Appendix D

Fish and Wildlife Coordination Act Report

Final
Program Environmental Impact Statement/Report

Final
July 2012

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Sacramento Fish and Wildlife Office
2800 Cottage Way, Room W-2605
Sacramento, California 95825-1846

In Reply Refer To
San Joaquin River Restoration Program

JUL 19 2012

Memorandum

To: Program Manager, San Joaquin River Restoration Program, Mid-Pacific Regional Office, U.S. Bureau of Reclamation
Sacramento, California

From: Field Supervisor, Sacramento Fish and Wildlife Office
Sacramento, California

Subject: San Joaquin River Restoration Program Fish and Wildlife Coordination Act Report

The attached document constitutes the Fish and Wildlife Service's Fish and Wildlife Coordination Act (FWCA) report, regarding the proposed restoration of the San Joaquin River as proposed by the San Joaquin River Restoration Program. This FWCA report also considers the Service's biological opinion (file # 08ESMF00-2012-F-0125) for this same action. This report assesses potential project impacts to fish and wildlife resources and provides our recommendations to avoid, minimize or compensate potential effects and is primarily based on information provided in the draft and administrative final Programmatic Environmental Impact Statement/Environmental Impact Report for the San Joaquin River Restoration Program.

If you have any questions please feel free to call Mark Littlefield at (916) 414-6520.

Attachment

United States Department of the Interior

Fish and Wildlife Service

Fish and Wildlife Coordination Act Report

for the

SAN JOAQUIN RIVER RESTORATION PROGRAM

Prepared for:
U.S. BUREAU OF RECLAMATION
SACRAMENTO, CALIFORNIA

Prepared by:
U.S. FISH AND WILDLIFE SERVICE
SACRAMENTO FISH AND WILDLIFE OFFICE
SACRAMENTO, CALIFORNIA

July 2012

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INTRODUCTION

This report constitutes the Fish and Wildlife Service's (Service) Fish and Wildlife Coordination Act (FWCA) report, as provided for in section 2(b) of the FWCA (Public Law 85-624; 16 U.S.C. 661-667e), regarding proposed restoration of the San Joaquin River. This FWCA report considers the Service's biological opinion (file # 08ESMF00-2012-F-0125)pursuant to section 7 of the Endangered Species Act of 1973, as amended (ESA). It is the Service's intent to provide this FWCA report for inclusion in the final Programmatic Environmental Impact Statement/Environmental Impact Report (PEIS/R) for the San Joaquin River Restoration Program (SJRRP). The planning for the proposed restoration of the San Joaquin River is authorized through the Central Valley Project Improvement Act and the San Joaquin River Restoration Settlement Act.

Background

In 1945, U.S Bureau of Reclamation (Reclamation) completed construction of the 319-foot tall Friant Dam on the San Joaquin River. Friant Dam diverted most of the San Joaquin River water supplies to over 1 million acres of farmland along the eastern portion of the San Joaquin Valley. Operation of the dam resulted in cessation of 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, the Natural Resource Defense Council (NRDC), along with a coalition of environmental groups and commercial fishermen, sued Reclamation, later citing a violation of California Fish and Game Code 5937, which requires dam owners to "keep in good condition" fish below the dam. More than 60 miles of the river have been dry in non-flood flow conditions ever since the dam was constructed.

On September 13, 2006, a Settlement Agreement was entered into by NRDC, Friant Water Users Authority, and the U.S. Departments of the Interior and Commerce. The parties agreed on terms and conditions which were subsequently approved by the U.S. Eastern District Court of California on October 23, 2006. The Settlement establishes two primary goals:

> Restoration Goal- To restore and maintain fish populations in "good condition" in the mainstem San Joaquin River below Friant Dam to the confluence with 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 to all of the Friant Division long-term contractors that may result from the Interim Flows and Restoration Flows provided for in the Settlement.

