally Delisted

FE = Federally Listed as Endangered

FT = Federally Listed as Threatened

MBTA = Protected under the Migratory Bird Treaty Act

California Department of Fish and Game State Listing Categories:

FP = Fully Protected

SC = Candidate for State Listing

SE = State Listed as Endangered

SSC = Species of Special Concern

ST = State Listed as Threatened:

Western Spadefoot

Status: CDFG Species of Special Concern.

Species Description. Western spadefoot (*Spea hammondi*) is a small anuran that ranges throughout the Central Valley of California and adjacent foothills. It primarily inhabits grassland and valley-foothill hardwood woodlands that contain vernal pools or seasonal wetlands, which are essential for breeding. It is typically found in close association with breeding habitat. More detailed life history and species descriptions for western spadefoot can be found in the following documents:



Western spadefoot, James Bettaso/USFWS

- San Joaquin River Restoration Study Background Report (McBain and Trush, Inc. 2002), Chapter 9, “Special-Status Plants and Wildlife,” Section 9.5.4.2
- California Interagency Wildlife Task Group, California Wildlife Habitat Relationships species accounts (CDFG 2005)

Known Occurrences. In addition to general information on range and occurrences provided in the species descriptions referenced above, the following sources describe occurrences of western spadefoot in the Project vicinity:

- The CNDDDB (CDFG 2009a) describes two occurrences of the western spadefoot within 3 miles of Reach 2B:
 - Occurrence No. 238: 2001, many larvae were observed in vernal pools within an alkali sink area, approximately 2.3 miles south of the Project area.
 - Occurrence No. 300: 2004, 100 tadpoles were observed in vernal pools within an alkali sink area, approximately 2.3 miles south of the Project area.
- CNDDDB (CDFG 2009a) describes two occurrences of the western spadefoot from within 4 miles of Reach 2B:
 - Occurrence No. 298: 2004, one tadpole was observed in a vernal pool at Kerman Ecological Reserve, approximately 2.6 miles south of the Project area.
 - Occurrence No. 299: 2004, 25 tadpoles were observed in a vernal pool at Kerman Ecological Reserve, approximately 3.3 miles south of the Project area.

Potential to Occur. Although known from the Project vicinity, habitat in the Project area is not expected to be suitable for this species, and at this point its potential for presence in the Project area is assessed as low.

Recommendation. Presence of this species in the Project area should be based on presence of vernal pool habitat. If suitable habitat is not observed for this species during a general habitat assessment in the Project area, it would be assumed absent.

Western Pond Turtle

Status: CDFG Species of Special Concern.

Species Description. Western pond turtle (*Actinemys marmorata*) is found within a variety of aquatic environments including ponds, marshes, rivers, streams, irrigation ditches, and vernal pools, and ranges from Washington to Mexico. It requires basking sites such as partially submerged logs or rocks, and suitable upland habitat (sandy banks or grassy open fields) for egg laying. Detailed



Western pond turtle, Matthew Bettelheim/URS

descriptions of the current distribution, habitat requirements, and foraging behaviors of the western pond turtle can be found in the following documents:

- San Joaquin River Restoration Study Background Report (McBain and Trush, Inc. 2002), Chapter 9, “Special-Status Plants and Wildlife,” Section 9.5.4.3
- Amphibian and Reptile Species of Special Concern in California, (Jennings and Hayes 1994), pp. 98–103

Known Occurrences. The following sources describe occurrences of western pond turtle within the vicinity of the Project area:

- CNDDDB (CDFG 2009a) describes the following five occurrences from within five miles of the Project area:
 - Occurrence No. 22: unknown, one specimen was collected by D.C. Holland, adjacent to the Mendota Pool.
 - Occurrence No. 25: 2001, one juvenile was observed at Fresno Slough by Catherine Dickert (CDFG) approximately 4.5 miles south of the Project area.
 - Occurrence No. 226: 2001, one adult was observed at Hamburger Slough by Catherine Dickert (CDFG), approximately 3.5 miles south of the Project area.
 - Occurrence No. 227: 2001, two juveniles were observed at Tin Can Slough by Catherine Dickert (CDFG), approximately 3 miles south of the Project area.
 - Occurrence No. 228: 2001, two juveniles and two adults were observed in a ditch by Catherine Dickert (CDFG), approximately 3.5 miles south of the Project area.
- The San Joaquin River Restoration Study Background Report (McBain and Trush 2002), Chapter 9, “Special-Status Plants and Wildlife,” Section 9.5.4.5 reports records of western pond turtle at Mendota Pool and within the Mendota Wildlife Area.

Potential to Occur. Western pond turtle likely occurs within the Project area. The recorded occurrences are all within the last 10 years and typically occur at slough habitats similar to Mendota Pool and Fresno Slough, which are part of the Project area. In addition to suitable aquatic features, the Project area contains potential upland nesting habitat (Moise and Hendrickson 2002).

Recommendation. A general habitat assessment would be conducted to identify areas of suitable habitat within the Project area. Presence would be assumed in habitats identified as suitable. Focused surveys are not recommended for this species.

Silvery Legless Lizard

Status: CDFG Species of Special Concern.

Species Description. Silvery legless lizard (*Anniella pulchra pulchra*) is found from Contra Costa County south to Mexico within the Sierra Nevada, Transverse, Peninsular and Coastal ranges, and in the San Joaquin Valley. It prefers areas with loose soils and leaf litter within riparian, oak woodland, interior dune and chaparral habitats. Detailed

descriptions of the current distribution, habitat requirements, and foraging behaviors of the silvery legless lizard can be found in the following documents:

- San Joaquin River Restoration Study Background Report (McBain and Trush, Inc. 2002), Chapter 9, “Special-Status Plants and Wildlife,” Section 9.5.4.5
- Amphibian and Reptile Species of Special Concern in California (Jennings and Hayes 1994), pp. 108-111

Known Occurrences. The CNDDDB (CDFG 2009a) describes only one occurrence of the silvery legless lizard within 10 miles of the Project area, but it is located within feet of the Project area. As recorded in Occurrence No. 13, in 2000 one individual was observed in litter east of Willow Slough, north of the San Joaquin River, and west of the Chowchilla bifurcation structure by Julie Vance (DWR), adjacent to Reach 2B.



Silvery legless lizard, Matthew Bettleheim/URS

Potential to Occur. Silvery legless lizard likely occurs within the Project area. There is one known occurrence of the species within the last 10 years from the east end of the Project area. The Project area contains suitable riparian habitat for this species (Moise and Hendrickson 2002). Loose or sandy soil that remains damp or is covered by leaf litter is particularly likely to support this species.

Recommendation. A general habitat assessment would be conducted to identify areas of suitable habitat within the Project area. During the habitat assessment some rock or log turning, and tactile searches in particularly suitable sandy or litter habitats may confirm presence at some locations. Such an assessment would be insufficient to confirm absence, and presence would be assumed in habitats identified as suitable. Focused surveys are not recommended for this species.

San Joaquin Whipsnake

Status: CDFG Species of Special Concern.

Species Description. The San Joaquin whipsnake (*Masticophis flagellum ruddocki*) is endemic to the San Joaquin Valley of California, between Arbutle and Kern County. It prefers dry, open scrub, grassland, chaparral, and desert within the San Joaquin Valley. Detailed descriptions of the current distribution, habitat requirements, and foraging behaviors of the San Joaquin whipsnake can be found in the following documents:

- San Joaquin River Restoration Study Background Report (McBain and Trush, Inc. 2002), Chapter 9, “Special-Status Plants and Wildlife,” Section 9.5.4.6
- California Interagency Wildlife Task Group, California Wildlife Habitat Relationships species accounts (CDFG 2005)

Known Occurrences. The CNDDDB identified two occurrences within 10 miles of the Project area:

- Occurrence No. 33: 2004, the shed skin of one adult was found and identified in an area of iodine bush and patches of annual grassland, approximately 2.4 miles south of the Project area.
- Occurrence No. 32: 2004, one adult was observed in annual grassland, approximately 5.6 miles southeast of the Project area.

Potential to Occur. The San Joaquin whipsnake has a high potential to occur within the Project area. The occurrences described above are recent, and Occurrence No. 33 is an area connected to the Project area by relatively undisturbed habitat (based on review of aerial photos). The Project area contains potentially suitable habitat, including annual grassland (Moise and Hendrickson 2002).

Recommendation. A general habitat assessment would be conducted to identify potentially suitable habitats in the Project area. If the assessment occurs when the snakes are active (April through October [Jennings and Hayes 1994]) there is potential to confirm their presence at some locations. Regardless of whether the habitat assessment results in detection of this species, San Joaquin whipsnake would be assumed present in habitat identified as suitable. Protocol survey guidelines have not been published for this species, and no focused surveys for San Joaquin whipsnake are recommended.

Coast Horned Lizard

Status: CDFG Species of Special Concern.

Species Description. Coast horned lizard (*Phrynosoma blainvillii*) is endemic to California and ranges from Sonoma County to Los Angeles County with patchy populations throughout the Central Valley and Coast Ranges. It prefers sandy soils but can be found in a variety of habitats including riparian woodland, chaparral, annual grassland, alkali flats, oak savannah, coastal scrub and some agricultural areas. Detailed descriptions of the current distribution, habitat requirements, and foraging behaviors of coast horned lizard can be found in the following documents:



Coast horned lizard, Jessie Golding/URS

- San Joaquin River Restoration Study Background Report (McBain and Trush, Inc. 2002), Chapter 9, “Special-Status Plants and Wildlife,” Section 9.5.4.3
- Amphibian and Reptile Species of Special Concern in California (Jennings and Hayes 1994), pp. 130–133

Known Occurrences. The CNDDDB (CDFG 2009a) describes two occurrences of coast horned lizard from within 10 miles of the Project area, both from approximately 2 miles south of the Project area:

- Occurrence No. 622: 2002, 2003, 2004, two individuals were observed in 2002 by Adrian Howard, one adult was observed in 2003 by Michelle Selmon and one adult was observed in 2004 by Rick Ortega (CDFG) within alkali sink scrub.
- Occurrence No. 655: 2003, one adult was observed in an alkali sink ecological reserve by Shari Heitkotter (CDFG).

Potential to Occur. Coast horned lizard has high potential to occur within the Project area. The occurrences described above are recent and from an area connected to the Project area by relatively undisturbed habitat (based on review of aerial photos). The Project area contains potentially suitable habitat, including riparian woodland and grassland (Moise and Hendrickson 2002).

Recommendation. A general habitat assessment would be conducted to identify potentially suitable habitats in the Project area. If the assessment occurs when the lizard is active (April through October [Jennings and Hayes 1994]) there is potential to confirm its presence at some locations. Such an assessment will likely be insufficient to confirm absence. The coast horned lizard would be assumed present in areas identified as suitable habitat during the habitat assessment.

Tricolored Blackbird

Status: Protected under the Migratory Bird Treaty Act and CDFG Species of Special Concern.

Species Description. Tricolored blackbird (*Agelaius tricolor*) is a passerine nearly endemic to California. It is found primarily in the Sacramento Valley, the San Joaquin Valley, along the central and southern California coasts, and the northeast interior of California. It breeds in colonies found near open water, typically in freshwater marsh habitat where there is extensive emergent or riparian vegetation. Its preferred foraging habitats include grasslands and agricultural areas. Detailed descriptions of the current distribution, habitat requirements, and foraging behaviors of the tricolored blackbird can be found in the following documents:



Tri-colored blackbird, Lee Karney/USFWS

- San Joaquin River Restoration Study Background Report (McBain and Trush, Inc. 2002), Chapter 9, “Special-Status Plants and Wildlife,” Section 9.5.4.33
- California Bird Species of Special Concern, Part II: Species Accounts, pp.437–443 (Shuford and Gardali 2008)

Known Occurrences. The following sources describe occurrences of tricolored blackbird within the vicinity of the Project area:

- CNDDDB (CDFG 2009a) does not report any occurrences from within 5 miles of the Project area. The following six occurrences are from between 5 and 10 miles away from the Project area:
 - Occurrence Nos. 222–225: 1992, nesting birds in flocks ranging in size from 200 to 6,000 adults were observed by Steve Brueggeman near duck brood ponds in the Mendota Wildlife Area, These occurrences are located between approximately 5 and 6.5 miles south of the Project area.
 - Occurrence No. 277: 1975, 5,000 individuals were observed nest building on pools near Cottonwood Creek by E. C. Beedy, et al., approximately 6.5 miles south of the Project area.
 - Occurrence No. 374: 1997, 2001, 2,000 individuals were observed in April 1997, 2,500 were observed in May 1997, and 10,000 were observed in 2001, on a substrate of silage by Diana Humple and Roy Churchwell, approximately 6 miles northeast of the Project area.

Potential to Occur. Tricolored blackbird has high potential to occur within the Project area because it has been documented in the vicinity and suitable habitat is present. There are six known occurrences of large nesting colonies on pond and creek banks within 10 miles of Reach 2B. Although five of the six occurrences are more than 15 years old, one exceptionally large colony was observed as recently as 2001. The Project area likely contains areas of open water surrounded by emergent and riparian vegetation that are suitable for nesting and grasslands/agricultural areas that are suitable for foraging (Moise and Hendrickson 2002). Vegetation associated with the Mendota Pool, where standing water is often present, may be particularly suitable for tricolored blackbird nesting.

Recommendation. A general habitat assessment would be conducted to identify suitable nesting and foraging habitat in the Project area. A general habitat assessment conducted in the spring would provide opportunity to observe this species if it is present.

Burrowing Owl

Status: Protected under the Migratory Bird Treaty Act and CDFG Species of Special Concern.

Species Description. The burrowing owl (*Athene cunicularia*) is a year round resident throughout much of the valley and coastal lowlands of California. It is typically found in open, dry, annual or perennial grasslands, deserts, and scrublands characterized by low-growing vegetation. It is a ground-nesting raptor and often uses the burrows of other species, such as ground squirrels. More detailed species descriptions can be found in the following sources:



Burrowing owl, Francesca Demgen/URS

- San Joaquin River Restoration Study Background Report (McBain and Trush 2002), Chapter 9, “Special-Status Plants and Wildlife,” Section 9.5.4.27
- California Interagency Wildlife Task Group, California Wildlife Habitat Relationships species accounts (CDFG 2005)

Known Occurrences. The following sources describe occurrences of burrowing owl from the vicinity of the Project area:

- CNDDDB (CDFG 2009a): The following five occurrences of burrowing owl are recorded from within 10 miles of the Project area (CDFG 2009a):
 - Occurrence No. 89: 1989, juveniles, adults and burrows were observed on the east bank of the San Luis Drain by Steven Miyamoto, approximately 4 miles south of the Project area.
 - Occurrence No. 538: 1989, two owls and an active burrow were observed on the bank of the San Luis Canal by Steven Miyamoto, approximately 6.5 miles south of the Project area.
 - Occurrence No. 539: 1991, two owls and an active burrow were observed on the bank of the San Luis Canal by J.A. Halstead (Kings River Conservation District), approximately 5.5 miles south of the Project area.
 - Occurrence No. 589: 1984, 12 pairs of owls were monitored between February 1 and July 31 within heavily grazed grassland by Rachael Conroy and David Chesemore (CSU Fresno), approximately 6 miles southeast of the Project area.
 - Occurrence No. 793: 2006, eight adults were observed at the top of a canal bank by Kevin O’Connor (CDFG), approximately 9.3 miles south of the Project area.
- The San Joaquin River Restoration Study Background Report (McBain and Trush 2002), Chapter 9, “Special-Status Plants and Wildlife,” Section 9.5.4.27, reports that there is a record of burrowing owl near the Mendota Pool.

Potential to Occur. The burrowing owl has a high potential to occur within the Project area for the following reasons:

- Potentially suitable habitats including grasslands, scrublands, and agricultural areas occur within the Project area (Moise and Hendrickson 2002).
- There are five CNDDDB documented occurrences within 10 miles of the Project area in areas of similar habitat (CDFG 2009a).
- The species has been observed near Mendota Pool (McBain and Trush 2002).

Recommendation. Suitable habitat in the Project area would be identified during the general habitat assessment. Meandering transects through such habitats may be sufficient to document presence. Signs of burrowing owl use such as white-wash, feathers, prey remains, or owl pellets at burrow entrances or on typical perches would be noted at that time. If some areas are found to be used heavily by burrowing owls, those areas may warrant avoidance during Project design. Even if burrowing owl use of potentially

suitable habitat is not confirmed during the habitat assessment, if suitable habitat is present owls could occupy that habitat following surveys and before Project construction. Therefore, focused surveys for burrowing owls are not recommended until the initiation of pre-construction activities, at which time they will likely be necessary in suitable habitat regardless of whether burrowing owl presence was previously confirmed or not.

Protocol Surveys. Typical measures to protect burrowing owls before and during construction are described in the “Staff Report on Burrowing Owl Mitigation” (CDFG 1995), and summarized below:

- Surveys should be conducted in winter (December 1 to January 31) and during the nesting season (April 15 to July 15) at dusk or dawn.
- Suitable habitat plus a 500-foot buffer should be surveyed on foot to identify burrows and owls.
 - Maximum distance between transects should be less than 100 feet.
- To avoid impacts, the Project should:
 - Avoid impacts within 160 feet of occupied burrows from September 1 to January 31
 - Avoid impacts within 250 feet of occupied burrows from February 1 to August 31
 - 6.5 acres of contiguous foraging habitat must be preserved for each breeding pair or individual
- If impacts are unavoidable, mitigation measures should be implemented, including:
 - No impact during the nesting season (February 1 to August 31)
 - Mitigation burrow and foraging habitat on a nearby area of protected land
 - Passive removal of birds to protected land
 - Long-term management and monitoring of protected land

Mountain Plover

Status: Protected under the Migratory Bird Treaty Act, CDFG Species of Special Concern, and proposed for Federal listing as threatened.

Species Description. The mountain plover (*Charadrius montanus*) is a winter resident of California found mostly in the Sacramento, San Joaquin and Imperial Valleys. It prefers to roost and forage in open grasslands, freshly plowed fields, and flat sparsely vegetated areas. Detailed descriptions of the current distribution, habitat requirements, and foraging behaviors of the mountain plover can be found in the following documents:



Mountain plover, Brian Small

- San Joaquin River Restoration Study Background Report (McBain and Trush, Inc. 2002), Chapter 9, “Special-Status Plants and Wildlife,” Section 9.5.4.21
- California Interagency Wildlife Task Group, California Wildlife Habitat Relationships species accounts (CDFG 2005)
- California Birds Species of Special Concern, Part II: Species Accounts, pp.180-186 (Shuford and Gardali 2008)

Known Occurrences. The following sources describe occurrences of the mountain plover within the vicinity of the Project area:

- CNDDDB (CDFG 2009a) describes the following two occurrences from within 10 miles of the Project area:
 - Occurrence No. 16: 2002, 40 birds were observed in plowed and fallow fields by Kimberly Kreitingner, approximately 8 miles south of the Project area.
 - Occurrence No. 17: 2001, five adults were observed on an area of tilled soil by Kimberly Kreitingner, approximately 8.5 miles south of the Project area.

Potential to Occur. Considering its life history, the aforementioned occurrences, and current knowledge of the Project area, the mountain plover may occur within the Project area. There are two documented occurrences that fall within 10 miles of the Project area from within the last 10 years. Additionally, these occurrences were documented in agricultural fields, which is one of the major habitat types present in the Project area. The Project area also includes grassland habitat, which is another habitat type preferred by the mountain plover (Moise and Hendrickson 2002). This species winters in the Central Valley and breeds elsewhere (CDFG 2005), so its presence would only be expected September through March.

Recommendation. A general habitat assessment would be sufficient to identify suitable wintering habitat that is potentially present in the Project area. Incidental observations could confirm use of suitable habitats that may be present in the Project area. A lack of observations is unlikely to demonstrate with any certainty that mountain plover does not occasionally use the Project area if suitable habitat is identified. Therefore, no focused surveys are recommended.

Merlin

Status: Protected under the Migratory Bird Treaty Act and CDFG Species of Special Concern.

Species Description. Merlin (*Falco columbarius*) is a small falcon that ranges across much of the Northern Hemisphere. Within California, merlin occur along the coast, in grasslands, savannas, woodlands, coniferous forests, wetlands, and occasionally desert, from September to May. Detailed descriptions of the current distribution, habitat requirements, and foraging behaviors of merlin can be found in the following documents:

- San Joaquin River Restoration Study Background Report (McBain and Trush, Inc. 2002), Chapter 9, “Special-Status Plants and Wildlife,” Section 9.5.4.18

- California Interagency Wildlife Task Group, California Wildlife Habitat Relationships species accounts (CDFG 2005)

Known Occurrences. In addition to general information on range and occurrences provided in the species descriptions referenced above, the following sources describe occurrences of Merlin in the Project vicinity:

- The CNDDDB (CDFG 2009a) describes one occurrence of Merlin within a 10 miles of the Project area:
 - Occurrence No. 11: 2007, one bird was observed in a rural area by Richard Montgomery (USFWS), approximately 2.6 miles from the Project area.
- Mendota Wildlife Area recorded sighting (eBird 2009)



Merlin, Ronald Laubenstein/USFWS

Potential to Occur. Merlin is somewhat of a habitat generalist and has potential to occur within the Project area during the non-breeding season (September to May). There is a recent CNDDDB occurrence within a few miles of the Project area and the Project area likely contains suitable foraging habitat, including wetlands, grasslands and savannah (Moise and Hendrickson 2002).