The Settlement also establishes a framework for accomplishing the Restoration and Water Management goals that will require National Environmental Policy Act (NEPA) and California Environmental Quality Act (CEQA) compliance for the project design, construction, and monitoring over the multi-year period. On March 30, 2009, President Obama signed the San

Joaquin River Restoration Settlement Act (SJRRS Act) giving the U.S. Department of the Interior full authority to implement the Settlement.

To achieve the Restoration Goal, the Settlement calls for a combination of channel and structural modifications which incorporate the following: new floodplain and related riparian habitat along the San Joaquin River downstream of Friant Dam; releases of water from Friant Dam to the confluence of the Merced River; modifications to control and diversion structures; filling or isolating high priority gravel pits in Reach 1 to ensure fish passage; and the reintroduction of spring and fall-run Chinook salmon.

To achieve the Water Management Goal, the Settlement calls for downstream recirculation, recapture, reuse, exchange or transfer of Restoration Flows to reduce, avoid, or offset the quantity of expected water supply impacts to Friant Division long-term contractors resulting from the release of the Interim and Restoration flows. In addition, the Settlement establishes a Recovered Water Account and allows the delivery of surplus water supplies to Friant Division long-term contractors during wet hydrologic conditions.

The SJRRP is comprised of several Federal and State of California agencies responsible for implementing the Settlement. Implementing Agencies responsible for managing and implementing the SJRRP are: the Service, Reclamation, National Marine Fisheries Service (NMFS), California Department of Water Resources (DWR), California Department of Fish and Game (DFG), and California Environmental Protection Agency. Reclamation and DWR initiated environmental compliance in August 2007 for implementing the SJRRP consistent with requirements of NEPA and CEQA. Reclamation is the lead NEPA agency and DWR is the lead CEQA agency in preparing the PEIS/R.

All of the Implementing Agencies are working collaboratively on the development and planning of the SJRRP to implement the Settlement. The Service is partnering with Reclamation on developing the NEPA/CEQA documents and permits, primarily in regard to fish and wildlife.

Location of the Study Area

The proposed project area is located in California's Central Valley and extends from the Sacramento-San Joaquin River Delta (Delta) to the base of the Tehachapi Mountains south of Bakersfield, California. The river restoration area is 153 miles long and stretches from Friant Dam to the confluence of the Merced River and crosses into the counties of Fresno, Madera, Merced and Stanislaus (Figure 1). Five river reaches have been defined to address the variation in river characteristics throughout the Restoration Area (Figure 2). Reach 1 begins at Friant Dam and continues for approximately 37 miles downstream to Gravelly Ford. Reach 1 is subdivided into 1A and 1B by Highway 99. Reach 2 starts at Gravelly Ford and extends downstream to Mendota Dam. Reach 2 is subdivided at the Chowchilla Bypass Bifurcation Structure into two sub-reaches, Reach 2A and Reach 2B. Reach 3 extends from Mendota Dam at the upstream end to Sack Dam at the downstream end. Reach 4 is located between Sack Dam and the confluence

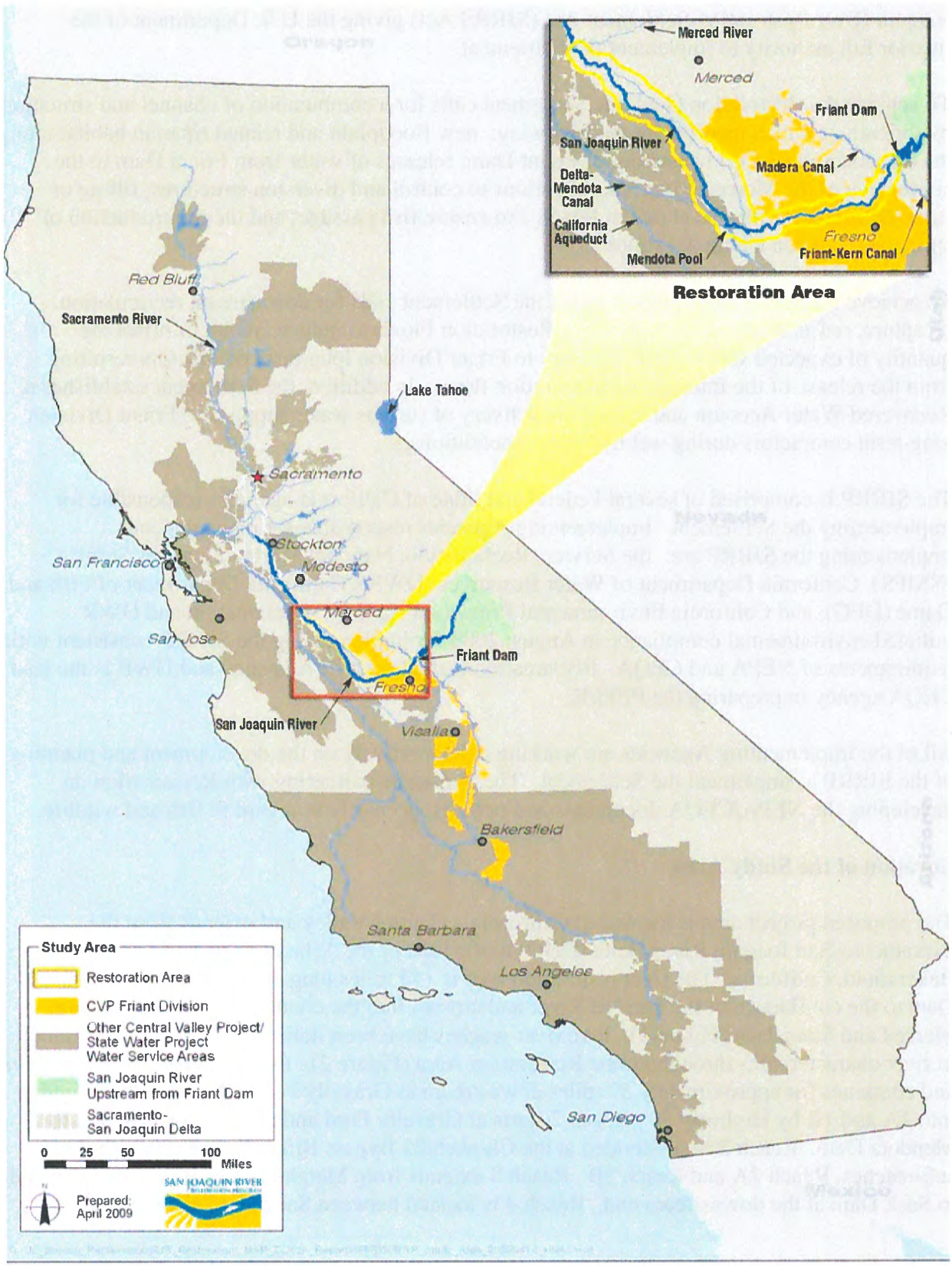


Figure 1. The San Joaquin River Restoration Area and downstream reaches.