Recommendation. Merlin is not expected to nest within the Project area, and no focused surveys are recommended.

White-faced Ibis

Status: Protected under the Migratory Bird Treaty Act and CDFG Species of Special Concern (rookery sites).



White-faced ibis, Dave Menke/USFWS

Species Description. White-faced ibis (*Plegadis chichi*) rookery sites are reported primarily from Colusa, Yolo, Fresno, Kings, Siskiyou, Plumas, and Modoc Counties, with scattered rookeries in Southern California (Small 1994). White-faced ibis nest in shallow marshes of the Central Valley, which also serve as foraging habitat (Zeiner et al. 1990). Detailed descriptions of the current distribution and habitat requirements of white-faced ibis rookery sites can be found in the following documents:

- San Joaquin River Restoration Study Background Report (McBain and Trush, Inc. 2002), Chapter 9, “Special-Status Plants and Wildlife,” Section 9.5.4.12

- California Interagency Wildlife Task Group, California Wildlife Habitat Relationships species accounts (CDFG 2005)

Known Occurrences. The following sources describe occurrences of white-faced ibis within the vicinity of the Project area:

- CNDDDB (CDFG 2009a) describes one occurrence (Occurrence No. 9) within 10 miles of the Project area, from 1983, when 24 pairs were observed nesting in cattail at Fresno Slough at Mendota Wildlife Area, approximately 5 miles south of the Project area.
- In the San Joaquin River Restoration Study Background Report (McBain and Trush, Inc. 2002), Chapter 9, “Special-Status Plants and Wildlife,” Section 9.5.4.12, Wolfe, pers. obs. (2000 and 2001), reports that white-faced ibis have been observed within San Joaquin River Reach 2.
- In “Preliminary Surveys for Endangered and Sensitive Species, 2001 Pilot Project of the San Joaquin River Riparian Habitat Restoration Program,” (ESRP 2001), it is noted that one or more white-faced ibis were observed from Reach 2A of the San Joaquin River, immediately upstream of the Project area.

Potential to Occur. Based on the proximity of the previously documented rookery site, and the likely presence of foraging areas within the Project area, there is potential for white-faced ibis rookeries to occur. Freshwater marsh habitat with tule and cattails, in addition to regular occurrences of the species, suggest that white-faced ibis could potentially breed within the Project area.

Recommendation. During the general habitat assessment, suitable habitat for white-faced ibis rookeries would be identified, with particular attention given to shallow freshwater marshes containing tule, cattail, or low-lying trees, and any evidence of prior use of the habitat as a rookery, if observed, would be noted. Ideally the habitat assessment would be conducted during the nesting season, in which case if a rookery is present it could be identified based on observations of breeding or nesting activity (returning to specific areas, gathering nesting materials, courtship activity, juvenile ibis concentrations, observed nests). No focused surveys for ibis rookeries are recommended, and there is no published survey protocol for this resource.

Western Mastiff Bat

Status: CDFG Species of Special Concern.

Species Description. Western mastiff bat (*Eumops perotis californicus*) ranges from the San Joaquin Valley and Coast Ranges of central California to the Colorado Desert. It occurs in open, dry areas such as coniferous or deciduous woodland, chaparral, desert habitats, coastal scrub, savanna, rocky canyons, and occasionally urban settings. It roosts primarily on cliff faces, man-made structures, and rocky outcrops. More detailed



Western mastiff bat, Dick Wilkins

life history and species descriptions can be found in the following documents:

- California's Wildlife: "western mastiff bat", CDFG (Ahlborn 1999)
- California Interagency Wildlife Task Group, California Wildlife Habitat Relationships species accounts (CDFG 2005)
- Mammalian species of special concern in California (CDFG) (Williams 1986)

Known Occurrences. There are two CNDDDB (CDFG 2009a) occurrences of western mastiff bat within 10 miles of the Project area:

- Occurrence No. 162: 1911, 1918, specimens collected by Grinnell, approximately 2 miles south of the Project area.
- Occurrence No. 235: 1999, detected on Whites Bridge near Fresno Slough, approximately 3.5 miles south of the Project area.

Potential to Occur. This species is known from the Project vicinity, and has potential to forage and roost in the Project area. Roost sites could potentially be associated with structures in the Project area, such as Chowchilla Bifurcation Structure or Mendota Dam. Cliff roosting habitat is not present within the Project area or nearby areas, decreasing the likelihood that a maternity roost would be present.

Recommendation. Structures with potential to provide bat roost habitat (such as the Chowchilla Bifurcation Structure) would be inspected for sign of bat use during the general habitat assessment.

Protocol Surveys. Although surveys beyond the general habitat assessment are not currently recommended for this species, the Western Bat Working Group recommends the following detection methods for western mastiff bat (WBWG 2007):

- Passive acoustic detection with a low-frequency microphone is recommended for detecting the western mastiff bat.
- Western mastiff bat roosts may also be visually surveyed for, by looking for guano at the base of cliffs.
- Although mist-netting is possible, it is not a recommended way of surveying for the western mastiff bat.

Western Red Bat

Status: CDFG Species of Special Concern.

Species Description. The western red bat (*Lasiurus blossevillii*) is a wide ranging bat that roosts primarily in trees from sea level up through coniferous forests. Its range is west of the Sierra Nevada from Shasta County south to Mexico. Its winter range includes western lowlands and coastal regions south of the San Francisco Bay. Western red bats typically forage over water and near riparian forests or over gravel bars. More detailed life history and species descriptions can be found in the following documents:

- California Interagency Wildlife Task Group, California Wildlife Habitat Relationships species accounts (CDFG 2005)
- Western Bat Working Group (WBWG), Western Red Bat Species Account (Van der Maarel 2005)

Known Occurrences. There are two CNDDDB (CDFG 2009a) occurrences of western red bat within 10 miles of the Project area:

- Occurrence No. 70: 1999, species observed in cottonwood/riparian forest habitat, approximately 2 miles south of the Project area.
- Occurrence No. 71: 1999, detected on Whites Bridge near Fresno Slough, approximately 3.5 miles south of the Project area.



Western red bat, J. Scott Altenbach

Potential to Occur. Western red bat has a high potential to occur in the Project area. Suitable riparian forest habitat is present within the Project vicinity, and likely is present within the Project area itself.

Recommendation. While the general habitat assessment that is recommended for this Project will provide additional information as to where the most likely roost habitat for this species occurs in the Project area, vegetation mapping will also provide similar information. It would be assumed that this species roosts in trees in riparian forests that may occur in the Project area, and forages over much of the Project area. Focused surveys are not recommended for this species.

Protocol Surveys. WBWG recommends the following methods for western red bat detection and surveys:

- Active acoustic detection is the easiest method of identifying presence of the western red bat.
- Surveys should not be visual, as the bat roosts singly, and is difficult to detect in trees.
- Surveys should not be dependent on mist-netting, as foraging areas are not suitable for netting.

American Badger

Status: CDFG Species of Special Concern.

Species Description. The American badger (*Taxidea taxus*) is found throughout most of California with the exception of the forested northwestern portion of the state. This carnivore is most abundant in drier regions



American badger, Gary M. Stolz/USFWS

containing scrub, forest, and herbaceous habitats. They are active year round and spend most of their time underground. Badgers prey on rodents, reptiles, birds, eggs, insects, and carrion. More detailed life history and species descriptions can be found in the following document:

- California Interagency Wildlife Task Group, California Wildlife Habitat Relationships species accounts (CDFG 2005)

Known Occurrences. The CNDDDB identifies one American badger occurrences (Occurrence No. 82) within 10 miles of the Project area. In 1985 one adult badger was observed standing on a burrow, approximately 3 miles south of the Project area, at Alkali Sink Ecological Reserve.

Potential to Occur. Based on the proximity of the occurrence to the Project area, there is potential for badger to occur. Grassland and open habitat such as elderberry savannah habitat all occur within the Project area and could potentially provide suitable habitat for the species (Moise and Hendrickson 2002).

Recommendation. During the general habitat assessment particular attention would be paid to the area near the eastern end of Reach 2B, where there appears to be a continuous band of grassland habitat contiguous with the Alkali Sink Ecological Reserve. Meandering transects through potentially suitable habitat during the habitat assessment may detect badger dens, identifiable by their characteristic shape, horizontal claw marks, and other features. Even if not detected during the habitat assessment, this species likely has at least occasional presence in the Project area. Focused surveys are not recommended, and neither USFWS nor CDFG has established survey protocols for this species.

4.2.3 Birds Observed at Mendota Wildlife Area

Bird species addressed in this section were not identified by either the USFWS species list or CNDDDB database search⁴. These species, however, have been observed at Mendota Wildlife Area (eBird 2009), located approximately 3.5 miles south of the Project area (Figure 3-1), and are conferred special status (either as a USFWS bird of conservation concern or a CDFG species of special concern or watch list species). All birds discussed in this section are also protected from unlawful take, killing, or possession under the Migratory Bird Treaty Act (16 U.S.C. § 703–712). All of the species addressed in this section are listed in Table 4-3, and are presented in this section in the same order as listed in the table.

Although habitat suitability and seasonality of use may vary for each species, observations at Mendota Wildlife Area suggest these species have some potential for occurrence. During the general habitat assessment recommended for this Project, attention would be paid to habitat with potential to support these species, and any observations of these species or their sign would be recorded. In each species description

⁴ Due to their State fully protected status, golden eagle and greater sandhill crane (both observed at Mendota Wildlife Area but not identified during the other database searches) are addressed in 4.2.1, Listed and Fully Protected Wildlife.

below the type of suitable habitat that could occur within the Project area is discussed. In many cases these species have been observed during the migratory or wintering period, and nesting in the Project area and vicinity is not expected.

Greater White-fronted Goose

Status: Protected under the Migratory Bird Treaty Act and CDFG Species of Special Concern.

Greater white-fronted goose (*Anser albifrons elgasi*) breeds in Alaska and winters in northeastern California and the Central Valley. It is common within the Central Valley between October and March but is also seen in September, April and early May. It is found in wet habitats including grasslands, pastures, croplands, meadows, freshwater emergent wetlands, and lacustrine habitat (Ehrlich et al. 1988). A detailed description of the current distribution, habitat requirements, and foraging behaviors of greater white-fronted goose can be found in the California Interagency Wildlife Task Group, California Wildlife Habitat Relationships species accounts (CDFG 2005). It is likely that either migratory, wintering or foraging habitat could occur in the Project area or the nearby Mendota Wildlife Area.



Greater white-fronted goose, USFWS

Redhead

Status: Protected under the Migratory Bird Treaty Act and CDFG Species of Special Concern.

Redhead (*Aythya americana*) is a year-round resident of California and is known to breed and winter within the Central Valley. It nests in a floating cup nest attached to emergent vegetation in freshwater emergent wetlands, within dense vegetation, near open water (Ehrlich et al. 1988). In the winter, it forages over large, deep bodies of water. Detailed descriptions of the current distribution, habitat requirements, and foraging behaviors of the redhead can be found in the following documents:



Redhead, Kevin Bercaw

- California Interagency Wildlife Task Group, California Wildlife Habitat Relationships species accounts (CDFG 2005)
- California Bird Species of Special Concern, Part II: Species Accounts, pp.85-90 (Shuford and Gardali 2008)

It is likely that either nesting or foraging habitat could occur in the Project area or the nearby Mendota Wildlife Area.

American White Pelican

Status: Protected under the Migratory Bird Treaty Act and CDFG Species of Special Concern.

American white pelican (*Pelecanus erythrorhynchos*) is a common winter resident in the Central Valley of California that breeds primarily in the interior of North America, including areas of northern California. It forages in shallow, inland waters at the edge of marshes, lakes and rivers. During the winter, it roosts on the ground near the water's edge. Detailed descriptions of the current distribution, habitat requirements, and foraging behaviors of the American white pelican can be found in the following document:



American white pelican, Dave Menke/USFWS

- California Interagency Wildlife Task Group, California Wildlife Habitat Relationships species accounts (CDFG 2005)

It is likely that either wintering or foraging habitat could occur in the Project area or the nearby Mendota Wildlife Area.

Double-crested Cormorant

Status: Protected under the Migratory Bird Treaty Act and CDFG Watch List (rookeries).



Double-crested cormorant, Rodney Krey/USFWS

Double-crested cormorant (*Phalacrocorax auritus*) is a yearlong resident of the California coast and a winter resident of the Central Valley and inland areas of Southern California. Within the Central Valley it is found within lacustrine and riverine habitats. It requires rocks, steep cliffs, dead tree branches or similar features for roosting and builds a platform nest either in trees or on the ground (Ehrlich et al. 1988). Detailed descriptions of the current distribution, habitat requirements, and foraging behaviors of the double-crested cormorant can be found in the following documents:

- San Joaquin River Restoration Study Background Report (McBain and Trush, Inc. 2002), Chapter 9, "Special-Status Plants and Wildlife," Section 9.5.4.8

- California Interagency Wildlife Task Group, California Wildlife Habitat Relationships species accounts (CDFG 2005)

It is likely that either wintering or foraging habitat could occur in the Project area or the nearby Mendota Wildlife Area.

Osprey

Status: Protected under the Migratory Bird Treaty Act and CDFG Watch List

Osprey (*Pandion haliaetus*) is a migratory and winter resident throughout California and a breeding resident of northern California. It is a large, solitary raptor that preys primarily on fish and is typically found near bodies of water. It uses rivers, lakes, bays, estuaries and surf zones to forage. It is a platform nester that builds nests along rivers, lakes and coasts (Ehrlich et al. 1988). Detailed descriptions of the current distribution, habitat requirements, and foraging behaviors of the osprey can be found in the following documents:



Osprey, Steve Hildebrand/USFWS

- San Joaquin River Restoration Study Background Report (McBain and Trush, Inc. 2002), Chapter 9, “Special-Status Plants and Wildlife,” Section 9.5.4.14
- California Interagency Wildlife Task Group, California Wildlife Habitat Relationships species accounts (CDFG 2005)

It is likely that either wintering or foraging habitat could occur in the Project area or the nearby Mendota Wildlife Area.

Northern Harrier

Status: Protected under the Migratory Bird Treaty Act and CDFG Species of Special Concern.



Northern harrier, Ned Kroeger/USFWS

Northern harrier (*Circus cyaneus*) is a widespread resident raptor in California. It builds platform nests on slightly elevated ground or in thick vegetation in areas of prairie, savannah, sloughs, wet meadows or marshes (Ehrlich et al. 1988). It forages in areas of open grassland and prairie. Detailed descriptions of the current distribution, habitat requirements, and foraging behaviors of the northern harrier can be found in the following documents:

- San Joaquin River Restoration Study Background Report (McBain and Trush, Inc. 2002), Chapter 9, “Special-Status Plants and Wildlife,” Section 9.5.4.16
- California Interagency Wildlife Task Group, California Wildlife Habitat Relationships species accounts (CDFG 2005)

- California Bird Species of Special Concern, Part II: Species Accounts, pp.149-155 (Shuford and Gardali 2008)
- In “Preliminary Surveys for Endangered and Sensitive Species, 2001 Pilot Project of the San Joaquin River Riparian Habitat Restoration Program,” (ESRP 2001), it is noted that one or more northern harriers were observed from Reach 2A of the San Joaquin River, immediately upstream of the Project area.

It is likely that foraging and nesting habitat could occur in the Project area.

Cooper’s Hawk

Status: Protected under the Migratory Bird Treaty Act and CDFG Watch List.

Cooper’s hawk (*Accipiter cooperii*) is a year round California resident found in woodlands, including riparian woodlands, and edge habitats. It builds platform nests in trees, often pine trees, in deciduous and coniferous forests (Ehrlich et al. 1998). Detailed descriptions of the current distribution, habitat requirements, and foraging behaviors of the Cooper’s hawk can be found in the following documents:

- San Joaquin River Restoration Study Background Report (McBain and Trush, Inc. 2002), Chapter 9, “Special-Status Plants and Wildlife,” Section 9.5.4.21
- California Interagency Wildlife Task Group, California Wildlife Habitat Relationships species accounts (CDFG 2005)



Cooper's hawk, James Phelps

Foraging and nesting habitat for this species could occur in the Project area.

Lesser Sandhill Crane

Status: Protected under the Migratory Bird Treaty Act and CDFG Species of Special Concern.

Lesser sandhill crane (*Grus canadensis canadensis*) is a winter resident of marshes and farmland in the Central Valley of California (Sibley 2003). It is an opportunistic forager that eats primarily aquatic insects, as well as grains, shoots, bulbs and berries (Ehrlich et al. 1988). Detailed descriptions of the current distribution, habitat requirements, and foraging behaviors of the lesser sandhill crane can be found in the following documents:



Sandhill crane, USFWS

- San Joaquin River Restoration Study Background Report (McBain and Trush, Inc. 2002), Chapter 9, “Special-Status Plants and Wildlife,” Section 9.5.3.12
- California Interagency Wildlife Task Group, California Wildlife Habitat Relationships species accounts (CDFG 2005).
- California Bird Species of Special Concern, Part II: Species Accounts, pp.167–172 (Shuford and Gardali 2008)

There may be suitable wintering or foraging habitat for this species in the Project area.

Long-billed Curlew

Status: USFWS Bird of Conservation Concern, protected under the Migratory Bird Treaty Act, and CDFG Watch List.

Long-billed curlew (*Numenius americanus*) is a winter resident of the marshes, fields, lawns and beaches of California (Sibley 2003). It builds a scrape nest usually in prairies or grassy meadows near water. It forages in a variety of habitats, feeding primarily on insects and burrow-dwelling crustaceans (Ehrlich et al. 1988). Detailed descriptions of the current distribution, habitat requirements, and foraging behaviors of the long-billed curlew can be found in the following documents:



Long-billed curlew, Lee Karney/USFWS

- San Joaquin River Restoration Study Background Report (McBain and Trush, Inc. 2002), Chapter 9, “Special-Status Plants and Wildlife,” Section 9.5.4.25
- California Interagency Wildlife Task Group, California Wildlife Habitat Relationships species accounts (CDFG 2005)
- In “Preliminary Surveys for Endangered and Sensitive Species, 2001 Pilot Project of the San Joaquin River Riparian Habitat Restoration Program,” (ESRP 2001), it is noted that one or more long-billed curlew were observed from Reach 2A of the San Joaquin River, immediately upstream of the Project area.

There may be suitable nesting or foraging habitat for the species in the Project area.

California Gull

Status: Protected under the Migratory Bird Treaty Act and CDFG Watch List.

California gull (*Larus californicus*) is a common winter resident of California that breeds in the alkali and freshwater lacustrine habitat east of the Sierra Nevada Mountains and the Cascades (CDFG



California gull, Dave Menke/USFWS

2005). A detailed description of the current distribution, habitat requirements, and foraging behaviors of the California gull can be obtained from the following source:

- California Interagency Wildlife Task Group, California Wildlife Habitat Relationships species accounts (CDFG 2005)

There may be suitable foraging and wintering habitat for the species in the Project area.

Loggerhead Shrike

Status: USFWS Bird of Conservation Concern, protected under the Migratory Bird Treaty Act, and CDFG Species of Special Concern.

Loggerhead shrike (*Lanius ludovicianus*) is a year round resident of lowlands and foothills throughout California (Sibley 2003). The shrike prefers open habitats with scattered perches and feeds mostly on large insects, but eats a variety of prey (CDFG 2005). It typically builds a cup nest in shrubs in either fields with scattered shrubs or open woodlands (Ehrlich et al. 1988). Detailed descriptions of the current distribution, habitat requirements, and foraging behaviors of the loggerhead shrike can be obtained from the following sources:

San Joaquin River Restoration Study Background Report (McBain and Trush, Inc. 2002), Chapter 9, “Special-Status Plants and Wildlife,” Section 9.5.4.31

- California Interagency Wildlife Task Group, California Wildlife Habitat Relationships species accounts (CDFG 2005)
- California Bird Species of Special Concern, Part II: Species Accounts, pp.271–277 (Shuford and Gardali 2008)
- In “Preliminary Surveys for Endangered and Sensitive Species, 2001 Pilot Project of the San Joaquin River Riparian Habitat Restoration Program,” (ESRP 2001), it is noted that one or more loggerhead shrikes were observed from Reach 2A of the San Joaquin River, immediately upstream of the Project area.



Loggerhead shrike, Dave Menke/USFWS

There may be suitable foraging and nesting habitat for this species in the Project area.

Yellow-headed Blackbird

Status: Protected under the Migratory Bird Treaty Act and CDFG Species of Special Concern.

Yellow-headed blackbird (*Xanthocephalus xanthocephalus*) is a



Yellow-headed blackbird, Dave Menke/USFWS

winter resident of California that historically bred throughout the Central Valley, although it is now patchily distributed throughout this breeding range (Shuford and Gardali 2008). It builds a cup nest and breeds almost exclusively in marshes with emergent vegetation (Ehrlich et al. 1988; Shuford and Gardali 2008). It forages primarily on grass and forb seeds. Detailed descriptions of the current distribution, habitat requirements, and foraging behaviors of the yellow-headed blackbird can be obtained from the following sources:

- California Interagency Wildlife Task Group, California Wildlife Habitat Relationships species accounts (CDFG 2005)
- California Bird Species of Special Concern, Part II: Species Accounts, pp.444-450 (Shuford and Gardali 2008)

There may be suitable foraging and nesting habitat for the species in the Project area.

4.3 Wetlands and Other Waters

Jurisdictional wetlands and other waters of the United States are Federally protected under the Clean Water Act and Rivers and Harbors Act.

USACE and the U.S. Environmental Protection Agency define wetlands as, “Those areas that are saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support a prevalence of vegetation typically adapted for the life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.”

“Waters of the United States” as defined in Code of Federal Regulations (33 CFR 328.3[a]; 40 CFR 230.3[s]) include: (1) All waters which are currently used, were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the ebb and flow of the tide; (2) All interstate waters including interstate wetlands; (3) All other waters such as intrastate lakes, rivers, streams (including intermittent streams), mud flats, sand flats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, or natural basins, the use, degradation, or destruction of which could affect interstate or foreign commerce including any such waters which are or could be used by interstate or foreign travelers for recreational or other purposes; or from which fish or shellfish are or could be taken and sold in interstate or foreign commerce; or which are used or could be used for industrial purposes by industries in interstate commerce; (4) All impoundments of waters otherwise defined as waters of the United States under the definition; (5) Tributaries of waters identified in paragraphs (1) through (4); (6) Territorial seas; and (7) Wetlands adjacent to waters (other than waters that are themselves wetlands) identified in paragraphs (1) through (6). The term “other waters of the United States” is used by USACE and the U.S. Environmental Protection Agency to characterize waterbodies, such as rivers, ponds, lakes, intermittent streams and others that do not meet the USACE’s wetland criteria, however, are jurisdictional waters.

Additional information about these natural resources can be found in the following documents:

- ERDC/EL 2008, U.S. Army Corps of Engineers, Engineering Research and Development Center/Environmental Laboratory. Wetlands Regulatory Assistance Program, April 2008, Interim Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region, Vicksburg, MS
- A Field Guide to the Identification of the ordinary high water mark (OHWM) in the Arid West Region of the Western United States. A Delineation Manual. Robert W. Lichwar and Shawn M. McCooley. August 2008. United States Corps of Engineers, Engineering Research and Development Center. ERDC/CRREL TR-08-12 (Lichwar and McCooley 2008)
- ERDC/EL 2008, U.S. Army Corps of Engineers, Engineering Research and Development Center/Environmental Laboratory. TR-08-28, Wetlands Regulatory Assistance Program, September 2008, Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region, Vicksburg, MS

Based on the reconnaissance surveys, the Project area and its 10-mile vicinity include numerous wetlands. Wetlands and other waters of the United States should be delineated in the areas that would potentially be affected by Project implementation.

Additionally, Reclamation will work to obtain further information from the USACE, the Central Valley Flood Protection Board, and other agencies that may have jurisdiction to assist with recommendations for levees and flood protection.

4.4 Special Status Plant Species

Special status plant species with potential to occur in the Project area are listed in Table 4-4. The potential for each of these species to occur is assessed in this section. Protocol surveys are proposed to identify special status plant species throughout the Project area. The survey methodology is described in Section 5.

**Table 4-4
Federally, State-, or CNPS-Listed Plant Species**

Scientific Name	Common Name	Family	Federal /State/CNPS Status	Habitat/ Communities	Potential to Occur	Blooming Period /Protocol Survey Date	Elevation
<i>Atriplex cordulata</i>	heartscale	Chenopodiaceae	--/--/1B.2	Chenopod scrub, meadows and seeps, and sandy/saline or alkaline valley and foothill grassland.	High potential to occur based on CNDDDB observations within 5 miles of the Project area and suitable habitat.	Apr-Oct/ late April	3 - 1,230 feet
<i>Atriplex depressa</i>	brittlescale	Chenopodiaceae	--/--/1B.2	Chenopod scrub, meadows and seeps, playas, valley and foothill grassland, and alkaline or clay vernal pools.	High potential to occur based on CNDDDB observations within 10 miles of the Project area and suitable habitat.	Apr-Oct/ late April	3 – 1,050 feet
<i>Atriplex minuscula</i>	lesser saltscale	Chenopodiaceae	--/--/1B.1	Chenopod scrub, playas, and alkaline or sandy valley and foothill grassland.	High potential to occur based on CNDDDB observations within 10 miles of the Project area and suitable habitat.	May-Oct/ mid June	50 - 660 feet
<i>Atriplex persistens</i>	vernal pool smallscale	Chenopodiaceae	---/--/1B.2	Alkaline vernal pools.	High potential to occur based on CNDDDB observations within 10 miles of the Project area and suitable habitat.	Jun-Oct / mid June	30 - 380 feet
<i>Atriplex subtilis</i>	subtle orache	Chenopodiaceae	--/--/1B.2	Valley and foothill grassland.	High potential to occur based on CNDDDB observations within 5 miles of the Project area and suitable habitat.	Jun-Aug (Oct*) *uncommon/ mid June	130 - 330 feet
<i>Atriplex vallicola</i>	Lost Hills crownscale	Chenopodiaceae	--/--/1B.2	Chenopod scrub, valley and foothill grassland, and alkaline vernal pools.	High potential to occur based on CNDDDB observations within 5 miles of the Project area and suitable habitat.	Apr-Aug/ late April	165 - 2,080 feet
<i>Castilleja campestris</i> ssp. <i>succulenta</i>	succulent owl's-clover	Scrophulariaceae	FT/SE/1B.2	Vernal pools (often acidic).	Low potential to occur based on habitat and elevation.	Apr-May/ late April	165 – 2,460 feet

Table 4-4
Federally, State-, or CNPS-Listed Plant Species

Scientific Name	Family	Federal /State/CNPS Status	Habitat/ Communities	Potential to Occur	Blooming Period /Protocol Survey Date	Elevation
<i>Caulanthus californicus</i> California jewel-flower	Brassicaceae	FE/SE/1B.1	Chenopod scrub, pinyon and juniper woodland, and sandy valley and foothill grassland.	Medium potential to occur based on habitat and elevation.	Feb-May/ mid March	200 - 3,280 feet
<i>Cordylanthus palmatus</i> palmate-bracted bird's beak	Scrophulariaceae	FE/SE/1B.1	Chenopod scrub and alkaline valley and foothill grassland.	High potential to occur based on CNDDDB observations within 5 miles of the Project area and suitable habitat.	May-Oct/ mid June	15 - 510 feet
<i>Delphinium recurvatum</i> recurved larkspur	Ranunculaceae	--/1B.2	Chenopod scrub, cismontane woodland, and alkaline valley and foothill grassland.	High potential to occur based on CNDDDB observations within 10 miles of the Project area and suitable habitat.	Mar-Jun/ mid March	10 - 2,460 feet
<i>Imperata brevifolia</i> California satintail	Poaceae	--/2.1	Chaparral, coastal scrub, Mojavean desert scrub, meadows and seeps (often alkali), and mesic riparian scrub.	Medium potential to occur based on habitat and elevation.	Sep-May/ mid March	0 - 1,640 feet
<i>Layia munzii</i> Munz's tidy tips	Asteraceae	--/1B.2	Chenopod scrub and alkaline clay valley and foothill grassland.	High potential to occur based on CNDDDB observations within 5 miles of the Project area and suitable habitat.	Mar-Apr/ mid March	490 – 2,300 feet
<i>Leptosiphon serrulatus</i> Madera leptosiphon	Polemoniaceae	--/1B.2	Cismontane woodland and lower montane coniferous forest.	Low potential to occur. No habitat and lower elevation.	Apr-May/ late April	980 – 4,265 feet
<i>Monolopia congdonii</i> San Joaquin woollythreads	Asteraceae	FE--/1B.2	Chenopod scrub and sandy valley and foothill grassland.	High potential to occur based on CNDDDB observations within 10 miles of the Project area and suitable habitat.	Feb-May/ mid March	200 – 2,630 feet
<i>Orcuttia inaequalis</i> San Joaquin Valley Orcutt grass	Poaceae	FT/SE/1B.1	Vernal pools.	Medium potential to occur based on elevation.	Apr-Sep/ late April	30 – 2,500 feet

**Table 4-4
Federally, State-, or CNPS-Listed Plant Species**

Scientific Name	Common Name	Family	Federal /State/CNPS Status	Habitat/ Communities	Potential to Occur	Blooming Period /Protocol Survey Date	Elevation
<i>Orcuttia pilosa</i>	hairy Orcutt grass	Poaceae	FE/SE/1B.1	Vernal pools.	Medium potential to occur based on elevation.	May-Sep/ mid June	150 - 660 feet
<i>Sagittaria sanfordii</i>	Sanford's arrowhead	Alismataceae	--/1B.2	Assorted shallow freshwater Marshes and swamps.	High potential to occur based on CNDDDB observations within 5 miles of the Project area and suitable habitat.	May-Oct/ mid June	0 – 2,130 feet
<i>Tropidocarpum capparideum</i>	caper-fruited tropidocarpum	Brassicaceae	--/1B.1	Alkaline hills valley and foothill grassland.	Medium potential to occur based on habitat and elevation.	Mar-Apr/ mid March	1 – 1,500 feet

Key:

U.S. Fish and Wildlife Service Federal Listing Categories:

FE = Federally Listed as Endangered

FT = Federally Listed as Threatened

California Department of Fish and Game State Listing Categories:

SE = State Listed as Endangered

ST = State Listed as Threatened

California Native Plant Society Listing Categories:

List 1A = Plants presumed extinct in California

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

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

List 1B.3 = Plants rare, threatened, or endangered in California and elsewhere, not very threatened in California

List 2.1 = Plants rare, threatened, or endangered in California, but more common elsewhere; seriously threatened in California

4.4.1 Federally and State-Listed Plants

Succulent Owl's Clover (Castilleja campestris ssp. succulenta)

Status: Federally listed as threatened, State listed as endangered, CNPS List 1B.2. Critical habitat for succulent owl's clover has been designated near Reach 1A of the San Joaquin River. Succulent owl's clover, also known as fleshy owl's-clover, is an annual herb, that is native to California and is endemic (limited) to California alone. Like other members of *Castilleja* and related genera, it is partly parasitic (hemiparasitic) on the roots of other plants. It belongs to the snapdragon family (*Scrophulariaceae*). Succulent owl's clover occurs on the margins of vernal pools, swales and some seasonal wetlands, often on acidic soils. It is never dominant and it is typically found in only a few of the vernal pools in an area. It is found only in vernal pools along the rolling lower foothills and valleys along the eastern San Joaquin Valley in the Southern Sierra Foothills Vernal Pool Region. Habitat loss and fragmentation are the largest threats to the survival and recovery of this vernal pool species. More detailed species description can be found in the following document:

- San Joaquin River Restoration Study Background Report (McBain and Trush, Inc. 2002), Chapter 9, “Special-Status Plants and Wildlife”

There are no known occurrences from the Project area and its 10-mile vicinity. Critical habitat for this species has been designated in other areas of the California Central Valley (Federal Register 50 CFR Part 17). There is a low potential for the plant to occur based on habitat, known occurrences in the Project area, and vicinity and elevation.

California Jewel-Flower (*Caulanthus californicus*)

Status: Federally and State listed as endangered, CNPS List 1B.1 species. This CNPS designation indicates that it is a California endemic considered by CNPS to be seriously endangered because greater than 80 percent of occurrences are threatened. Critical habitat has not been designated for California jewel-flower. California jewel-flower (*Caulanthus californicus*) is an annual herb that is native to California. An annual in the mustard family (Brassicaceae), California jewel-flower grows to about 4 inches in height (Hickman 1993). Its seeds germinate in the fall when the rainy season begins, but additional seedlings may continue to emerge for several months (USFWS 1998). California jewel-flower seedlings develop into rosettes (clusters of leaves at ground level) during the winter months. This species blooms



California jewel-flower, USFWS

between February and May and seed set continues until the plants die, which may occur as late as May in years of favorable rainfall and temperatures. Both plant size and population size of California jewel-flower vary substantially depending on site and weather conditions (USFWS 1998). California jewel-flower grows at elevations of 0 to 3,000 feet in shadscale scrub, valley and foothill grassland, and pinyon-juniper woodland (CNPS 2009). Its geographic range is in the southern San Joaquin Valley, but it was formerly much more widespread. More detailed species description can be found in the following documents:

- San Joaquin River Restoration Study Background Report (McBain and Trush, Inc. 2002), Chapter 9, “Special-Status Plants and Wildlife”
- U.S. Fish and Wildlife Service. 1998. *Recovery plan for upland species of the San Joaquin Valley, California*. Region 1, Portland, OR. 319 pp.

There are no known occurrences of the species from the Project area and its 10-mile vicinity. The potential for the species to occur, based on habitat, known occurrences in the Project area and vicinity and elevation is low.

Palmate-Bracted Bird’s-Beak (*Cordylanthus palmatus*)

Status: Federally listed as endangered, State listed as endangered, CNPS List 1B.1. Palmate-bracted bird’s-beak is a hemiparasitic annual. Saltgrass is the most likely host plant for palmate-bracted bird’s-beak. The combination of hemiparasitism, salt excretion, and a deep root system allows palmate-bracted bird’s-beak to grow during the hot, dry

months after most other annuals have died (Coats et al. 1993). This species is restricted to seasonally flooded, saline-alkali soils in lowland plains and basins at elevations of less than 150 meters (500 feet). Within these areas, palmate-bracted bird's-beak grows primarily along the edges of channels and drainages, with a few individuals scattered in seasonally wet depressions, alkali scalds, and grassy areas (USFWS 1998). More detailed species description can be found in the following documents:



Palmate-bracted bird's-beak, USFWS

- San Joaquin River Restoration Study Background Report (McBain and Trush, Inc. 2002), Chapter 9, “Special-Status Plants and Wildlife”
- U.S. Fish and Wildlife Service. 1998. *Recovery plan for upland species of the San Joaquin Valley, California*. Region 1, Portland, OR. 319 pp.

The occurrence of palmate-bracted bird's-beak has been recorded at the Alkali Sink Ecological Reserve and Mendota National Wildlife Refuge. CNPS records indicate occurrences in the Kerman (359A), Tranquillity (360A), Firebaugh NE (381A) and Poso Farm (381B) quadrangles. These are immediately adjacent to the Project area quadrangle Mendota Dam (381D). The potential for this plant to occur in the Project area is high.

San Joaquin Woollythreads (Monolopia congdonii)

Status: Federally listed as endangered, CNPS List 1B.2. This CNPS designation indicates that it is a California endemic considered by CNPS to be fairly endangered because 20 to 80 percent of known occurrences are threatened. Critical habitat has not been proposed for San Joaquin woollythreads. An annual in the sunflower family (Asteraceae), San Joaquin woollythreads is 2 to 12 inches tall (Hickman 1993). It grows at elevations of 200–2,650 feet in alkali sinks and 21 valley and foothill grassland with sandy soils (CNPS 2009). *The Jepson Manual* treats this plant as *Lembertia congdonii* (Hickman 1993). The geographic range of San Joaquin woollythreads is in the southwestern San Joaquin Valley (Hickman 1993). Plants bloom between February and May, shed seed immediately upon maturity, and then die and break apart. As part of efforts to conserve San Joaquin woollythreads, extensive surveys of potential habitat for this species have been conducted on public lands, and its ecology has been researched (USFWS 1998). A recovery strategy for the species is provided in Recovery Plan for Upland Species of the San Joaquin Valley, California (USFWS 1998). More detailed species description can be found in the San Joaquin River Restoration Study Background Report (McBain and Trush, Inc. 2002), Chapter 9, “Special-Status Plants and Wildlife.” CNPS has recorded the species in the vicinity of the Project area in DWR quadrangle Coit Ranch (360B) approximately 8 miles south of the Project area. Based on the presence of the plant's preferred habitat in the Project area, occurrence in the vicinity and the elevation range, the potential for the species to occur in the Project area is high.

San Joaquin Valley Orcutt Grass (*Orcuttia inaequalis*)

Status: San Joaquin Valley Orcutt grass is Federally and State listed as endangered and is a CNPS List 1B.1 species. This CNPS designation indicates that it is a California endemic considered by CNPS to be seriously endangered because more than 20 of 26 occurrences are threatened. Critical habitat for this species is designated immediately adjacent to Reach 1A. San Joaquin Valley Orcutt grass is a small, grayish-green, sticky, aromatic, tufted annual in the grass family (Poaceae) that occurs in vernal pools. The plant has several stems 2–6 inches tall, terminating in a spike-like inflorescence (58 Federal Register [149]:41700–41708, August 5, 1993). The blooming period for this species is from May through September (Skinner and Pavlik 1994). San Joaquin Valley Orcutt grass occurs near Friant, and suitable habitat for this species is present on clay soils on hillsides far above the river. Restoration actions that influence vernal pools could affect this species. The overall trend for this species is one of decline (CDFG 1999). More detailed species description can be found in the San Joaquin River Restoration Study Background Report (McBain and Trush, Inc. 2002), Chapter 9, “Special-Status Plants and Wildlife.” San Joaquin Valley Orcutt grass is not known from the Project area or its vicinity. It has been documented in the Fresno North, Friant, and Lanes Bridge quadrangles (CDFG 2009a). Based on the sandy nature of the soils in the vicinity of Reach 2B, the lack of preferred habitat (vernal pools) and no known occurrences within the nine-quad Project area, the potential for the plant to occur is low.

Hairy Orcutt Grass (*Orcuttia pilosa*)

Status: Hairy Orcutt grass is Federally and State listed as endangered and is a CNPS List 1B.1 species. This designation indicates that it is a California endemic considered by CNPS to be seriously endangered because greater than 80 percent of occurrences are threatened. Hairy Orcutt grass (*Orcuttia pilosa*) is an annual species native to California. It is a yellow-green, tufted annual of the grass family. This species is found in vernal pools in undulating topography on remnant alluvial fans and stream terraces. The species grows primarily in large pools that retain water until late spring (Stone et al. 1988). Its elevation range is 175–650 feet. The life history of hairy Orcutt grass is similar to that of other species in its genus (*Orcuttia*). Inflorescences appear a few days after the water in the pools evaporates, as early as May and sometimes even in mid-April. Most flowers and seed are produced in June and July; however, flowering may continue into September in wet years (Griggs 1980, 1981). More detailed species description can be found in the San Joaquin River Restoration Study Background Report (McBain and Trush, Inc. 2002), Chapter 9, “Special-Status Plants and Wildlife.” Critical habitat for this species is designated in and immediately adjacent to Reach 1A of the San Joaquin River in the Gregg, Herndon, Lanes Bridge, and Madera quadrangles. There are no known occurrences in the Project area; the nearest documented CNPS occurrence is located in the Madera quadrangle (380A). Based on the lack of preferred habitat (vernal pools), known occurrences near the Project area and elevational distribution, the potential for the plant to occur is medium.

4.4.2 CNPS Rare, Threatened, or Endangered (List 1 and 2 Plants)

Heartscale (Atriplex cordulata)

Status: CNPS List 1B.2. Heartscale is an annual herb of the goosefoot family (Chenopodiaceae) that grows 10–50 cm (4–20 inches) tall (Hickman 1993). This species lives in moderately alkaline or saline soil in chenopod scrub, desert scrub, or sandy grassland habitats (Skinner and Pavlik 1994). Heartscale blooms from April to October (Skinner and Pavlik 1994). More detailed species description can be found in the San Joaquin River Restoration Study Background Report (McBain and Trush, Inc. 2002), Chapter 9, “Special-Status Plants and Wildlife.” Heartscale has been reported to occur in the Project area (Mendota Dam DWR quadrangle 381D). CNPS records identify the species also in the adjacent Jamesan (359B), Tranquillity (360A), Bonita Ranch (380B), Gravelly Ford (380C), Firebaugh NE (381A), and Poso Farm (381B) quadrangles. There is a high potential for the plant to occur based on appropriate habitat, soil type and known occurrences.

Brittlescale (Atriplex depressa)

Status: CNPS List 1B.2. Brittlescale is an annual herb from the goosefoot family (Chenopodiaceae). The species is found in chenopod scrub, playas, and valley foothill grassland habitats on clay or alkaline soils (Skinner and Pavlik 1994). More detailed species description can be found in the San Joaquin River Restoration Study Background Report (McBain and Trush, Inc. 2002), Chapter 9, “Special-Status Plants and Wildlife.” CNPS and CNDDDB records identify brittlescale in the Jamesan (359B) and Tranquillity (360A) quadrangles adjacent to the Project area. High potential to occur based on habitat and nearby occurrences.

Lesser Saltscale (Atriplex minuscula)

Status: CNPS List 1B.1. Lesser saltscale is an annual herb of the goosefoot family (Chenopodiaceae) (Hickman 1993). The species has many upright reddish stems that grow up to 40 cm (16 inches) tall, as well as egg-shaped leaves. Lesser saltscale occurs in alkaline soils of chenopod scrub, playa, and grassland habitats. The flowering period of lesser saltscale is May–October (Skinner and Pavlik 1994). More detailed species description can be found in the San Joaquin River Restoration Study Background Report (McBain and Trush, Inc. 2002), Chapter 9, “Special-Status Plants and Wildlife.” Based on CNPS and CNDDDB records, this plant occurs in the Project area (Mendota Dam 381D) and the adjacent Jamesan (359B), Bonita Ranch (380B), Gravelly Ford (380C), and Firebaugh NE (381A), Poso Farm (381B). High potential to occur based on records of presence in the Project area and vicinity, habitat, soils and elevation.