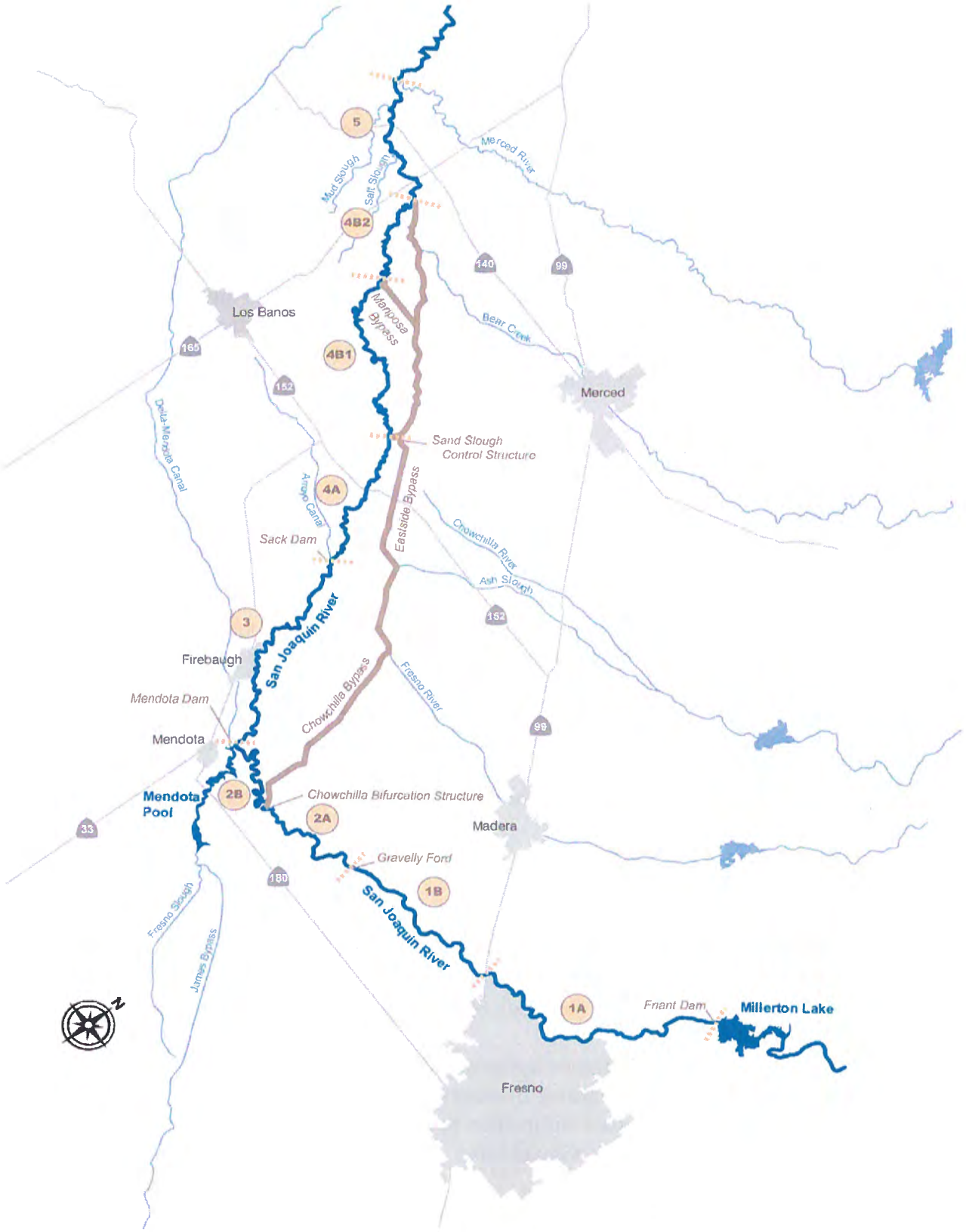


Figure 2. Detailed map showing the Restoration Area and the project reaches.

with Bear Creek and the Eastside Bypass. Reach 4 is subdivided into three sub-reaches: 4A (Sack Dam to Sand Slough Control structure), 4B1 (Sand Slough Control structure to Mariposa Bypass) and 4B2 (Mariposa Bypass to Bear Creek). Reach 5 extends from the confluence of the Eastside Bypass downstream to the Merced River confluence. The proposed project area also includes sections of the Eastside Bypass and Mariposa Bypass.

PROJECT DESCRIPTION

The Settlement and the SJRRS Act authorize and direct specific physical and operational actions to occur in order to implement the SJRRP. Within the Settlement itself those actions are described within paragraphs 11-16 and are distinguished as two levels of environmental analysis; Program and Project. Program level actions are potential actions that will require additional environmental analysis, whereas the Project level actions are being analyzed completely and are necessary for the initial implementation of the SJRRP.

Alternatives

The following summarizes the SJRRP alternatives as described in the April 2011, Draft EIS/R for the SJRRP and the second administrative Final PEIS/R dated June 2012. This FWCA report attempts to capture an up-to-date project description based on revisions that have been provided to us since the Draft PEIS/R.