Vernal Pool Smallscale (Atriplex persistens)

Status: CNPS List 1B.2. Vernal pool smallscale is an annual herb of the goosefoot family (Chenopodiaceae). This species is found in chenopod scrub and vernal pool communities. The flowering period of vernal pool smallscale is July–September (Skinner and Pavlik 1994). More detailed species description can be found in the San Joaquin River Restoration Study Background Report (McBain and Trush, Inc. 2002), Chapter 9, “Special-Status Plants and Wildlife.” The species has been recorded by CNPS and CNDDDB in the Bonita Ranch (380B), and Gravelly Ford (380C) quadrangles, which are

adjacent to the Project area quadrangle. The potential for the species to occur, based on presence in the immediate vicinity of the Project area, the appropriate habitat and elevation, is high.

Subtle Orache (Atriplex subtilis)

Status: CNPS List 1B.2. Subtle orache is a short-statured, fine-textured, annual in the goosefoot family occurring in valley and foothill grasslands. Its blooming period is from June to October. More detailed species description can be found in the San Joaquin River Restoration Study Background Report (McBain and Trush, Inc. 2002), Chapter 9, “Special-Status Plants and Wildlife.” Based on CNPS and CNDDDB records, this plant occurs in the Project area (Mendota Dam 381D) and the adjacent Jamesan (359B), Bonita Ranch (380B), Gravelly Ford (380C), and Firebaugh NE (381A) quadrangles. The potential for the species to occur in the Project area is high. The plant has been recorded in the Project area and its immediate vicinity.

Lost Hills Crownscale (Atriplex vallicola)

Status: CNPS List 1B.2. Lost Hills crownscale is an annual plant in the goosefoot family. It is a small (< 8 inches in height) one to few stem, generally erect plant with ascending to erect branches and stiff, gray-scaly, surfaces that become glabrous. The leaves are elliptic to ovate, green to gray-scaly, entire with a tapered to obtuse base. The plant occurs near dried ponds on alkaline soils in vernal pools, and in chenopod scrub and valley and foothill grassland (CNPS 2009). The species intergrades with *A. coronata*, perhaps best considered a subspecies of it (Hickman 1993). More detailed species description can be found in the San Joaquin River Restoration Study Background Report (McBain and Trush, Inc. 2002), Chapter 9, “Special-Status Plants and Wildlife.” CNPS and CNDDDB records indicate presence in the immediate vicinity of the Project area in the Jamesan (359B) and Tranquillity (360A) quadrangles. Based on the known occurrences and the presence of appropriate habitat, the potential for the Lost Hills crownscale to occur in the Project area is high.

Recurved Larkspur (Delphinium recurvatum)

Status: CNPS List 1B.2. Recurved larkspur, a member of the buttercup family (Ranunculaceae), is a perennial herb that grows 18–85 centimeters tall (Hickman 1993). This species grows in seasonal alkali wetlands of chenopod scrub, grassland, and montane woodland communities, typically in valley bottoms on heavy clay alkali soils (Jones and Stokes Associates 1998). Recurved larkspur blooms from March through May (Skinner and Pavlik 1994). It is widely distributed throughout elevations of 30–600 meters in California’s Central Valley (Hickman 1993). More detailed species description can be found in the San Joaquin River Restoration Study Background Report (McBain and Trush, Inc. 2002), Chapter 9, “Special-Status Plants and Wildlife.” The plant is known from the immediate vicinity of the Project area. Its presence has been recorded in the CNDDDB and CNPS databases from the Jamesan (359B), Bonita Ranch (380B), Firebaugh NE (381A) and Firebaugh (381C) quadrangles. The potential for recurved larkspur to occur in the Project area is high based on its recorded presence in the immediate vicinity, the appropriate habitat and soils.

Munz's Tidy Tips (Layia munzii)

Status: CNPS List 1B.2. Munz's tidy tips is an annual in the sunflower family (Asteraceae). It is 3–20 inches tall (Hickman 1993) and blooms between March and April (CNPS 2009). It grows at elevations of 150–2,600 feet in alkaline clay soils in low-lying areas and on hillsides in chenopod scrub, valley sink scrub and valley and foothill grassland. Populations may be evident only in wet years. Restoration actions that influence grasslands and scrub could affect this species. More detailed species description can be found in the following documents:

- San Joaquin River Restoration Study Background Report (McBain and Trush, Inc. 2002), Chapter 9, "Special-Status Plants and Wildlife"
- U.S. Fish and Wildlife Service. 1998. *Recovery Plan for Upland Species of the San Joaquin Valley, California*. Region 1, Portland, OR. 319 pp.

CNDDDB and CNPS have records of this species in the Jamesan (359B), Tranquillity (360A), Coit Ranch (360B), Firebaugh (381C) quadrangles, which are adjacent to the Project area quad (Mendota Dam 381D). Even though the majority of soils in Reach 2B is sandy while this species appears to predominantly occur on clayey soils, the potential for the plant to occur within the Project area is high based on numerous known occurrences in the immediate vicinity.

Sanford's Arrowhead (Sagittaria sanfordii)

Status: CNPS List 1B.2. Sanford's arrowhead is a rhizomatous emergent perennial herb of the water-plantain family (Alismataceae). This species grows in freshwater marshes, ponds, and ditches and various other shallow stagnant or slowly moving freshwater habitats (Hickman 1993) and flowers from May through October (Skinner and Pavlik 1994). More detailed species description can be found in the San Joaquin River Restoration Study Background Report (McBain and Trush, Inc. 2002), Chapter 9, "Special-Status Plants and Wildlife." The CNPS and CNDDDB databases contain records of the plant's presence from the Project area quadrangle (Mendota Dam 381D), however, the species has not been observed there since 1948. This site was surveyed in 1980, however no plants were found. Another adjacent quadrangles where the plant was recorded by CNPS is Jamesan (359B). The potential for the plant to occur in the Project area is high based on previous occurrence records and suitable habitat.

4.5 Special Status Vegetation Alliances

This section lists special status vegetation alliances with a potential to occur in the Project area and the Project area 10-mile vicinity. The first vegetation alliance name is the 2003 terrestrial natural community designation (CDFG 2003a), the second and third are the current vegetation alliance common and scientific names (CDFG 2009b). The vegetation alliances' global and state rank is noted in parentheses. Protocol surveys will be performed to identify special status vegetation alliances throughout the Project area. The survey methodology is described in Section 5.1.4. Detailed descriptions of these special status vegetation alliances are included in Attachment A.

4.5.1 Globally or State Ranked Critically Imperiled Vegetation Alliances

There are no globally or State ranked critically imperiled special status vegetation alliances known to occur in the Project area or within a 10-mile vicinity of the Project area.

4.5.2 Globally or State Ranked Imperiled Vegetation Alliances

There are six globally or State ranked imperiled special status vegetation alliances known to occur within a 10-mile vicinity of the Project area.

- Box-Elder Forest, box-elder forest – *Acer negundo* alliance, (G5S2)
- Buttonbush Scrub, button willow thickets – *Cephalanthus occidentalis* alliance, (G5S2)
- Tar Plant Fields, tar plant fields – *Centromadia pungens* or other spp. herbaceous alliance (G2?S2?)⁵
- Alkali Sacaton Grassland, alkali sacaton grassland – *Sporobulus airoides* alliance, (G4S2)
- Ditch-Grass Wetland, widgeon-grass mats – *Ruppia (cirrhosa, maritima)* aquatic herbaceous alliance (G4?S2)
- Western Sea-Purslane Marsh, Western sea-purslane marsh – *Sesuvium verrucosum* herbaceous alliance (G3S2.2)

4.5.3 Globally or State-Ranked Vulnerable Vegetation Alliances

There are 13 globally or State ranked vulnerable special status vegetation alliances known to occur within a 10-mile vicinity of the Project area.

- Valley Sink Scrub, Iodine bush scrub – *Allenrolfea occidentalis* alliance (G4S3)
- Northern Claypan Vernal Pool, includes the following three alliances: 1) Fremont's goldfields–saltgrass alkaline vernal pools - *Lasthenia fremontii* – *Distichlis spicata* alliance (G4S3); 2) Fremont's goldfields–Downingia vernal pools - *Lasthenia fremontii* – *Downingia (bicornuta)* alliance (G3S3); and 3) smooth goldfields vernal pool bottoms - *Lasthenia glaberrima* alliance (G3S3)
- Valley Oak Forests and Woodlands, Valley oak woodland - *Quercus lobata* woodland alliance (G3S3)
- Oregon Ash Riparian Forest, Oregon ash groves – *Fraxinus latifolia* forest alliance (G4S3.2)
- California Sycamore Riparian Forest and Woodland, California sycamore woodlands – *Platanus racemosa* alliance (G3S3)
- Fremont Cottonwood Riparian Forests and Woodlands, Fremont cottonwood forest - *Populus fremontii* alliance (G4S3.2)
- Black Willow Riparian Forests and Woodlands, Black willow thickets – *Salix gooddingii* alliance (G4S3)

⁵ Question mark denotes temporary status where CDFG has not made a final decision about the rank(s).

- Red Willow Riparian Forests, Red willow thickets – *Salix laevigata* woodland alliance (G3S3)
- Spinescale Scrub, Spinescale scrub – *Atriplex spinifera* alliance (G3S3)
- California Rose Riparian Scrub, California rose briar patches – *Rosa californica* alliance (G3S3)
- Bush Seepweed Scrub, Bush seepweed scrub – *Suaeda moquinii* alliance (G5S3.2)
- Elderberry Scrub and Savanna, Blue elderberry stands – *Sambucus nigra* shrubland alliance (G3S3)
- Alkali Heath Dwarf Scrub, Alkali heath marsh – *Frankenia salina* alliance (G4S3)

4.6 Groundwater

This section identifies existing groundwater data sources and presents a brief evaluation of that data.

Seepage and waterlogging damage to crops in low-lying farmland has historically been an issue in the lower reaches of the San Joaquin River. Large scale groundwater development has lowered the shallow pre-development water table in the Delta-Mendota Subbasin and other parts of the San Joaquin River Hydrologic Region, but the potential for waterlogging of crops adjacent to Reach 2B exists due to introduction of Restoration Flows and will be evaluated. Descriptions of the current distribution of groundwater levels can be found in the DWR Water Data Library

(<http://www.water.ca.gov/waterdatalibrary>) and the following documents:

- SJRRP. 2010. San Joaquin River Restoration Program. Reach 2B Preliminary Monitoring Well Data Maps. Available at: www.restoresjr.net/activities/if/
- McBain and Trush, Inc. (eds.). 2002. San Joaquin River Restoration Study Background Report, Chapter 4: Shallow Groundwater Hydrology. Prepared for Friant Water Users Authority, Lindsay California, and Natural Resources Defense Council, San Francisco, California.
- USGS. 2009. Groundwater Availability of the Central Valley Aquifer, California. Faunt, C. (ed). Professional Paper 1766.
- DWR. 2003. California's Groundwater, Bulletin 118, Update 2003

In some portions of San Joaquin River and Tulare Lake hydrologic regions natural drainage conditions are inadequate to remove the quantities of deep percolation that accrue to the water table where the upper, semiconfined aquifer is shallow. Therefore, groundwater levels often encroach on the root zone of agricultural crops, and subsurface drainage must be supplemented by constructed facilities for irrigation to be sustained. Present problem areas were defined by DWR in the San Joaquin Valley Drainage Program (SJVDP) as locations where the water table is within 5 feet of the ground

surface at any time during the year. Potential problem areas were defined in the SJVDP at locations where the water table is between 5 and 20 feet below the ground surface. The term “shallow groundwater” is referred to as the highest zone of saturation down to a depth of approximately 20 feet (SJRRP unpublished data).

The preliminary depth to water monitoring threshold for Reach 2B was set at 7 feet below ground surface, according to the Preliminary Monitoring Well Data Maps (SJRRP 2010). A 2-foot buffer zone was established between the monitoring threshold and the action threshold, with the action threshold at the top of the buffer zone (which started at 5 feet in the case of Reach 2B). If the depth to water rises above the 7 foot below ground surface range, a site evaluation is performed to determine if any actions are necessary. If no actions are required, then new thresholds are set and monitoring continues. To date, one action to increase monitoring frequency has been taken for one well. According to the weekly groundwater report of SJRRP preliminary groundwater elevation and seepage monitoring well data, thresholds have been reset on three wells, with new buffer zones from 4 – 6 feet and 6 – 8 feet below ground surface (SJRRP 2010).

Monitoring thresholds for salinity are expressed as crop salt tolerance levels of concern (LOC) for the active root zone (0–30 inches below ground surface) and LOC for the plow layer (0–12 inches) associated with early-season establishment of crops. Salt tolerance is expressed as the electrical conductivity of the saturation extract (EC_e) value in 22 decisiemens per meter (dS/m) at 25 degrees Celsius. The current Reach 2B thresholds are 1.5 dS/m for the active root zone and 2.0 dS/m for the plow layer (SJRRP unpublished data).

According to SJRRP unpublished data, shallow groundwater problem areas are generally limited to areas northwest, west, and southwest of Mendota Pool and Fresno Slough. DWR’s Water Data Library has about 20 wells that are within approximately 2,000 feet of the San Joaquin River’s Reach 2B (an arbitrary corridor width for screening purposes only). None of the 20 wells has recent water levels within 20 feet of the ground surface, though only a few are close to the river and their screen intervals are unknown.

Seven SJRRP monitoring wells and two piezometers have been constructed along Reach 2B to characterize groundwater conditions and monitor water levels (SJRRP unpublished data, SJRRP 2010) (Figure.4-1). Depth-to-water measurements from these monitoring points are available from July to November 2009.

The seven monitoring wells are along San Mateo Avenue at river mile 211.8. The top of the perforated intervals range from 10 to 40 feet below ground surface (bgs), and the wells are up to 52.5 feet deep (SJRRP unpublished data). Water level monitoring beginning July 2009 indicated that water levels were generally below 20 feet bgs (20 feet bgs or less is considered a shallow water table). However, two of the wells indicated water levels above 20 feet bgs (as shallow as 11.68 feet bgs (SJRRP 2010) (Figure 4-1). These water level data indicate that shallow groundwater areas are present in the upstream part of Reach 2B. Water level monitoring will continue in the upstream part of Reach 2B to confirm that water levels remain below the monitoring threshold of 7 feet bgs.

The two SJRRP piezometers (PZ-09-R2B-1 and -2) are further downstream, approximately 1.5 miles above the Mendota Pool and just north of the Mendota Pool, respectively (Figure 4-1), on the properties of landowners who identified historical seepage issues. The depth to water in PZ-09-R2B-1 and -2 in October and November 2009 ranged from 9.7 to 10.9 feet bgs and 5.7 to 6.05 feet bgs, respectively. These water level data, along with the landowner-identified seepage shown on Figure 4-1, indicate that the depth to water is at least locally above the monitoring threshold of 7 feet bgs, and seepage issues will need to be closely monitored in the lower part of Reach 2B to determine if actions are necessary. Soil sampling and soil salinity surveys—together with routine visual monitoring patrols and local landowner reporting of crop health, levee seeps or boils, and other observations—are also part of the monitoring program (SJRRP unpublished data). No additional field surveys are recommended for this issue. The results of planned future USGS groundwater modeling should also be reviewed as they become available, as discussed in Section 5.2.

Mendota Pool Bypass and Reach 2B Improvements Project

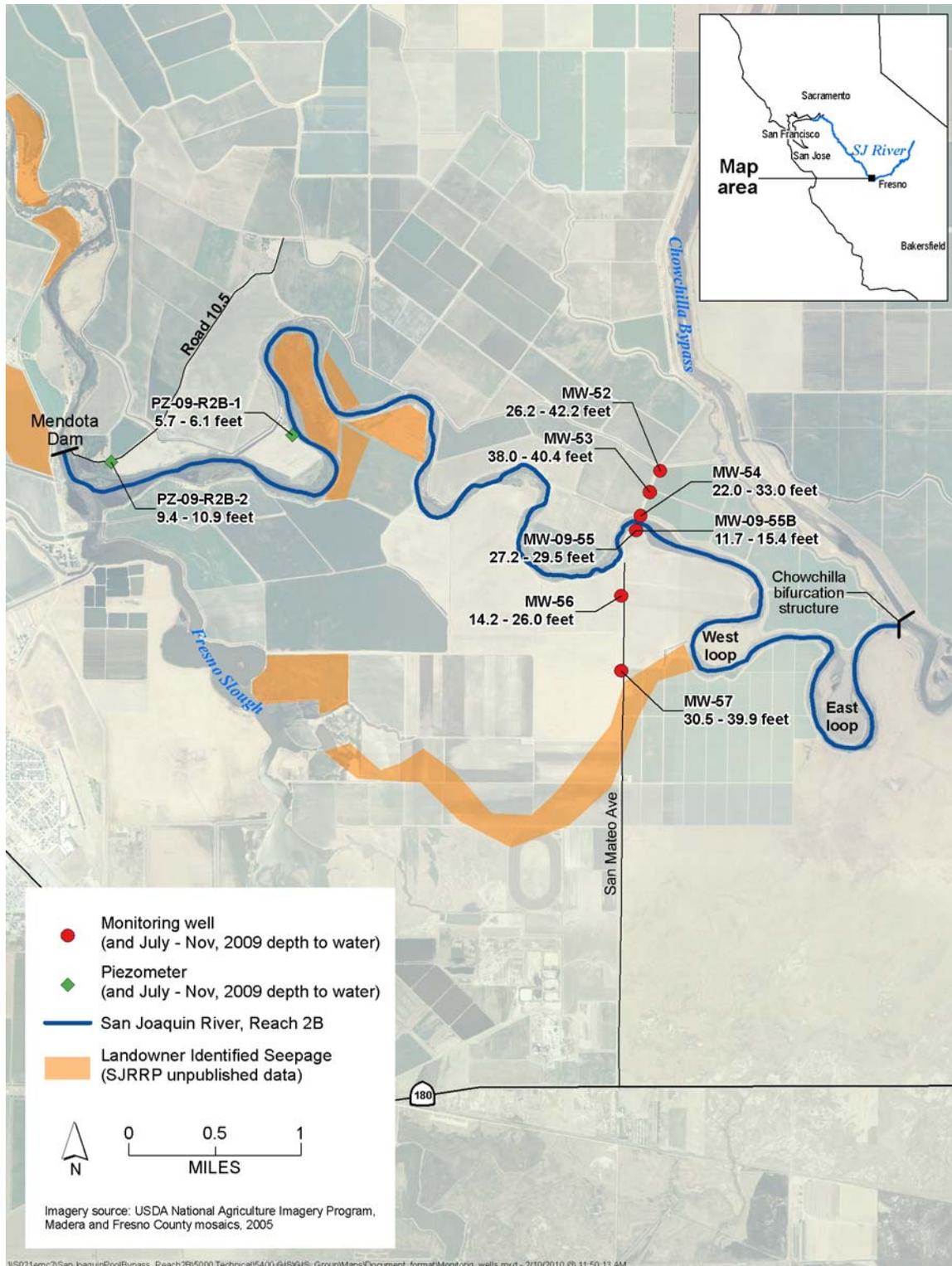


Figure 4-1
Monitoring Wells

4.7 Hydro-Geomorphology

This section identifies existing data sources associated with hydrology, geomorphology, hydraulics and sediment transport, and presents a brief evaluation of that data.

4.7.1 Hydrology

Hydrology involves the determination of river flows for design purposes. River flows can include base flows, habitat flows, bankfull flows and flood flows. Pre-Friant Dam 2-year peak flow was about 16,500 cfs. The selected Interim and Restoration design flows have been determined through the Settlement and are available for analysis.

- Existing levee design capacity: 2,500 cfs
- Proposed levee design capacity: 4,500 cfs

MEI (2000) derived a flow loss curve for the reach between Friant Dam and Gravelly Ford, and found that no flow reaches the bifurcation structure when flows are 75 cfs or less at Gravelly Ford. However, flow loss tapers to 5% when flows are about 4,000 cfs at Gravelly Ford.

MEI (2000) studied post-Friant Dam daily mean flows from 1949 to 1998, and the spring flood flow releases in 1986 and 1995. These spring flood flow releases generally ranged from March to June. MEI compared the sediment transport capacity under the existing condition to the proposed step flow release scenarios of interest at that time (San Joaquin River Riparian Habitat Restoration Program). Under the current program, a new set of flows will be analyzed as stipulated in the Settlement. To facilitate a long-term stability assessment, a synthetic flow record of the expected future condition in the form of a flow duration curve is recommended.

4.7.2 Geomorphology

Geomorphology involves determination of the size and shape of a river's active channel and floodplain that over time remains stable. A stable channel is loosely defined as one that neither aggrades nor degrades, but maintains its average cross-section, planform, and profile features over time. A stable channel can tolerate short-term disturbances (e.g., El Nino) without significant long-term impacts, or it might migrate laterally while maintaining its general geometric features. This condition is referred to as dynamic equilibrium.

Due to the indeterminate nature of geomorphology as a practice, restoration professionals rely on analog information (i.e., reference data) or hydraulic geometry equations (i.e., published empirical or theoretical relationships) to derive the stable channel dimensions. Reference data and hydraulic geometry establish relationships between stable channel dimensions and a scalable independent variable, such as bankfull flow. Data available to estimate the geomorphically-based stable channel include the following:

- Historical aerial photos, best available are 1937, 1938, and 1998. (Pre-1937 aerials do not exist.)
 - 1937 photographs, obtained from Exchange Contractors and from the Bureau of Reclamation, extend from Ledger Island (river mile [RM] 263) downstream to Sack Dam (RM 182).
 - 1998 photographs obtained from Bureau of Reclamation extend from Friant Dam (RM 267.5) to the Merced River confluence (RM 118).
- Cain (1997) and JSA/MEI (1998) provide summaries of physical processes and historical and existing morphology of the river from Friant Dam to the Merced River confluence, including data required for the hydraulic and sediment transport assessments described below.
- Current channel dimensions as represented in available topography and survey data (see below).

4.7.3 Hydraulics

Hydraulic modeling involves computation of flow depth, velocity, shear stress, and other parameters that tend to control the erosiveness of river flows and sediment transport through the Project reach. Hydraulics drives geomorphic processes. Data available for hydraulic studies include the following:

- Land topography, channel geometry
 - 1998/1999 data (Ayres 1998, 1999), 2-foot contour interval, DTM format, NAVD29, does not cover land area outside the river levees
 - JSA/MEI (1998) additional cross-section surveys in Reach 2
 - RM stationing based on 1993 aerial photos
 - 2008 LiDAR, 1-foot contours combined with 2008–2009 bathymetry being developed
- Roughness: vegetation type and density, MEI (2009) calibrated the HEC-RAS 1-D model using measured water surface profiles and adjusting Manning's roughness coefficients. To model the options considered for Reach 2B and the Mendota Pool Bypass, roughness coefficients ranged from 0.03 to 0.05 for the main channel and 0.055 to 0.15 for the overbanks (floodplain) with open and dense vegetation cover, respectively.
- Upstream and downstream boundary conditions
- Structures
 - Mendota pool operation rules and data
 - Chowchilla bypass operation rules and data
 - Flood and water delivery operations rules and data

4.7.4 Sediment Transport

Sediment transport modeling involves analysis of erosion potential and sediment continuity (including areas of scour and deposition). The analysis considers the bed

(sand) separately from the banks, which might consist of compacted and/or cohesive soils and vegetation. The following is a summary of the available sediment transport data.

- Design flow rates, flow duration curve and other results of hydraulic studies
- Bed material size and gradation (not including riprap or other bed reinforcement types or locations), MEI (2000) pebble count and bulk samples (mostly sand in Reach 2B)
- Bank material (soil type, cohesiveness, slope stability)
- Upstream and downstream boundary conditions
- Applications of specific equations (sand). MEI (2000) applied the Meyer-Peter and Muller equation for bed load and the Einstein equation for suspended load. However, newer equations may be more relevant

Although no model was referenced, MEI (2000) developed and applied several sediment transport relationships.

4.8 Land Use, Agriculture, and Socioeconomics and Environmental Justice

4.8.1 Land Use and Agriculture

This section identifies existing land use and agriculture data sources, which are assessed for their potential use in analyzing the impacts on land use and agriculture of the Reach 2B alternatives. In each case, existing land use data will be utilized and spatially evaluated to assess potential impacts associated with the Project.

The California Department of Water Resources Land Use Survey program periodically publishes agricultural land use maps for many California counties (Department of Water Resources 2006). The surveys include more than 70 crops or crop categories and, in some cases, information on irrigation methods and water sources. The surveys are conducted using aerial photos and satellite imagery. The most current map for Fresno County reflects agricultural land use in 2000. The corresponding map for Madera County reflects agricultural land use in 2001.

Other land use information is available at the County level from the California Department of Conservation. That agency's Farmland Mapping and Monitoring Program provides county level data on prime farmland, farmland of statewide importance, unique farmland, and farmland of local importance (California Department of Conservation 2006). The most recent information for Fresno County is for 2006. The most recent information for Madera County is for 2008.

Currently it is unknown whether or to what extent land which would be affected by the Reach 2B alternatives is covered by Williamson Act or "Super Williamson Act" contracts. Both provisions were enacted to slow conversion of agricultural land by providing for lower property taxes for covered landowners. Should land which would be permanently removed from crop production by the Reach 2B alternatives be enrolled in

the programs, the land use impacts would need to include the implications of the alternatives on the agricultural land base in Fresno and Madera Counties.

Estimating land use at a detailed level will require the application of Geographic Information Systems (GIS) to data from the two agencies noted above. Data at the individual parcel level can be collected and tabulated using Assessor Parcel Numbers to search property records through the Fresno County and Madera County Assessor's Offices. In addition, land use information in the Reach 2B area may be available from the water agencies in whose service areas the affected lands are located.

Information on the agricultural yield, price, and production value per acre is available for most crops commercially grown in Fresno and Madera counties (Fresno County Agricultural Commissioner and Madera County Department of Agriculture, various years). Information on the investment and production costs per acre is also available in enterprise budgets for many crops grown in the San Joaquin Valley, although not specifically for Fresno or Madera County (University of California Cooperative Extension Service, various dates). The budgets are characterized as typical of production practices, but not applicable in all situations (see, e.g., a 2008 study on the costs to establish and produce alfalfa in the San Joaquin Valley; University of California Cooperative Extension Service 2008). Consequently, farm-level validation of the investment and production cost information is advisable. Further, accurate estimation of the impacts of the Reach 2B alternative will require data collection on specifically affected lands from the water districts in whose service areas those lands are found and, potentially, discussions with individual landowners.

4.8.2 Socioeconomics and Environmental Justice

The Reach 2B segment of the San Joaquin River is in, and divides, unincorporated areas in north central Fresno County and south western Madera County. The midpoint of Reach 2B is approximately 4 miles from the city of Mendota and 11 miles from the city of Firebaugh, both in Fresno County. All of the Madera County area within 20 miles of Reach 2B is unincorporated.

The most recent data relative to socioeconomic and environmental justice characteristics for the area which would be directly affected by the Reach 2B alternatives are from the 2000 Census of Population and Housing (see Table 4-5). The land immediately adjacent to Reach 2B is in Fresno County Census Tract 83.01 and Madera County Census Tract 4. Population in the two tracts was 3,936 and 1,559, respectively, in 2000. The single largest group in both areas in 2000 was Hispanics or Latinos, who made up 95 percent and 57 percent, respectively, of the total population in the Fresno and Madera County Census Tracts.

In 2000, household employment in Fresno County Census Tract 83.01 was 1,075, of whom 40 percent were in agriculture, forestry, fishing, hunting, and mining. In that year, household employment in Madera County Census Tract 4 was 561, of whom 56 percent were in those industry segments. Because of the location of the tracts, it is expected that agriculture was and is the single largest industry in the area.

In 1999, per capita income in Fresno County Census Tract 83.01 was \$6,785, while that in Madera County Census Tract 4 was \$12,718 (see Table 4-6) (U.S. Census Bureau 2000). Median annual household incomes in the Fresno and Madera County Census Tracts were \$22,881 and \$32,557, respectively. The poverty rate for individuals was 36 percent in the Fresno County Tract and 15 percent in the Madera County Tract. The unemployment rate in the Fresno County Tract was 30.8 percent and that in the Madera County Tract was 12.8 percent.

Table 4-5
Population Characteristics of Census Tracts Comprising Land in Reach 2B, 2000 Data

Population, by Race	Fresno County Census Tract 83.01		Madera County Census Tract 4	
	Number	Percent	Number	Percent
White	105	3%	604	39%
Black/African American	23	1%	5	0%
American Indian/Alaska Native	10	0%	5	0%
Asian	25	1%	31	2%
Native Hawaiian/Pacific Islander	0	0%	2	0%
Some other race	3	0%	0	0%
Two or more races	21	1%	30	2%
Hispanic or Latino	3,749	95%	882	57%
Total Population	3,936	100%	1,559	100%

Source: U.S. Census Bureau

Table 4-6
Income, Poverty, and Employment Characteristics of Census Tracts Comprising Land in Reach 2B, 1999 Data

Characteristic	Fresno County Census Tract 83.01	Madera County Census Tract 4
Per capita income	\$6,785	\$12,718
Median household income	\$22,881	\$32,557
Individuals below poverty level	1,425 (36%)	236 (15%)
In labor force	1,553	643
Employed	1,075 (69.2%)	561 (87.2%)
Unemployed	478 (30.8%)	82 (12.8%)

Source: U.S. Census Bureau

More current information on employment by industry, population, and per capita income are available from Fresno and Madera Counties. County-level employment information by industry is available from the California Employment Development Department (2009). More current information on population at the county and individual incorporated city levels and for the total unincorporated area within each county is available from the California Department of Finance Demographic Research Unit (2009a). More current

information on per capita income at the county level is also available from the California Department of Finance Financial and Economic Data (2009).

The choice of analytical tools for estimating the socioeconomic impacts of the Reach 2B alternatives will depend on the adequacy of the available data, including the extent to which recent detailed land use information can be used to infer socioeconomic impacts.

4.9 Air Quality, Noise, and Traffic

4.9.1 Air Quality

Pollutant emissions from construction activities will be calculated using California Air Resources Board (CARB) factors and compared to local air district thresholds to evaluate the significance of the impact. The local air district in the Project area is the San Joaquin Valley Air Pollution Control District (SJVAPCD).

The air quality background conditions for the Project area can be characterized using existing air quality data monitored and reported by CARB. Data from the stations in Merced, which are the closest representative stations to the Project area, are summarized in Table 4-7 and Table 4-8. A map of the stations' locations compared to the Project area is provided as Figure 4-2. These monitored values represent the main pollutants associated with the Project and are for the most-recent 3-year period of data reported. The attainment status of the Project area with respect to ambient air quality standards is summarized in Table 4-9. The attainment status indicates how poor the air quality is in a given region. The San Joaquin Valley air basin, which is where the Project area is located, does not attain the national or State ozone standard; nor does San Joaquin Valley air basin attain the state particulate matter standards.

**Table 4-7
Summary of Pollutant Monitoring Data at Merced – 2334 M
Street**

Criteria Air Pollutant	Yearly Monitoring Data		
	2006	2007	2008
PM ₁₀			
Highest 24-hour concentration (µg/m ³)	94.0	65.0	75.4
Annual mean (µg/m ³)	32.5	29.7	34.5
Days above CAAQS	8	6	14
Days above NAAQS	0	0	0
PM _{2.5}			
Highest 24-hour concentration (µg/m ³)	55.8	81.6	54.0
Annual mean (µg/m ³)	14.8	15.2	15
Days above NAAQS	6	17	9

Source: CARB 2010, http://www.arb.ca.gov/adam/php_files/aqdphp/topfourdisplay.php, accessed 1/22/10.

**Table 4-8
Summary of Pollutant Monitoring Data at Merced – South
Coffee Avenue**

Criteria Air Pollutant	Yearly Monitoring Data		
	2006	2007	2008
Ozone – 1 Hour			
Highest concentration (ppm)	0.102	0.105	0.131
Days above CAAQS	4	5	14
Days above NAAQS	0	0	3
Ozone – 8 Hour			
Highest concentration (ppm)	0.091	0.096	0.120
Days above CAAQS	33	25	54
Days above NAAQS	23	18	33

Source: CARB 2010, http://www.arb.ca.gov/adam/php_files/aqdphp/topfourdisplay.php, accessed 1/22/10.

**Table 4-9
Federal and State Attainment Status**

Pollutant	Federal Status	State Status
O ₃	Non-attainment, serious for 8 hour average ⁽¹⁾	Non-Attainment, severe for 1 hour and 8 hour average
PM ₁₀	Attainment ⁽²⁾	Non-attainment
PM _{2.5}	Non-attainment	Non-attainment
CO	Attainment/Unclassified	Attainment/Unclassified
NO ₂	Attainment/Unclassified	Attainment
SO ₂	Attainment/Unclassified	Attainment

Notes: ⁽¹⁾ The SJVAPCD has submitted a request to EPA for redesignation to “extreme” nonattainment for the 8 hour ozone standard.

⁽²⁾ On September 25, 2008, EPA redesignated the San Joaquin Valley to attainment for the PM₁₀ National Ambient Air Quality Standard (NAAQS) and approved the PM₁₀ Maintenance Plan.

Source: SJVAPCD, <http://www.valleyair.org/aqinfo/attainment.htm>, accessed 1/22/10.

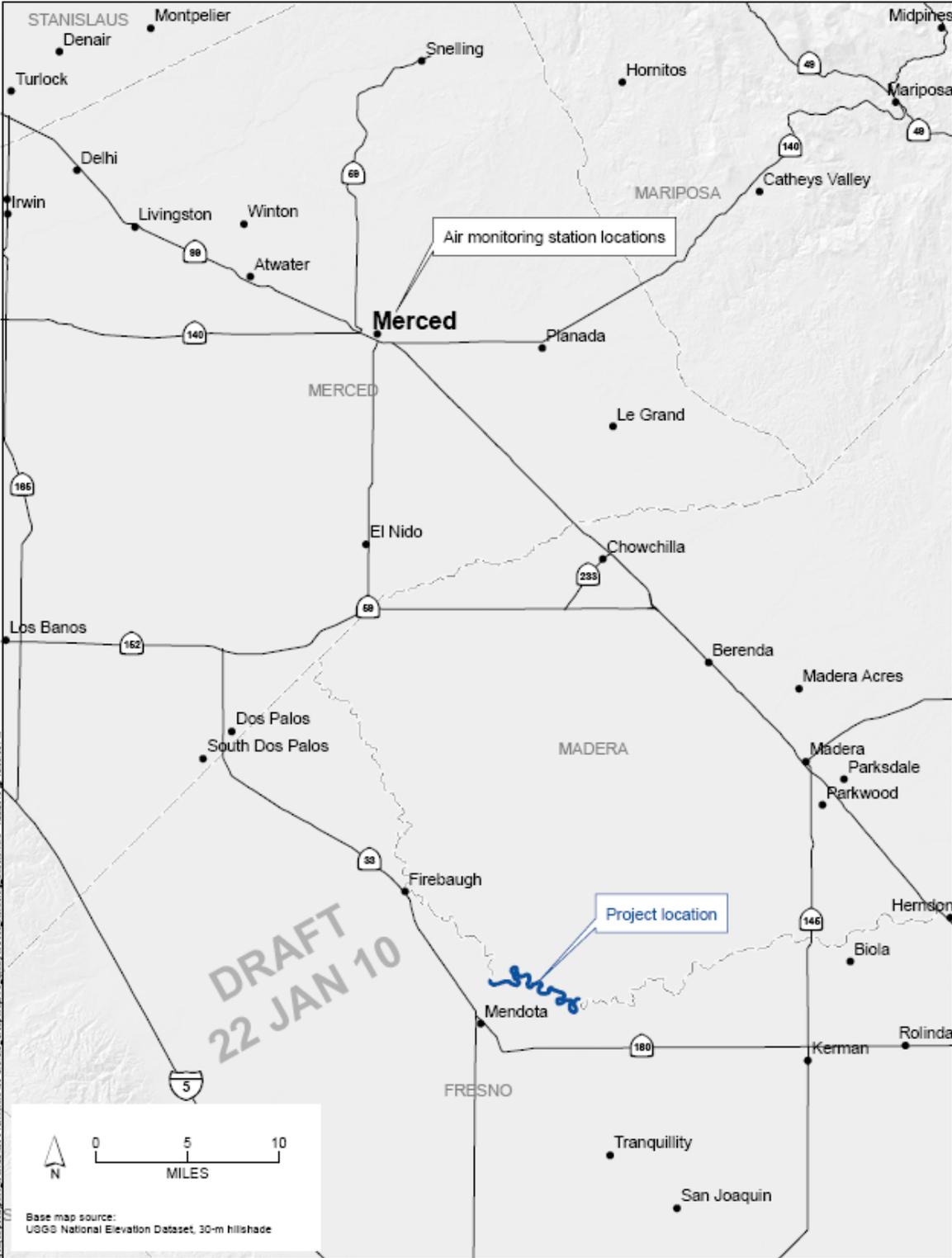


Figure 4-2
Merced Air Quality Monitoring Station Locations

4.9.2 Noise

The existing noise (and vibration) environment surrounding Reach 2B in the Project Area is generated from agricultural activities, vehicular traffic on area roadways, aeronautical sources including the Firebaugh and Mendota Municipal Airports, and industry and urban noise from the City of Mendota.

All existing noise data and will be reviewed to determine the most recent noise data available in the Reach 2B in the Project area. Data sources may include Caltrans, County of Merced, City of Mendota, and Firebaugh and Mendota Municipal Airports. Land use investigations will be performed by reviewing aerial photos, maps, and photographs of the Project area to identify noise and vibration-sensitive land uses and existing noise and vibration sources. The Program EIS/R states there are a handful of sensitive receivers (residential) in close proximity to Reach 2B; the nearest is located 460 feet from the river centerline. The description and location of these sensitive receptors needs to be confirmed. Existing data will be reviewed and summarized to give approximate background noise levels around Reach 2B.

4.9.3 Traffic

Existing traffic data that is readily available will be evaluated in the Reach 2B project area. Existing traffic data may include City and County records along with California Department of Transportation records. An analysis of the existing traffic conditions in the Project area based on existing and historic traffic volume counts will be conducted.

5.0 Data Needs and Survey Approach

This section identifies the data needs and survey approach recommended to support future environmental documents and permitting for the Project. The information presented in this section was developed using the methods described in Section 3 and is based on the existing data and resource-specific evaluations presented in Section 4.

5.1 Biological Resources

This section describes the survey approach for each biological resource area identified in Section 4 for which surveys are recommended. Proposed surveys, survey timing, and survey goals are summarized in Table 5-1.

**Table 5-1
Proposed Surveys**

Survey	Proposed Dates	Goals
Reconnaissance Survey	March 2010	<ul style="list-style-type: none"> • Develop specific and detailed methods for habitat assessment survey. • Make a preliminary evaluation of potential high quality habitat areas. • Map raptor stick nests before deciduous trees have fully leafed out.
Special Status Plant Survey	March–June 2010	<ul style="list-style-type: none"> • Identify presence, location, and abundance of special status plant species. • Collect voucher specimens, when appropriate.
Habitat Assessment Survey	May 2010	<ul style="list-style-type: none"> • Identify and map habitats and features suitable for use by special status species. • Observe and record wildlife sightings and signs. • Gather necessary information to determine the need for focused surveys.
Wetland Delineation	May 2010	<ul style="list-style-type: none"> • Delineate wetland boundaries. • Identify non-wetland waters of the U.S.
Special Status Natural Communities Survey	March–June 2010 (concurrent with plant surveys)	<ul style="list-style-type: none"> • Identify presence of special status natural communities. • Delineate boundaries of natural communities.
Valley Elderberry Longhorn Beetle Protocol Survey	June–October 2010	<ul style="list-style-type: none"> • Map elderberry shrubs, count stems, and search for exit holes
Other Focused Surveys (Dependent on results of habitat assessment survey)	<i>Varies based on specific protocol.</i>	<ul style="list-style-type: none"> • Determine presence of special status species where data from the habitat assessment is not sufficient.

A number of existing data and background reports were reviewed during preparation of this TM. Directly relevant background information spans a period of nearly a decade, and some existing data leads identified during preparation of this TM may warrant further

investigation. It is possible that some valuable sources were not obtained before completion of the TM. Therefore, it is recommended that compilation of existing data continue.

Before initiating the field surveys recommended in this section, it will be essential to define a Project area, or study area, that includes the maximum possible Project extent. That delineation should also minimize inclusion of areas that ultimately will not be part of the Project area. The level of effort associated with field surveys recommended for the Project will be directly related to the extent of the Project area delineated. A defined Project area, or study area, is identified as a primary data need before initiation of biological field surveys, for all resource areas requiring surveys.

The survey approach presented in this section does not include preconstruction surveys and activities, which are expected to be extensive due to a likely abundance of biological resources in the Project area (protected or otherwise). Specific avoidance measures, preconstruction surveys, and other activities designed to protect biological resources in the Project area will be developed following completion of this TM and the surveys described herein, in subsequent documents.

5.1.1 Fish and Aquatic Resources

This section describes the approach for fish surveys in the Project area. Surveys are not recommended before implementation of restoration actions. The suite of species occupying the Mendota Pool and Reach 3 includes a substantial number of introduced fishes along with a few native species. No listed fish species have been detected in these surveys. Therefore additional surveys would not be needed for environmental documents or permits. Since these fish populations would act as source populations to the San Joaquin River restoration actions and could negatively influence the success of re-establishing viable salmon runs, or other native fish populations in the San Joaquin River, surveys of these resources should be incorporated into long-term monitoring associated with the restoration program.

Collection of basic fishery data would use a variety of sampling methods including gill nets, seines, minnow traps, fyke nets, boat and backpack electrofishing and angling. Effort would be tracked during sampling (unit hours per method) and sampling would occur in all types of aquatic habitats available. Catches would be compared to previous surveys, but because of variability in fish populations and in water year types, only qualitative comparisons would be made.

5.1.2 Special Status Wildlife Surveys

This section describes the approach for wildlife surveys in the Project area recommended to support future Project environmental documents and permitting, before initiation of preconstruction surveys and activities. During all wildlife surveys a list of wildlife species observed will be recorded.