All six of the action alternatives include features that may occur after additional evaluation and environmental permitting is completed on each feature. They include: re-operation of Friant Dam and Downstream Flow Control Structures, recapture of flows, and a grouping of potential actions referred to as the "Common Restoration Actions." The Common Restoration Actions are stipulated in Paragraph 11, of the Settlement– they are the high priority channel improvements that may be needed to provide channel capacity for full Restoration flows to be analyzed on a Program level in the SJRRP draft EIS/R. The Common Restoration Actions include:

- Construct Mendota Pool Bypass and Modify Reach 2B to convey at least 4,500 cubic feet per second (cfs)
- Modify the Sand Slough Control Structure to Enable Fish Passage
- Screen Arroyo Canal and Provide Fish Passage at Sack Dam
- Modify Reach 4B1 for conveyance of at least 475 cfs and up to 4,500 cfs
- Modify San Joaquin River Headgate Structure to enable flow routing between 500 cfs and 4,500 cfs
- Modify Eastside and Mariposa Bypasses for Fish Passage
- Enable Deployment of Seasonal Barriers at Mud and Salt Sloughs
- Modify Chowchilla Bypass Bifurcation Structure
- Fill or Isolate High Priority Gravel Pits
- Enhance Spawning Gravel
- Reduce Potential for Redd Superimposition and/or Hybridization
- Supplement the Salmon Population
- Modify Floodplain and Side-Channel Habitat

- Enhance In-channel Habitat
- Reduce Potential for Aquatic Predation of Juvenile Salmonids
- Reduce Potential for Fish Entrainment
- Enable Fish Passage
- Modify Flood Flow Control Structures

Differences are minimal between the six Proposed Action Alternatives for the Program, and include combining variations in recapture locations and maximum flow releases (specific to Reach 4B1 only). All other modifications and associated alternatives will be addressed in the Project-specific documents.

Table 1. Breakdown of Proposed Action Alternative Differences for the Program

Alternative	Water Recapture Opportunity	Channel Capacity (Reach 4B1)
A1	**Recapture in R and D only**	**475 cfs**
A2	**Recapture in R and D only**	**4,500 cfs**
B1	**Recapture in R, D and Additional Recapture in OE**	**475 cfs**
B2	**Recapture in R, D, and Additional Recapture in OE**	**4,500 cfs**
C1	**Recapture in R, D, OE and Additional Recapture at a New San Joaquin River Pumping Plant**	**475 cfs**
C2	**Recapture in R, D, OE and Additional Recapture at a New San Joaquin River Pumping Plant**	**4,500 cfs**

R= Restoration Area, D=Delta, OE=Outside the Restoration Area w/ Existing Facilities

Alternative A1
Alternative A1 includes re-operation of Friant Dam and a range of actions to achieve the Restoration and Water Management goals. Reach 4B1 would convey at least 475 cfs and the Eastside and/or Mariposa Bypasses would be used to convey the remaining flows above 475 cfs. Also included is the potential for recapture of flows in the Restoration Area (R) and/or Delta (D) using existing diversion facilities, operated under existing operating criteria.

Alternative A2
Alternative A2 includes the same Restoration and Water Management actions as A1, plus additional restoration actions to increase Reach 4B1 channel capacity to at least 4,500 cfs with integrated floodplain habitat. Under this alternative the Eastside Bypass would not convey flows after completion of Reach 4B1 channel modifications.

Alternative B1
Alternative B1 includes the same Restoration and Water Management actions as A1, plus the additional Water Management actions for potential recapture of flows in the San Joaquin River downstream of the confluence with the Merced River using existing facilities.

Alternative B2
Alternative B2 includes the same Restoration and Water Management actions as B1 plus the additional Restoration Actions to increase Reach 4B1 channel capacity to at least 4,500 cfs with integrated floodplain habitat included in A2.

Alternative C1
Preferred Alternative: Alternative C1 includes the same Restoration and Water Management actions as B1, plus additional Water Management actions for recapture of flows through a new pumping plant on the San Joaquin River downstream of the confluence with the Merced River.