Reconnaissance Survey

Pending approval of temporary right-of-entry permits, a reconnaissance survey of the Project area is proposed for March 2010, or the earliest available time at which access is

granted. If right of entry has not been granted by this time, reconnaissance could be conducted from public lands, levee roads, and the limited public access points present along the river corridor. It is estimated that this survey would involve 2 wildlife biologists and would be conducted over the course of 2 or 3 days. The survey would be conducted from vehicle and on foot, and would serve three general purposes:

1. The reconnaissance survey would be instrumental in developing appropriate methods for the habitat assessment survey. For example, prior surveys in the Project area have been conducted using boats, mountain bikes, vehicles, and on foot. Some combination of these methods will be required during the habitat assessment survey, and careful evaluation of which methods will be most effective will allow for a more efficient and complete habitat assessment survey in spring 2010. The reconnaissance survey will also allow for revision of the estimated level of effort needed during the habitat assessment survey.
2. The reconnaissance survey would allow for early evaluation of specific areas providing high quality or rare habitat where focused surveys may be required. Some, or even most, determinations regarding the need for focused surveys will likely be deferred until after completion of the habitat assessment survey. Depending on Project schedule, however, if specific focused surveys would be instrumental to Project design or would take multiple seasons to complete it may be desirable to initiate those surveys in spring 2010. This would require planning before completion of the habitat assessment surveys, and the reconnaissance survey may facilitate such planning.
3. The reconnaissance survey would also allow an opportunity to map raptor stick nests, including potential Swainson's hawk nests, before deciduous trees had fully leafed out. Surveys before March 20 provide superior opportunities to map existing nests (Swainson's Hawk Technical Advisory Committee 2000). This information could be valuable during Project design, and will help focus attention during the spring habitat assessment survey on exiting nest sites.

Habitat Assessment Survey

A general habitat assessment survey is recommended for spring 2010.⁶ It is estimated that this survey would involve 4 wildlife biologists and would be conducted over the course of 5 to 7 days. The survey would be conducted on foot, using vehicles to gain access at various locations, and would potentially use mountain bikes or boats for additional ease of access, pending determinations made during the reconnaissance survey. The habitat assessment survey would serve three general purposes:

1. The spring habitat assessment would allow biologists opportunity to identify habitats and features suitable for use by special status species. The field team will be familiar with the list of special status wildlife species potentially occurring in the Project area, and will have recently reviewed habitat requirements for those species. The location of features such as burrow concentrations, burrows with a

⁶ If access to the site is not obtained before spring 2010, the habitat assessment will be conducted at the earliest possible time after access permission is granted.

- particular type of sign, dens, and nests would be recorded with a Global Positioning System (GPS) receiver, and attributes describing those features would be logged into the GPS data logger. Following the reconnaissance survey a data dictionary appropriate for collecting useful habitat and feature data would be developed for use during the habitat assessment survey. Metadata will be provided for all GPS data and will include standard information such as coordinate systems, methods of data collection, and personnel responsible for collecting the data.
2. During the spring habitat assessment wildlife activity should be relatively high, affording opportunities for observation of common wildlife, special status wildlife, and wildlife sign. Field team members will be carefully selected to include individuals knowledgeable with the relevant taxa, who will adequately identify wildlife as it is encountered. A list of wildlife and sign observed during the surveys would be recorded, and the location and details of special status species observations would be recorded with the GPS data logger.
 3. Field work conducted during the habitat assessment would allow for further assessment of the need for focused surveys for individual special status species for which additional information may be required.

Focused Surveys

In many cases data collected and observations made during the habitat assessment, and/or existing data, would be sufficient to accomplish the goals of this investigation, i.e., to provide sufficient data to support the Project EIS/R and permitting documents. Based on existing data and observations made during the habitat assessment, avoidance where possible combined with comprehensive preconstruction activities designed to protect special status species and other biological resources, and mitigation when avoidance is not possible, may be sufficient to meet the investigation's goals. Surveys beyond the habitat assessment may be required for some species, as discussed in Section 4.2. However, in most cases those decisions will best be made with the benefit of the reconnaissance and habitat assessment survey results, and potentially following further refinement of the Project area limits. One exception is protocol surveys for valley elderberry longhorn beetle and its host plants, for which protocol surveys would be conducted sometime before the end of October 2010, as described in Section 4.2.1.

5.1.3 Wetlands

Wetland delineation in the Project area will be conducted in accordance with the methodology presented by the Corps of Engineers' *Wetlands Delineation Manual* (Environmental Laboratory 1987) the *Interim Regional Supplement to the Corps of Engineers' Wetland Delineation Manual: Arid West Region* (ERDC/EL 2008) or the most recent version of these or other applicable documents before the field surveys, to determine the extent of wetlands and other WUS within the mitigation site.

Before the field surveys biologists will review the following sources of information relevant to the Project:

- Aerial photographs of the Project area and vicinity
- USDA/NRCS Soil Survey of Fresno and Madera Counties, California (USDA/NRCS 2008a, 2008b)
- Standard biological references and field guides, including the Jepson Manual (Hickman 1993)
- The National Wetlands Inventory Maps

Field Survey Methodology

The hydrology, soils, and vegetation of the Project area will be examined along several transects and the resulting data will be used to determine wetland boundaries. Typically, a pair of sampling points will be analyzed for each potential wetland. Initially, a low-lying point will be sampled to confirm a wetland location. Subsequently, a point in an adjacent upland area will be analyzed to determine its status. After examining the hydrology, soils and vegetation of each data point, the wetland boundary location will be interpolated using contours, wetland vegetation and obvious hydrologic indicators between corresponding wetland and upland points. Each data point will be marked with a flag or wooden stake set flush with the ground and marked to correspond with the point's data form. Wetlands and other WUS boundaries will be marked with pin-flags and recorded using a GPS unit. A list of vegetation observed within the Project area will be prepared.

Vegetation

A visual estimate of absolute vegetation cover will be recorded within a 5-foot radius for herbs, a 10-foot radius for shrubs and 40-foot radius for trees at each survey point. Observed plants' wetland indicator status will be based on The National List of Plant Species that Occur in Wetlands (Reed 1988), and the Western Mountains, Valleys and Coast Region Regional Supplement (ERDC/EL 2008). The latter recent publication updated the plants' wetland status by removing the + and – signs indicated in the List. This categorized plant species into five groups: OBL, FACW, FAC, FACU and UPL based on their probability to occur in wetlands. The five categories are as follows:

- Obligate plants (OBL) occur almost always (>99 percent) in wetlands under natural conditions, but also occur rarely (<1 percent) in non-wetlands.
- Facultative wetland plants (FACW) occur usually (>67 percent to 99 percent) in wetlands but also occur (1 percent to 33 percent) in non-wetlands.
- Facultative plants (FAC) have a similar likelihood (34 percent to 66 percent) of occurring both in wetlands and non-wetlands.
- Facultative upland plants (FACU) sometimes occur in wetlands (1 percent to 33 percent), but occur more often (>67 percent to 99 percent) in non-wetlands.
- Obligate upland plants rarely occur in wetlands (<1 percent), but occur almost always (>99 percent) in non-wetlands under natural conditions.

If a species is listed as NI and no adjacent regional indicator are assigned, it will not be used to calculate hydrophytic vegetation indicators. Species not listed in The National List of Plant Species that Occur in Wetlands (Reed 1988) were assumed to be upland.

Hydrophytic wetland vegetation will be determined to be present if more than 50 percent of the dominant plant species will be FAC, FACW, or OBL according to the Wetland Plant List. The dominance of plant species will be determined by using USACE's 50/20 rule (ERDC/EL 2008). In cases where the Dominance Test approaches 50 percent and indicators of hydric soil and wetland hydrology are present, vegetation will be re-evaluated by calculating the Prevalence Index. The Prevalence Index takes into consideration all plant species in the community (not just a few dominants). In problematic cases, the Prevalence Index, Morphological Adaptations, and Problematic Hydrophytic Vegetation indicators will be used in addition to the Dominance Test to determine the wetland status of the vegetation. The FAC-neutral test will be performed after evaluation of vegetation at each sampling point to assist with the determination of wetland hydrology.

Soils

A soil pit will be dug at each potential wetland data collection point within the Project area to determine the characteristics of each soil horizon. The soil texture of each horizon will be determined by the U.S. Department of Agriculture texture-by-feel analysis. The hue, chroma, and value of the soil matrix and redox features, where present, will be determined using a standard Munsell® soil chart. Only freshly broken and wetted surfaces of sampled soil for each horizon will be compared to the chart. Colors will be compared in full sun. Hydric soil indicators will be recorded when observed.

Hydrology

Each soil pit will be examined for primary and secondary indicators of wetland hydrology. Where feasible, data points hydrology indicators will be recorded during the spring season, when they are most easily observed. A sampling point will be determined positive for wetland hydrology if one of the following primary indicators will be present: inundation, saturation in the upper 30 cm (12 in), water marks, drift lines, sediment deposits, drainage patterns in wetlands, oxidized rhizospheres or any other single primary indicator or any two secondary wetland hydrology indicators.

Non-Wetland Waters of the U.S.

Features will be identified as non-wetland WUS based on the presence of defined bed and banks, drift lines and/or ordinary high water marks (OHWM, average 2 year return frequency). These features, typically streams or ditches, will be mapped using a combination of field measurements and aerial photography. Cross-sectional widths of non-wetland waters will be measured in the field from the OHWM. These measurements will be taken at 100-ft. increments for the larger features and at 50-ft increments for the smaller ephemeral drainages.

5.1.4 Special Status Plants and Vegetation Alliance Surveys

Botanical surveys will be conducted in accordance with CDFG's *Protocols for Surveying and Evaluating Impacts to Special Status Native Plant Populations and Natural*

Communities (CDFG 2009c, revised November 24). They will be conducted in a manner that will locate any listed species that may be present. Botanical surveys will be conducted before commencement of any activities that may modify vegetation, such as clearing, mowing, or ground-breaking activities. It is appropriate to conduct a botanical field survey when natural (or naturalized) vegetation occurs onsite; it is unknown if special status plant species or natural communities occur onsite; and the Project has potential to affect directly or indirectly vegetation, special status plants or natural communities that have historically been identified on the Project area, or special status plants or natural communities occur on sites with similar physical and biological properties as those in the Project area. Additional details regarding vegetation alliance surveys are presented below.

Survey Objectives

Field surveys will be conducted in a manner that maximizes the likelihood of locating special status plant species or special status natural communities that may be present. Surveys shall be floristic in nature, meaning that every plant taxon that occurs on site will be identified to the taxonomic level necessary to determine rarity and listing status. “Focused surveys” that are limited to habitats known to support special status species or are restricted to lists of likely potential species are not considered floristic in nature and are not adequate to identify all plant taxa on site to the level necessary to determine rarity and listing status. A list of plants and natural communities detected during the survey will be recorded. More than one field visit may be necessary to adequately capture the floristic diversity of a site. An indication of the prevalence (including estimated total numbers, percent cover, density) of the species and communities on the site is also useful to assess the significance of a particular population.

Survey Preparation

Before field surveys are conducted, relevant botanical information in the general Project area will be compiled to provide a regional context for the investigators. CNDDDB10 and BIOS11 will be consulted for known occurrences of special status plants and natural communities in the Project area before field surveys. Generally, vegetation and habitat types potentially occurring in the Project area based on biological and physical properties of the site and surrounding ecoregion will be identified, unless a larger assessment area is appropriate. Then, a list of special status plants and natural communities with the potential to occur within these vegetation types will be developed. This list can serve as a tool for the investigators and facilitate the use of reference sites; however, special status plants on site might not be limited to those on the list. Field surveys and subsequent reporting shall be comprehensive and floristic in nature and not restricted to or focused only on this list. The survey report shall include the list of potential special status species and natural communities, and the list of references used to compile the background botanical information for the site.

Survey Extent

Surveys shall be comprehensive over the entire site, including areas that will be directly or indirectly impacted by the Project. Adjoining properties shall also be surveyed where direct or indirect Project impacts, such as those from drainage pattern modification, temporary construction staging areas, access roads or herbicide application, could

potentially extend offsite. Pre-Project surveys restricted to known CNDDDB rare plant locations may not identify all special status plants and communities present and do not provide a sufficient level of information to determine potential impacts.

Field Survey Method

Surveys shall be conducted using systematic field techniques in all habitats of the site to ensure thorough coverage of potential impact areas. The level of effort required per given area and habitat is dependent upon the vegetation and its overall diversity and structural complexity, which determines the distance at which plants can be identified. Surveys shall be conducted by walking over the entire site to ensure thorough coverage, noting all plant taxa available at <http://www.dfg.ca.gov/biogeodata/cnddb>, <http://www.bios.dfg.ca.gov/> and ecological subregions of California, available at <http://www.fs.fed.us/r5/projects/ecoregions/toc.htm> observed. The level of effort shall be sufficient to provide comprehensive reporting. For example, one person-hour per eight acres per survey date is needed for a comprehensive field survey in grassland with medium diversity and moderate terrain, with additional time allocated for species identification.

Timing and Number of Visits

Surveys shall be conducted in the field at the time of year when species are both evident and identifiable. Usually this is during flowering or fruiting. Visits shall be spaced throughout the growing season to accurately determine what plants exist on site. This may involve multiple visits to the same site (e.g., in early, mid, and late-season for flowering plants) to capture the floristic diversity at a level necessary to determine if special status plants are present. The timing and number of visits will be determined by geographic location, the natural communities present, and the weather patterns of the year(s) in which the surveys are conducted.

Reference Sites

When special status plants or natural communities are known to occur in the type(s) of habitat present in the Project area, reference sites shall be observed (nearby accessible occurrences of the plants) to determine whether those species are identifiable at the time of the survey and to obtain a visual image of the target species, associated habitat, and associated natural community.

Use of Existing Surveys

Even if floristic inventories or special status plant surveys may already exist. Additional surveys will be necessary for the following reasons: Surveys will not be current; or surveys were conducted in natural systems that commonly experience year to year fluctuations such as periods of drought or flooding (e.g., vernal pool habitats or riverine systems); or surveys are not comprehensive in nature; or fire history, land use, physical conditions of the site, or climatic conditions have changed since the last survey was conducted; or surveys were conducted in natural systems where special status plants may not be observed if an annual above ground phase is not visible (e.g., flowers from a bulb); or changes in vegetation or species distribution may have occurred since the last survey was conducted, due to habitat alteration, fluctuations in species abundance and/or seed bank dynamics.

Negative Surveys

Adverse conditions may prevent investigators from determining the presence of, or accurately identifying, some species in potential habitat of target species. Disease, drought, predation, or herbivory may preclude the presence or identification of target species in any given year. These conditions shall be discussed in the report. The failure to locate a known special status plant occurrence during one field season does not constitute evidence that this plant occurrence no longer exists at this location, particularly if adverse conditions are present. For example, surveys over a number of years may be necessary if the species is an annual plant having a persistent, long-lived seed bank and is known not to germinate every year. Habitats, such as grasslands or desert plant communities that have annual and short-lived perennial plants as major floristic components may require yearly surveys to accurately document baseline conditions for purposes of impact assessment. In forested areas, however, surveys at intervals of five years may adequately represent current conditions. To further substantiate negative findings for a known occurrence, a visit to a nearby reference site may ensure that the timing of the survey was appropriate.

Reporting and Data Collection

Adequate information about special status plants and natural communities present in a Project area will enable reviewing agencies to effectively assess potential impacts to special status plants or natural communities and will guide the development of minimization and mitigation measures.

The following information for locations of each special status plant or natural community detected during a field survey of a Project area will be recorded:

- A detailed map (1:24,000 or larger) showing locations and boundaries of each special status species occurrence or natural community found as related to the Project. Occurrences and boundaries will be marked as accurately as possible. Locations will be documented by use of global positioning system (GPS). Coordinates will include the datum in which they were collected.
- The site-specific characteristics of occurrences, such as associated species, habitat and microhabitat, structure of vegetation, topographic features, soil type, texture, and soil parent material. If the species is associated with a wetland, provide a description of the direction of flow and integrity of surface or subsurface hydrology and adjacent off-site hydrological influences as appropriate.
- The number of individuals in each special status plant population as counted (if population is small) or estimated (if population is large).
- If applicable, information about the percentage of individuals in each life stage such as seedlings vs. reproductive individuals.
- The number of individuals of the species per unit area, identifying areas of relatively high, medium, and low density of the species over the Project area.
- Digital images of the target species and representative habitats to support information and descriptions.

Voucher Collection

Voucher specimens provide verifiable documentation of species presence and identification. This information is vital to all conservation efforts. Collection of voucher specimens shall refer to current online published lists available at: <http://www.dfg.ca.gov/biogeodata>. Collections will be conducted in a manner that is consistent with conservation ethics, and is in accordance with applicable state and federal permit requirements (e.g., incidental take permit, scientific collection permit). Voucher collections of special status species (or suspected special status species) shall be made only when such actions would not jeopardize the continued existence of the population or species. Voucher specimens will be deposited with an indexed regional herbarium no later than 60 days after the collections have been made. Digital imagery will be used to supplement plant identification and document habitat. All relevant permittee names and permit numbers on specimen labels will be recorded. A collecting permit is required before the collection of State-listed plant species.

Botanical Survey Reports

Reporting will be consistent with relevant language anticipated to be included in Temporary Entry Permits that will be necessary to access private Property in the Project area, as described in Section 3.0.

Qualifications

Botanical consultants will possess the following qualifications:

- Knowledge of plant taxonomy and natural community ecology
- Familiarity with the plants of the area, including special status species
- Familiarity with natural communities of the area, including special status natural communities
- Experience conducting floristic field surveys or experience with floristic surveys conducted under the direction of an experienced surveyor;
- Familiarity with the appropriate state and federal statutes related to plants and plant collecting
- Experience with analyzing impacts of development on native plant species and natural communities

Survey Scheduling

The plant surveys will be performed in three phases at three different times of the year to coordinate the survey time with the plants' blooming period. Protocol surveys for the California jewel-flower, recurved larkspur, Munz's tidy tips and San Joaquin woollythreads will be performed in the first phase in mid-March. Heartscale, brittlescale, Lost Hills crowscale, succulent owl's-clover and San Joaquin Valley Orcutt grass surveys will be performed in late April in the second phase. Surveys for the late flowering species lesser saltscallion, vernal pool smallscale, subtle orache, palmate-bracted bird's-beak, hairy Orcutt's grass and Sanford's arrowhead will be performed in mid- to late June.

5.2 Groundwater

A multistep process to identify areas susceptible to increases in infiltration and subsequent impacts from rising groundwater has already been completed by SJRRP, and the monitoring and action thresholds required to meet the Project objectives have been defined (SJRRP unpublished data). The preliminary depth to water monitoring threshold is 7 feet below ground surface according to the Preliminary Monitoring Well Data Maps for Reach 2B (SJRRP 2010), as described in more detail Section 4.6. Data presented in Section 4.6 indicate that some areas in the lower part of Reach 2B are susceptible to seepage issues and will need continued monitoring.

If groundwater modeling is necessary to evaluate the potential for seepage from the river to create waterlogging conditions along Reach 2B, the USGS CVHM model will be used to simulate the impacts of Interim and Restoration flows. The CVHM model grid and layers may be refined if local-scale resolution is required (SJRRP unpublished data).

5.3 Hydro-Geomorphology

This section describes the hydro-geomorphology data needs and recommends certain data be collected to support ongoing modeling and concept refinement, and subsequently inform the alternatives evaluation.

5.3.1 Hydrology

A “future conditions” flow duration curve for the Project should be developed and made available for analysis. The flow duration curve provides a more complete hydrologic condition to address long-term sediment transport and supply conditions. The flow duration curve is a statistical representation of a long-term flow record. The integration of flows and sediment transport over decades can provide a more comprehensive stability analysis than using individual storms or releases. The future conditions flow record could be generated through the reservoir operation model by simulating the proposed operating rules.

Along with a sediment transport function, the flow duration curve can be used to predict the most effective discharges and help determine the active channel design dimensions. The flow duration curve will provide the ability to more completely analyze the impacts from the full range of expected future flows.

Flow losses from river bed seepage should also be addressed. Madeheim (1999) derived flow loss curve between Gravelly Ford and the Chowchilla Bifurcation Structure. As new Interim Flow data becomes available, it can be used in conjunction with Madeheim to provide more supporting documentation and allow refinements in loss predictions.

5.3.2 Hydraulics

According to MEI (2000), adequate data to verify the hydraulic conditions are not available. MEI made use of the sparse available data, with some adjustments. Measuring water surface elevations for a range of known flow rates would provide valuable

information to calibrate the hydraulic model, reduce uncertainty, and increase confidence in the modeling results. Water surface elevations and flow rates should be collected throughout the Project reach. Four to six locations along the approximate 12-mile length should be adequate for collecting this information.

5.3.3 Sediment Transport

Field measurements of the amount of sediment being transported by the San Joaquin River could be collected to support the ongoing modeling efforts. The long-term supplies and incoming sediment load are important boundary conditions for the analytical assessment. These data may determine if the long-term sediment supply to Reach 2B will be adequate to replace the material transported out of the reach. The incoming sediment load is often computed by a model when measurements are not available. MEI (2000) provides an estimated load to Reach 2B that may be useful for future analyses which predicts that Reach 2B will experience a 34% increase in sediment storage from existing conditions.

There is a high level of uncertainty in measuring sediment transport conditions. Measuring bed load is a difficult task because the samplers can disturb the flow and transport dynamics. The load can vary spatially across the river channel and temporally over the hydrograph. Nevertheless, measurements for model verification provide an increased level of confidence in modeling results.

In addition to bed material sampling, periodic surveys of the bed profile and channel geometry over time can provide valuable data to assess how the new channel is responding to the future modified flow and sediment regime. Channel surveys are often completed on a 3- to 5-year cycle or after large flow events. Annual visual inspections should be conducted to identify any locations of erosion/deposition, debris build-up, bank armor in need of repair, or areas in need of structural repairs. Visual inspections can be used to identify the need for and frequency of channel surveys. Future aerial photographs can also be used to identify areas of bank erosion; such photographs could be taken along with any vegetation establishment monitoring.

Sediment Sampling

The objective of sediment sampling is to provide some level of verification of the sediment transport model. Although, it can be difficult to obtain samples during large flows, sampling should take place during the spring flood flow releases. Ideally, a sediment rating curve should be developed for the range of foreseeable flows.

Different bed load samplers are available and there is some debate over which ones are most appropriate. The most common is the box and bag samplers (e.g., Helle-Smith), which is laid on the bed. Sediment moving downstream is directed into the box opening and is captured in the collection bag. Various size openings are available depending on bed size. The sampler can be hand held or suspended from a cable. Suspended load is typically measured with a suspended sediment sampler, where an empty container with control valves is lowered into the water column. The valve is opened at selected depths to trap water and suspended material. Continuous samplers are preferred in rivers and will integrate the sediment concentration over time. Because sediment load varies across the

width of the river, several sample locations at each cross section will be required. Recommended sample locations are $\frac{1}{4}$, $\frac{1}{2}$, and $\frac{3}{4}$ of the river's width and at the river's thalweg. Depth point samples should be collected at $\frac{1}{3}$ and $\frac{2}{3}$ of the flow depth. Typically, the more sample points collected the more representative the samples will be of the total load.

Bulk sediment sampling of the bed in the reach just above the Mendota Pool could provide characterization data of the material transported from upstream and deposited in the pool reach. The resulting data would be helpful in understanding the material being transported through Reach 2B and how the bed might respond under future conditions.

5.4 Land Use, Agriculture, and Socioeconomics and Environmental Justice

This section describes data needs for land use, agriculture, and socioeconomic and environmental justice measurements relative to the Reach 2B alternatives. This section also includes recommendations on the collection of the requisite data for analyzing the alternatives by use of the analytical tools which will be discussed in a separate TM.

5.4.1 Land Use and Agriculture

The Reach 2B alternatives are expected to result in the permanent removal of different acreages of land from production, nearly all of which is likely to be cropland currently under cultivation. Analysis of the impacts of the alternatives will require detailed information on the quality and uses of the affected lands.

The majority of data needed to complete the impact analysis is available through literature collection, review, and subsequent analysis, as follows:

1. Information on the soil quality and irrigation status of land is available from the California Department of Conservation through its Farmland Mapping and Monitoring Program. The most current map available for Fresno County is for 2006 and the most current for Madera County is 2008. It is recommended the GIS data for those maps be obtained and overlaid on maps of the specific parcels which would be affected to estimate the acreages of prime farmland, unique farmland, or farmland of statewide importance which would be affected by each of the alternatives. That information would necessarily be included in the land use sections of subsequent environmental documents relative to the Reach 2B alternatives.
2. It is expected that the crop data required for agricultural impact estimation will be obtained from one or more sources. The first is the land use maps from the California Department of Water Resources. It is recommended that those maps for Fresno and Madera Counties (2000 data for Fresno County and 2001 data for Madera County) be downloaded and compared, using spatial analysis, with the land requirements for the Reach 2B alternatives.

In addition to literature and map review, it may be necessary to contact agencies and/or landowners directly to obtain other data. The key economic and socioeconomic impacts of the Reach 2B alternatives will be related directly to the amount of land that is permanently removed from agricultural production under the various alternatives; and to the crops that are grown on the land removed from production. Estimation of those impacts will require data on the crops grown on the affected land.

The underlying crop acreage data are essential for accurate estimation of these impacts, and publicly-available secondary data are not adequate for the analysis. The California Department of Water Resources publishes, through its Land Use Survey program, county-level maps showing the locations of up to 70 different crop or crop categories. The most recent such maps relevant for the Reach 2B project are for land use in 2000 in Fresno County and 2001 in Madera County. In both cases, the maps and associated data are outdated and of little use in describing current conditions.

An alternative source of crop data for lands which will be affected by the options is from the agencies which provide irrigation water to the lands. These include Columbia Canal Company, Aliso Water District, and Farmers Water District. Water agencies which serve agricultural land with irrigation water typically record, on an annual basis, the acreages of crops within their respective service areas which receive water. Thus, as maps are developed showing the impacted lands for the Reach 2B alternatives, it is proposed that each water district be requested to note on the maps the specific crops grown on each parcel. For permanent cropland, the tree or vine crop currently on the land would be that which would be included in the impact estimation. For annual cropland, a representative mix of crops would be developed either using typical rotations for the area based on information from water district managers; or using data from the annual crop reports of Fresno and Madera Counties. Crop data may also be solicited directly from individual landowners.

With accurate crop acreage data, the agricultural impacts of the alternatives can be estimated using secondary sources of information from, e.g., the University of California Cooperative Extension Service's production enterprise budgets showing costs of establishing and growing various crops; annual crop reports of the Fresno County Agricultural Commissioner and Madera County Department of Agriculture; and other sources.

The estimation of agricultural impacts will be based on the specific analytical tools selected. Regardless of the tools utilized, however, estimation will require data on the agricultural use of the affected properties. With that information, the direct impacts from the permanent removal of land from production can be estimated based on the loss of income from that land, offset by any payments to affected landowners for the loss. Indirect impacts, e.g., those for such businesses as farm machinery and farm chemical suppliers, may be estimated using county-level input-output data.⁷

⁷ This information is frequently estimated based on data and software obtained from the Minnesota IMPLAN Group and is utilized to analyze the regional interindustry impacts of changes in such variables as crop

Data on the Williamson Act enrollment of affected lands would be obtained from the Fresno County and Madera County Assessor offices. It is recommended that spatial analysis software be utilized to compare these data with the areas of the Reach 2B alternatives.

5.4.2 Socioeconomics and Environmental Justice

Estimation of the socioeconomic and environmental justice impacts of the Reach 2B alternatives on the specific Fresno and Madera County Census Tracts will necessarily be based on data from the 2000 Census of Population and Housing. Data available at that level include population, per capita income, poverty rates, and household employment. More current population data below the county level are available only for incorporated cities and for the aggregate of all unincorporated areas within counties. If it can be assumed that population growth in Fresno County Census Tract 83.01 and Madera County Census Tract 4 reflects population growth for the entire respective unincorporated areas in those two counties, then current population in the affected Census Tracts could be estimated through and including mid year 2009 based on data from the California Department of Finance.

The development of Census Tract socioeconomic impacts for the alternatives will also necessarily incorporate other data at the county or regional levels. The direct employment impacts of the alternatives can be inferred from the affected crop acreages and representative labor requirements taken from crop enterprise budgets prepared by the University of California Cooperative Extension Service. Budgets are typically prepared for such regions as the South or North San Joaquin Valley or the Sacramento Valley rather than individual counties.

The alternatives will affect the property taxes received by either, or both, Fresno and Madera Counties for the affected parcels. If land affected by the Reach 2B alternatives is purchased by the State or Federal government, property tax revenues to the county(ies) in which the land(s) are located would be reduced accordingly. The socioeconomic assessment should include an estimate of those revenues.

The development of Census Tract environmental justice impacts for the alternatives will be based on data from the 2000 Census of Population and Housing, which include population by groups including Hispanic or Latino. Later data are available from the California Department of Finance (2009b), but only at the county level and through 2007.

acreage, business expansions or contractions, and resource availability. See Website <http://www.implan.com>, accessed December 18, 2009.

5.5 Air Quality, Noise, and Traffic

5.5.1 Air Quality

No additional data gathering, pollutant monitoring, or field work would be required to sufficiently characterize the Project area settings. The CARB-monitored data and attainment status is the generally accepted methodology for characterizing existing conditions for a Project area.

SJVAPCD Regulation VIII must be followed by all construction projects, regardless of whether monitoring is performed. Regulation VIII rules contain measures to reduce fugitive dust from construction activities.

5.5.2 Noise

Dependant on the adequacy of existing available data, a survey of baseline conditions may be needed. The survey would include noise monitoring of those sources identified to have an influence on noise levels within the vicinity of Reach 2B, specifically, agricultural activities, vehicular traffic, aeronautical sources, industry and urban noise. The duration and method of monitoring would be based on considerations such as the review of existing available data, methods available, and accessibility to potential sites. Monitoring shall be conducted using systematic field techniques to ensure thorough coverage of potential impact areas.

5.5.3 Traffic

To determine current conditions, a baseline survey of traffic data will be conducted. Traffic data collection will include turning movements at intersections and average daily traffic (ADT) counts on existing roads. Permission will be acquired from the entities with jurisdiction over the roads before data collection can commence.

Turning movement data will be collected during peak periods, at both controlled and uncontrolled locations in the Project area that could be affected by construction or operation/maintenance traffic. Information that will be collected will include vehicle traffic, truck traffic, signal timing, phasing and lane-use, and special intersection geometrics as necessary.

Potentially impacted intersections are shown on Figure 5-1 and include:

1. Route 180 and North San Mateo Avenue
2. Route 33 and Bass Avenue
3. Bass Avenue and Helm Canal Road/Columbia Road/Drive 10 ½
4. Drive 10 ½ and Eastside Drive
5. Eastside Drive and North San Mateo Avenue/Road 13

Final intersections will be determined through consultation with Reclamation and DWR.

Average daily traffic counts will be conducted by standard methods and surveying techniques on existing roadways that could be affected by the Project. Time of year and

number of counts will be determined based on consultation with Reclamation and DWR. Potentially impacted intersections are shown on Figure 5-1 and include:

- Road 10 ½
- North San Mateo Avenue

Final roads will be determined through consultation with Reclamation and DWR.

Mendota Pool Bypass and Reach 2B Improvements Project

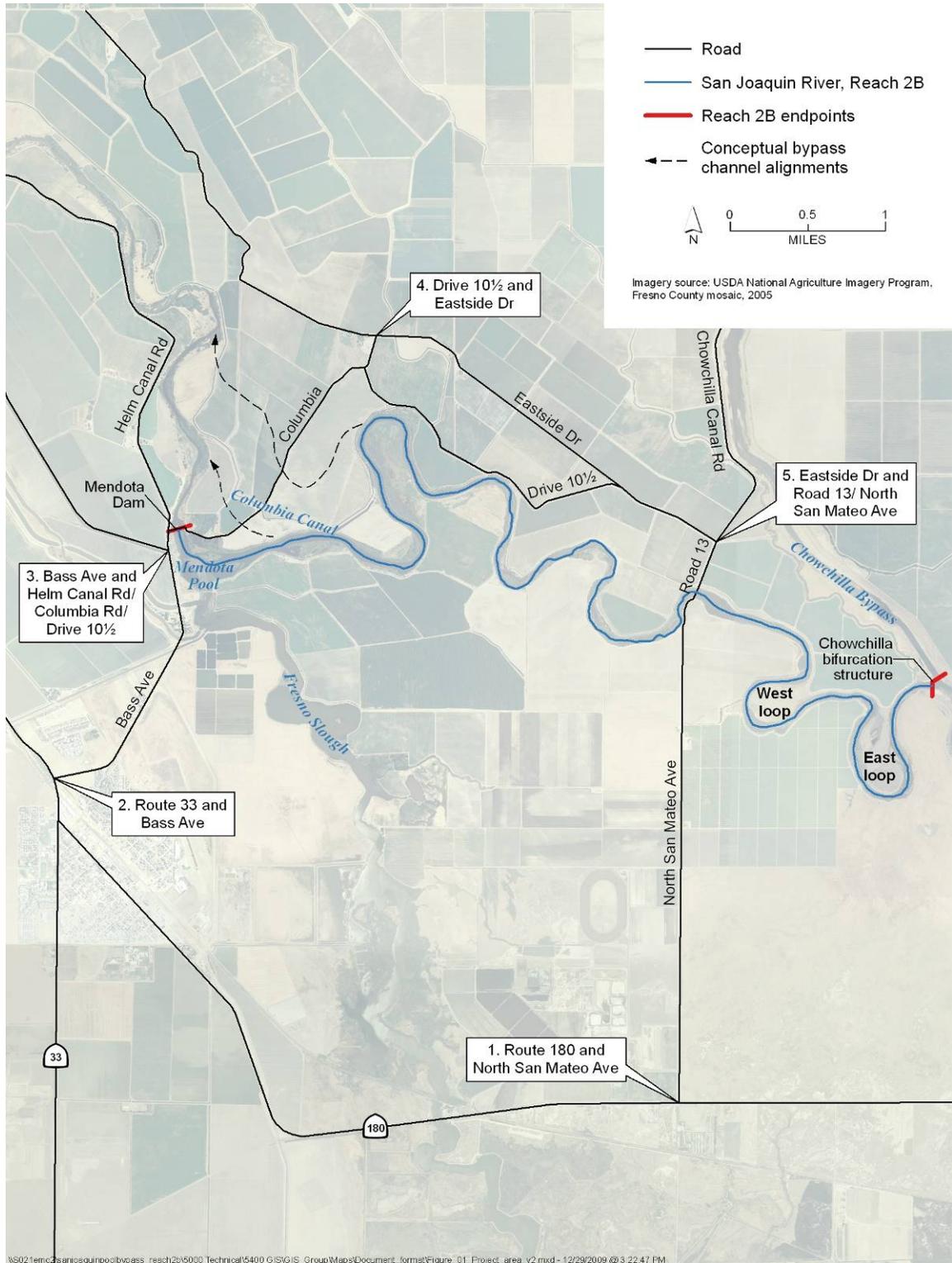


Figure 5-1
Anticipated Traffic Survey Locations

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Attachment A

Special Status Vegetation Alliances with Potential to Occur in the Project Area

This appendix presents descriptions of special status vegetation alliances with potential to occur in the Project area. A primary source of additional information for these alliances is *A Manual of California Vegetation*, Second Edition, by John Sawyer, Todd Keeler-Wolf, and Julie Evens 2009, ISBN 978-0-943460-49-9. Additional sources are listed for some alliances, as appropriate.

Globally or State Ranked Imperiled Vegetation Alliances

Box-Elder Forest (box-elder forest – *Acer negundo* alliance)

Status: State ranked as imperiled (G5S2) – At high risk of extinction or elimination in the State due to very restricted range, very few populations, steep declines, or other factors.

Box-elder forest is a vegetation alliance where box-elder trees are dominant in the canopy or co-dominant with Oregon ash (*Fraxinus latifolia*), white alder (*Alnus rhombifolia*), Fremont cottonwood (*Populus fremontii*), black willow (*Salix gooddingii*) or valley oak (*Quercus lobata*). Box-elder trees are typically less than 60 feet tall and the alliance provides intermittent or continuous cover that may be two-tiered. The understory shrub layer is open or intermittent, the herbaceous layer is sparse to abundant. In California, the alliance is mainly limited to riparian zones of major streams and rivers that are regularly flooded. Stands of box-elder forest are typically small and rare in the San Joaquin Valley (Sawyer, Keeler-Wolf and Evens 2009). The Project area and its 10-mile vicinity are within the known distribution area of this alliance. Therefore, the box-elder forest alliance has a high potential to occur.

Buttonbush Scrub (button willow thickets – *Cephalanthus occidentalis* alliance)

Status: State ranked as imperiled (S2) – At high risk of extinction or elimination in the State due to very restricted range, very few populations, steep declines, or other factors.

Button willow thickets is a vegetation alliance where button willow shrubs are dominant in the canopy or co-dominant with red-twig dogwood (*Cornus sericea*), black willow (*Salix gooddingii*), shining willow (*S. lucida* ssp. *lasiandra*), and sandbar willow (*Salix exigua*). Button willow shrubs are typically less than 20 feet tall and the alliance provides open, intermittent or continuous canopy cover. The herbaceous understory layer is sparse or grassy. The alliance occurs in seasonally flooded basins, sloughs, oxbow lakes and floodplains with subsurface water at the end of the growing season. Many small stands occur in riparian settings throughout most of its distribution range in the San Joaquin Valley. Often these stands form narrow strips along levees (Sawyer, Keeler-Wolf and Evens 2009). The Project area and its 10-mile vicinity are within the known distribution

area of this alliance. Therefore, the buttonbrush scrub alliance has a high potential to occur.

Tar Plant Fields (tar plant fields – *Centromadia pungens* or other sp.) herbaceous alliance)

Status: Globally and State tentatively ranked as imperiled (G2?S2?) – At high risk of extinction or elimination due to very restricted range, very few populations, steep declines, or other factors.

Tar plant fields is a vegetation alliance where tar plant of the genus *Centromadia* is dominant to conspicuous in the herbaceous layer with other herbaceous species (*Atriplex* spp., *Bromus* spp., *Deschampsia danthonioides*, *Downingia bella*, *Erodium cicutarium*, *Hirschfeldia incana*, *Lasthenia fremontii*, *L. californica*, *Trifolium depauperatum*, and *T. variegatum*). Emergent shrubs, such as alkali heath (*Frankenia salina*) and *Suaeda moquinii* may be present at low cover. Herbs are typically lower than three feet and their cover is intermittent. The alliance occurs in vernal wet habitats, including edges of alkaline vernal pools, bottoms of shallow pools, and alkaline flats subjected to periodic or intermittent water inundation. Soils are fine-textured alluvium, sometimes underlain by claypan or another impervious layer, poorly drained, and derived from sedimentary or volcanic substrates. Observations from the San Joaquin Valley include reports of summer flowering *C. pungens* covering large parts of the section, typically occurring on alkaline flats (Sawyer, Keeler-Wolf and Evens 2009). The Project area and its 10-mile vicinity are within the known distribution area of this alliance. Therefore, the tar plant fields alliance has a high potential to occur.

Alkali Sacaton Grassland (alkali sacaton grassland - *Sporobolus airoides* alliance)

Status: State ranked as imperiled (S2) – At high risk of extinction or elimination in the State due to very restricted range, very few populations, steep declines, or other factors.

This alliance is a tussock-forming grassland dominated by alkali sacaton (*Sporobolus airoides*). This grassland alliance occurs on fine-textured, poorly drained, usually alkaline soils. Most sites have seasonally high water tables or are saturated during winter flooding. Intergrades and often co-occurs with the Alkali Meadow and Northern Claypan Vernal Pool vegetation alliances. Alkali sacaton grassland was formerly extensive in the Tulare Lake Basin and along the San Joaquin Valley through north to Stanislaus and Contra Costa counties, now much reduced. Other major native grasses occurring in this alliance are alkali barley, dwarf barley, annual hair grass, saltgrass and creeping wildrye. Characteristic forbs and shrubs include iodine bush, alkali heath, alkali mallow, gumplant, saltbush and bush seepweed. Non-native grasses are also prevalent, particularly foxtail barley, Mediterranean barley, red brome, soft chess and foxtail fescue. The showy display of spring wildflowers includes yellow carpet, bluedicks, downingia, goldfields, meadowfoam, miniature lupine, navarretia, popcorn flower and tidy tips. Additional information about this plant alliance can be found in:

- California Native Grass Association's online guide to California grasslands, 2009, <http://www.cnga.org/guide1.htm>
- UC Santa Barbara Biogeography Lab, Community Types Mapped for the California GAP Analysis Project (<http://www.biogeog.ucsb.edu/projects/gap/data/cnddb/36210.html>)
- U.S. Fish and Wildlife Service. 1998. *Recovery plan for upland species of the San Joaquin Valley, California*. Region 1, Portland, OR. 319 pp.

According to the CNDDDB database large areas of alkali sacaton grassland occur approximately 5 miles north of the Project area. Therefore, based on the presence of appropriate habitat and nearby occurrences, the alkali sacaton grassland alliance has a high potential to occur.

Ditch-grass Wetland (widgeon-grass mats – *Ruppia (cirrhosa, maritima) aquatic herbaceous alliance*)

Status: State ranked as imperiled (S2) – At high risk of extinction or elimination in the State due to very restricted range, very few populations, steep declines, or other factors.

Widgeon-grass mats is a vegetation alliance where widgeon-grass species are dominant, herb forming submerged beds in water with other aquatic species (*Myriophyllum* spp, *Najas guadalupensis*, *Potamogeton foliosus*, *Utricularia macrorhiza*, and *Zannischellia palustris*). Widgeon-grass mats are typically less than 8 inches tall and the alliance canopy cover is open to continuous. The alliance occurs in seasonally or permanently flooded brackish marshes, channels, ponds, rivers, coastal wetlands; low-lying basins of high evaporation and infrequent inputs of freshwater in alkaline and saline wetlands (Sawyer, Keeler-Wolf and Evens 2009). The alliance occurs in Los Banos Wildlife Refuge, San Luis Wildlife Refuge and is dominant in managed marshes around Kesterson Reservoir in the San Joaquin Valley (Schuler et al. 1990). According to the *Manual of California Vegetation* (Sawyer, Keeler-Wolf and Evens 2009) distribution map for the vegetation alliance, the northern portion of the Project area and its 10-mile vicinity is within the known distribution area of this alliance. Therefore, based on the known distribution range and the presence of appropriate habitat, the ditch-grass wetland alliance has a high potential to occur.

Western Sea-Purslane Marsh (Western sea-purslane marsh – *Sesuvium verrucosum herbaceous alliance*)

Status: State tentatively ranked as imperiled and threatened (S2.2) – At high risk of extinction or elimination in the State due to very restricted range, very few populations, steep declines, or other factors. Globally tentatively ranked as vulnerable – at moderate risk of extinction or elimination due to a restricted range, relatively few populations, recent and widespread declines, or other factors.

Western sea-purslane marsh is a vegetation alliance where Western sea-purslane is the dominant or co-dominant in the herbaceous layer with other herbaceous species (*Chenopodium chenopodioides*, *Cotula coronopifolia*, *Distichlis spicata*, *Heliotropium curassavicum*, *Lolium perenne*, *Rumex crispus*, *R. pulcher*, *Salicornia bigelovii*, *Sarcocornia pacifica*, and *Spergularia marina*). Western sea-purslane marsh is typically

less than three feet tall and the alliance canopy cover is open to intermittent. The alliance occurs in seasonally dry alkaline flats; margins are usually alkaline or saline habitats, including coastal wetlands, vernal pools, and desert playas. Soils are usually clay. Stands occur in the San Joaquin Valley and the Kern National Wildlife Refuge and other alkaline wetlands (Sawyer, Keeler-Wolf and Evens 2009). The western portion of the Project area and its 10-mile vicinity is within the known distribution area of this alliance. The western sea-purslane marsh alliance has a high potential to occur.

Globally or State Ranked Vulnerable Vegetation Alliances

Valley Sink Scrub (Iodine bush scrub – *Allenrolfea occidentalis* alliance)

Status: State ranked as vulnerable (S3) – At moderate risk of extinction or elimination in the State due to a restricted range, relatively few populations, recent and widespread declines, or other factors.

Iodine bush scrub is a vegetation alliance where iodine bush is the dominant or co-dominant in the shrub canopy with other species (*Atriplex canescens*, *Frankenia salina*, *Kochia californica*, *Sarcobatus vermiculatus*, and *Suaeda moquinii*). The plants are often halophytes, i.e., tolerant of alkaline and saline soils. Shrubs form low, open to dense succulent shrublands that are typically less than seven feet tall. The alliance canopy cover is open to continuous. Herbaceous layer is variable or lacking and may include salt grass (*Distichlis spicata*), alkali sacaton (*Sporobolus airoides*) or occasionally red brome (*Bromus madritensis* ssp. *rubens*). The understory annuals are most active from January to April; the perennials and shrubs from March to September. The alliance occurs in dry lakebed margins, hummocks, playas perched above current drainages, seeps and alkali sinks. Alkali sinks are drainage basins that have soils high in soluble salts, which may or may not be alkaline (Twisselmann 1967). Playas (shallow, temporary lakes) may form in alkali sinks during periods of heavy rainfall. High ground water supplies provide capillary water for the perennials. Soil surfaces often have a brilliant white salty crust over dark, sticky clay. Hot, dry summers, damp winters with long periods of tule fog. On less severe sites the alliance may transition into several more common saltbush alliances. The alliance formerly surrounded the large San Joaquin Valley lakes (Kern, Buena Vista, Tulare, Goose) and north along the trough of the San Joaquin Valley through Merced County to the gooselands of the Sacramento Valley (Solano to Glenn County, west of the Sacramento river); but now essentially extirpated due to flood control, agricultural developments, and ground water pumping (UCSB 2002). Additional information about this vegetation alliance can be found at:

- A Manual of California Vegetation, Second Edition, by John Sawyer, Todd Keeler-Wolf, and Julie Evens 2009, ISBN 978-0-943460-49-9.
- UC Santa Barbara Biogeography Lab, Community Types Mapped for the California GAP Analysis Project (<http://www.biogeog.ucsb.edu/projects/gap/data/cnddb/36210.html>).
- U.S. Fish and Wildlife Service. 1998. *Recovery plan for upland species of the San Joaquin Valley, California*. Region 1, Portland, OR. 319 pp.

The CNDDDB database identifies several large areas of Valley Sink Scrub approximately 8 miles north of the Project area. Based on the *Manual of California Vegetation* (Sawyer, Keeler-Wolf and Evens 2009) distribution map for the vegetation alliance, the entire Project area and its 10-mile vicinity are within the known distribution area of this alliance. Therefore, based on nearby occurrences, known distribution range and the presence of appropriate habitat, the valley sink scrub alliance has a high potential to occur.

Northern Claypan Vernal Pool

Based on the current classification (CDFG 2009) this natural terrestrial community consists of the following three alliances and numerous associations:

- Fremont's goldfields–saltgrass alkaline vernal pools–*Lasthenia fremontii*–*Distichlis spicata* alliance
- Fremont's goldfields–Downingia vernal pools–*Lasthenia fremontii*–*Downingia (bicornuta)* alliance
- Smooth goldfields vernal pool bottoms–*Lasthenia glaberrima* alliance)

Status: The global and State ranking varies based on the species composition from globally and State vulnerable (G3S3) to globally apparently secure and State vulnerable (G4S3). These alliances are at moderate risk of extinction or elimination globally or in the State due to a restricted range, relatively few populations, recent and widespread declines, or other factors.

These vernal pool ecosystems are shallow ephemeral water bodies found in depressions (up to several acres in size) among grasslands and open woodlands from Central San Joaquin Valley north to Glenn and Colusa counties. Northern claypan vernal pools include a clay, silicone cemented hardpan layer that retains water inputs throughout some portion of the spring, but typically the depression dries down entirely into early summer months. They tend to be circumneutral to alkaline and slightly saline wetlands with characteristic plant species from genera such as *Downingia*, *Plagiobothrys*, *Eryngium*, *Lasthenia* and *Spergularia*. Due to draw-down characteristics, vernal pools typically form concentric rings of similar forb-rich vegetation. Given their relative isolation in upland-dominated landscapes, many endemic plant species are common in California vernal pools. They often intergrade with vernal marsh and cismontane alkali marsh, which have water present throughout the year. Additional information about these vegetation alliances can be found in:

- A Manual of California Vegetation, Second Edition, by John Sawyer, Todd Keeler-Wolf, and Julie Evens 2009, ISBN 978-0-943460-49-9
- UC Santa Barbara Biogeography Lab, Community Types Mapped for the California GAP Analysis Project (<http://www.biogeog.ucsb.edu/projects/gap/data/cnddb/36210.html>)
- U.S. Fish and Wildlife Service. 1998. *Recovery plan for upland species of the San Joaquin Valley, California*. Region 1, Portland, OR. 319 pp.

The CNDDDB database identifies one large area of Northern Claypan Vernal Pool approximately 5 miles west of the Project area, south of highway 180. Based on the *Manual of California Vegetation* (Sawyer, Keeler-Wolf and Evens 2009) distribution map for the vegetation alliance, the entire Project area and its 10-mile vicinity are within the known distribution area of the three vegetation alliances. Therefore, based on nearby occurrences, known distribution range and the presence of appropriate habitat, the Northern claypan vernal pool community has a high potential to occur.

Valley Oak Forests and Woodlands (Valley oak woodland – *Quercus lobata* woodland alliance)

Status: The global and State ranking varies based on the species composition (Association) from globally and State ranked as vulnerable (G3S3) to globally and State ranked as imperiled (G2S2). The valley oak woodland associations are at high to moderate risk of extinction or elimination in the State due to restricted or a very restricted range, very few or relatively few populations, steep or recent and widespread declines, or other factors.

Valley oak woodland alliance is a vegetation alliance where valley oak is the dominant or co-dominant in the tree canopy with other trees (*Acer negundo*, *Alnus rhombifolia*, *Fraxinus latifolia*, *Juglans hindsii* and hybrids, *Platanus racemosa*, *Populus fremontii*, *Quercus agrifolia*, *Q. douglasii*, *Q. kelloggii*, *Q. wislezeni*, *Salix gooddingii* and *S. lasiolepis*). Valley oak woodlands are typically up to one hundred feet tall and the alliance canopy cover is open to continuous. Shrubs are common to occasional along with vines, such as California grape and pipevine (*Vitis californica*, *Aristolochia californica*). The herbaceous layer may be grassy. The alliance occurs in valley bottoms, seasonally saturated soils that may be intermittently flooded and summit valleys. Soils are usually alluvial or residual. Early explorers in California noted valley oaks as dense forests and woodlands ranging over two miles from the main stems of the large rivers in the mid-1800s. Today, very few upland stands remain (Sawyer, Keeler-Wolf and Evens 2009). The Project area and its 10-mile vicinity are within the known distribution area of this alliance. The CNDDDB database does not identify any valley oak associations in the vicinity of the Project area, however, numerous valley oaks were observed during reconnaissance surveys. Therefore, based on field observations, known distribution, and the presence of appropriate habitat, the valley oak forests and woodlands alliance has a high potential to occur.

Oregon Ash Riparian Forest (Oregon ash groves – *Fraxinus latifolia* forest alliance)

Status: State ranked as vulnerable and threatened (S3.2) – At moderate risk of extinction or elimination in the State due to a restricted range, relatively few populations, recent and widespread declines, or other factors.

Oregon ash groves is a vegetation alliance where Oregon ash is the dominant or co-dominant in the tree canopy with other trees (*Acer macrophyllum*, *Alnus rhombifolia*, *Quercus kelloggii*, *Q. wislezeni*, and *S. laevigata*). Oregon ash groves are typically up to eighty feet tall and the alliance canopy cover is open to continuous. Shrubs are sparse to intermittent. The herbaceous layer is variable. The alliance occurs in riparian corridors,

seeps, stream banks and terraces. Soils are usually alluvial. (Sawyer, Keeler-Wolf and Evens 2009). The Project area and its 10-mile vicinity are within the known distribution area of this alliance. Therefore, based on the known distribution range and the presence of appropriate habitat, the Oregon ash riparian forest alliance has a high potential to occur.

California Sycamore Riparian Forest and Woodland (California sycamore woodlands – *Platanus racemosa* alliance)

Status: Globally and State ranked as vulnerable (G3S3), however, some associations are ranked as critically imperiled (G1S1) and imperiled (G2S2). At moderate risk of extinction or elimination globally and in the State due to a restricted range, relatively few populations, recent and widespread declines, or other factors.

California sycamore woodlands are vegetation alliances where California sycamore is the dominant or co-dominant in the tree canopy with other trees (*Alnus rhombifolia*, *Populus fremontii*, *Quercus lobata*, *Salix laevigata*, *S. gooddingii*, *S. lasiolepis*, *S. lutea* and *Umbellularia californica*). California sycamore woodlands are typically up to one hundred and twenty feet tall and the alliance canopy cover is open to intermittent. Shrubs are open to intermittent. The herbaceous layer is sparse or grassy. The alliance occurs in riparian corridors, intermittent streams, gullies, seeps, springs, stream banks and terraces that are subject to high intensity flooding. Soils are rocky or cobbly alluvium with permanent moisture at depth. Stands of California sycamore woodland occur sporadically in the Great Valley (Sawyer, Keeler-Wolf and Evens 2009). The Project area and its 10-mile vicinity are within the known distribution area of this alliance. Therefore, based on the known distribution range and the presence of appropriate habitat, the California sycamore riparian forest and woodland alliance has a high potential to occur.

Fremont Cottonwood Riparian Forests and Woodlands (Fremont cottonwood forest – *Populus fremontii* alliance)

Status: State ranked as vulnerable and threatened (S3.2) – At moderate risk of extinction or elimination in the State due to a restricted range, relatively few populations, recent and widespread declines, or other factors.

Fremont cottonwood forest is a vegetation alliance where Fremont cottonwood is the dominant or co-dominant in the tree canopy with other trees (*Acer negundo*, *Fraxinus latifolia*, *Juglans hindsii*, *Platanus racemosa*, *Quercus agrifolia*, *Q. lobata*, *Salix exigua*, *S. laevigata*, *S. gooddingii*, *S. lasiolepis*, and *S. lutea*). California sycamore woodlands are typically up to eighty feet tall and the alliance canopy cover is open to continuous. Shrubs are open to intermittent. The herbaceous layer is variable. The alliance occurs in riparian corridors, floodplains, low-gradient rivers, perennial or seasonally intermittent streams, springs, and in valleys with a dependable subsurface water supply that varies considerably during the year. Mixed stands of Fremont cottonwood forest occur sporadically in the Great Valley and are generally small and fragmented. They occur along the San Joaquin River and its major tributaries (Sawyer, Keeler-Wolf and Evens 2009). The Project area and its 10-mile vicinity are within the known distribution area of this alliance. Therefore, based on the known distribution range

and the presence of appropriate habitat, the Fremont cottonwood riparian forests and woodlands alliance has a high potential to occur.

Black Willow Riparian Forests and Woodlands (Black willow thickets – Salix gooddingii alliance)

Status: State ranked as vulnerable (S3) with some associations considered rare – At moderate risk of extinction or elimination in the State due to a restricted range, relatively few populations, recent and widespread declines, or other factors.

Black willow thickets is a vegetation alliance where black willow is the dominant or co-dominant in the tree canopy with other trees (*Alnus rhombifolia*, *Populus fremontii*, *Salix laevigata*, *S. lasiolepis*, *S. lucida* ssp. *lasiandra* and *S. lutea*). Black willow thickets are typically up to one hundred feet tall and the alliance canopy cover is open to continuous. Shrubs are open to continuous with valley elderberry (*Sambucus nigra*), coyote brush (*Baccharis pilularis*), mulefat (*B. salicifolia*) and redbud dogwood (*Cornus sericea*). The herbaceous layer is variable. The alliance occurs in riparian corridors, rocky floodplains, of small intermittent streams, springs, and seeps. Black willow is an alliance indicator along the San Joaquin River and its tributaries (Sawyer, Keeler-Wolf and Evens 2009). The Project area and its 10-mile vicinity are within the known distribution area of this alliance. Therefore, based on the known distribution range and the presence of appropriate habitat, the black willow riparian forests and woodlands alliance has a high potential to occur.

Red Willow Riparian Forests (Red willow thickets – Salix laevigata woodland alliance)

Status: Globally and State ranked as vulnerable (G3S3) – at moderate risk of extinction or elimination in the State due to a restricted range, relatively few populations, recent and widespread declines, or other factors.

Red willow thickets is a vegetation alliance where red willow is the dominant or co-dominant in the tree canopy with other trees (*Acer negundo*, *Aesculus californica*, *Alnus rhombifolia*, *Platanus racemosa*, *Populus fremontii*, *Quercus agrifolia*, *Q. Chrysolepis*, *Salix gooddingii*, *S. lasiolepis*, *S. lucida* ssp. *lasiandra* and *Sambucus nigra*). Black willow thickets are typically up to seventy feet tall and the alliance canopy cover is open to continuous. The shrub layer is open to continuous. The herbaceous layer is variable. The alliance occurs in riparian corridors, floodplains, lake edges, low-gradient depositions along streams. Red willow thickets are scattered throughout the California Great Valley (Sawyer, Keeler-Wolf and Evens 2009). The Project area and its 10-mile vicinity are within the known distribution area of this alliance. Therefore, based on the known distribution range and the presence of appropriate habitat, the red willow riparian forests alliance has a high potential to occur.

Spinescale Scrub (Spinescale scrub – Atriplex spinifera alliance)

Status: Globally and State ranked as vulnerable (G3S3) – at moderate risk of extinction or elimination in the State due to a restricted range, relatively few populations, recent and widespread declines, or other factors.

Spinescale scrub is a vegetation alliance where spinescale is the dominant or co-dominant in the shrub canopy with other shrubs (*Ambrosia salsola*, *Atriplex polycarpa*, *Frankenia salina*, *Ephedra californica*, *Gutierrezia californica*, *Isocoma acradenia*, and *Picrothamnus desertorum*). Spinescale scrub is typically up to seven feet tall and the alliance canopy cover is open. The herbaceous layer is variable with seasonal annuals reaching high cover. The alliance occurs in alluvial fans, old lake beds perched above current drainages. Soils are moderately sandy clay loams to fine, silty clays that may be carbonate rich. Spinescale scrub is scattered on alkaline soils throughout the San Joaquin Valley adjacent to and above iodine bush scrub alliance (Sawyer, Keeler-Wolf and Evens 2009). The western portion of the Project area and its 10-mile vicinity are within the known distribution area of this alliance. Therefore, based on the known distribution range and the presence of appropriate habitat, the spinescale scrub alliance has a high potential to occur.

California Rose Riparian Scrub (California rose briar patches – *Rosa californica* alliance)

Status: Globally and State ranked as vulnerable (G3S3) – at moderate risk of extinction or elimination in the State due to a restricted range, relatively few populations, recent and widespread declines, or other factors.

California rose briar patches is a vegetation alliance where California rose is the dominant or co-dominant in the shrub canopy with other shrubs (*Artemisia californica*, *Baccharis pilularis*, *Rubus armeniacus*, *Salix lasiolepis*, *Salvia mellifera*, *Sambucus nigra*, and *Symphoricarpos mollis*). Emergent red willow and other trees may be present at low cover. California rose briar patches are typically up to seven feet tall and the alliance canopy cover is open to continuous and may be two-tiered. The herbaceous layer is open. The alliance occurs at creek bottoms, stream terraces, and bordering sloughs and channels, including those in intertidal zones. Soils are mixed alluvium. California rose briar patches are scattered throughout the San Joaquin (Sawyer, Keeler-Wolf and Evens 2009). The Project area and its 10-mile vicinity are within the known distribution area of this alliance. A number of California rose briar patches were observed during reconnaissance surveys. Therefore, based on field observations, known distribution and the presence of appropriate habitat, the California rose riparian scrub alliance has a high potential to occur.

Bush Seepweed Scrub (Bush seepweed scrub – *Suaeda moquinii* alliance)

Status: State ranked as vulnerable and threatened (S3.2) – at moderate risk of extinction or elimination in the State due to a restricted range, relatively few populations, recent and widespread declines, or other factors. The California Great Valley associations are very rare.

Bush seepweed scrub is a vegetation alliance where bush seepweed is the dominant or co-dominant in the shrub canopy with other shrubs (*Allenrolfia occidentalis*, *Atriplex polycarpa*, *A. canescens*, *Frankenia salina*, *Kochia californica*, *Sarcobatus vermiculatus*, and *Sporobolus airoides*). Bush seepweed scrub is typically up to five feet tall and the alliance canopy cover is open to continuous. The herbaceous layer is sparse to intermittent. The alliance occurs in flat to gently sloping valley bottoms, playas, toe

slopes adjacent to alluvial fans, and bajadas. Soils are deep, saline or alkaline. Bush seepweed scrub is scattered throughout the San Joaquin Valley (Sawyer, Keeler-Wolf and Evens 2009). The Project area and its 10-mile vicinity are within the known distribution area of this alliance. Therefore, based on the known distribution range and the presence of appropriate habitat, the bush seepweed scrub alliance has a high potential to occur.

Elderberry Scrub and Savanna (Blue elderberry stands – Sambucus nigra shrubland alliance)

Status: Globally and State ranked as vulnerable (G3S3) – at moderate risk of extinction or elimination in the State due to a restricted range, relatively few populations, recent and widespread declines, or other factors.

Blue elderberry stands is a vegetation alliance where blue elderberry is the dominant or co-dominant in the shrub canopy with other shrubs (*Artemisia californica*, *Baccharis pilularis*, *B. salicifolia*, *Ceanothus megacarpus*, *Diplacus aurantiacus*, *Fraxinus latifolia*, *Hazardia squarrosa*, *Heteromeles arbutifolia*, *Malosma laurina*, *Nicotiana glauca*, *Ribes speciosum*, *Rhus integrifolia*, *Rubus spp.*, *Salix exigua*, *S. lasiolepis*, *Toxicodendron diversilobum*, and *Vitis californica*). Emergent trees, such as California walnut (*Juglans californica*) Fremont cottonwood (*Populus fremontii*), coast live-oak (*Quercus agrifolia*), and valley oak (*Q. lobata*) may be present at low cover. Blue elderberry stands are typically up to twenty-eight feet tall and the alliance canopy cover is open to continuous and may be two-tiered. The herbaceous layer is variable and usually grassy. The alliance occurs on stream terraces and in bottomlands; localized areas in upland settings. Soils are typically gravelly alluvium and intermittently flooded. Blue elderberry stands are scattered throughout the San Joaquin Valley along creeks and stream terraces (Sawyer, Keeler-Wolf and Evens 2009). The Project area and its 10-mile vicinity are within the known distribution area of this alliance. Several blue elderberry stands were observed during the reconnaissance surveys. Therefore, based on field observations, known distribution and the presence of appropriate habitat, the elderberry scrub and savanna alliance has a high potential to occur.

Alkali Heath Dwarf Scrub (Alkali heath marsh – Frankenia salina alliance)

Status: State ranked as vulnerable (S3) – at moderate risk of extinction or elimination in the State due to a restricted range, relatively few populations, recent and widespread declines, or other factors.

Alkali heath marsh is a vegetation alliance where alkali heath is the dominant or co-dominant in the herbaceous or subshrub (suffrutescent) layer with other species (*Arthrocnemum subterminale*, *Atriplex spp.*, *Agrostis avenacea*, *Batis maritime*, *Cressa truxilensis*, *Distichlis spicata*, *Hordeum murinum*, *Lasthenia spp.*, *Lepidium spp.*, *Sarcocornia californica*, and *Suaeda taxifolia*). Alkali heath marsh is typically composed of herbs and subshrubs up to two feet tall and the alliance canopy cover is open to continuous. The alliance occurs in coastal salt marshes, brackish marshes, alkali meadows, alkali playas. Soils are typically saline, sandy to clayey alluvium. Alkali heath marsh alliance in the San Joaquin Valley includes *Lasthenia spp.*, *Lepidium dictyotum* and *Arthrocnemum subterminale* (Sawyer, Keeler-Wolf and Evens 2009). The western portion of the Project area and its 10-mile vicinity are within the known distribution area

of this alliance. Therefore, based on the known distribution range and the presence of appropriate habitat, the alkali heath dwarf scrub alliance has a high potential to occur.