Alternative C2
Alternative C2 includes the same Restoration and Water Management actions as C1, plus the additional Restoration actions to increase Reach 4B1 channel capacity to at least 4,500 cfs with integrated floodplain habitat included in A2.

Conservation Strategy

A number of actions that are proposed to be implemented may substantially alter not only the aquatic ecosystem of the San Joaquin River, but also the river's riparian and wetland ecosystems, and some adjacent upland ecosystems. Riparian, wetland, and upland ecosystems of the Central Valley, such as those along the San Joaquin River, provide habitat for a large number of species, including several Federally and State-listed species.

As part of the SJRRP, a strategic habitat conservation approach is being developed for the conservation of sensitive habitats along the river and associated with project implementation. The development of a more clearly defined project footprint for the Program actions and associated base vegetation map are underway to facilitate the implementation of the strategic habitat conservation approach. The approach allows Reclamation and DWR, in coordination with the Service, NMFS and DFG to develop a Conservation Strategy while the current unknowns associated with the SJRRP are still in development. The Conservation Strategy's overall goal is to stipulate strategic parameters for design and planning, which would avoid, minimize and/or compensate for adverse effects on sensitive habitats and species that may otherwise result from flows or construction. The Conservation Strategy will be consistent with the Recovery Plans for Federally listed species, the Service's Mitigation Policy, Migratory Bird Treaty Act, Clean Water Act, and the Magnuson-Stevens Act.

Modeling

The SJRRP is currently utilizing several models to test conceptual designs and analyses of the system to assist in determining the best ways to restore the system while meeting the Settlement goals.

Conceptual and quantitative models are critical tools to understanding how the San Joaquin River system would respond to the various proposed modifications and flows. Several state-of-the-art models are available for analyzing water quality conditions in complex (riverine) systems and several models are being developed. The analyses will continue as the various components

that are called out in the Settlement are planned and constructed and as the system changes over time. Some of the models that the SJRRP is developing are specific to salmon and riparian floodplain development including the Ecosystem Diagnosis and Treatment (EDT) model and hydraulic models.

The EDT model is a framework that views salmon as the indicator or diagnostic species for the ecosystem. The EDT framework was designed so that analyses made at different spatial scales (i.e., from tributary watersheds to successively larger watersheds) might be related and linked. Biological performance is a central feature of the framework and is defined in terms of three elements: life history diversity, productivity, and capacity. These elements of performance are characteristics of the ecosystem that describe persistence, abundance, and distribution potential of a population. Other fish modeling approaches, and the addition of individual based models, will be developed to improve the evaluation of specific restoration actions.

One dimensional models, including HEC-RAS, SRH-1D, and SRH-1DV, perform 1-D hydraulic analyses on networks of natural or constructed open channels. The software is capable of performing steady flow calculations and unsteady flow calculations, and additional models build on these results to perform sediment transport and mobile bed computations (SRH-1D), water temperature modeling (HEC-5Q, based on HEC-RAS), and vegetation modeling (SRH-1DV). The basic steady flow computational procedure involves solving the 1-D energy equation, including friction and contraction/expansion energy losses. The momentum equation is utilized for rapidly changing water surfaces. The models also accommodate channel obstructions, such as bridges, culverts, and weirs, and can assess changes due to channel modifications and levees. The output of the 1-D hydraulic model provides water surface elevation, depth and velocity. These data from the HEC-RAS model are then used to produce inundation maps by depth. These maps when combined with estimated acreages provide a picture of the depth in the existing channel and on the floodplain for baseline vegetation and flow conditions. Since the HEC-RAS model is 1-D, only average velocities over each cross-section can be obtained from the model results. Once the field data is collected, the parameters needed for a 2-D hydraulic model would allow the SJRRP to obtain water surface elevations and velocities on a grid throughout the Restoration Area. These offer the potential to predict the local pattern and timing of inundation depth and velocity which will assist in development of the alternative designs for the SJRRP.

A 2-D hydraulic model provides the ability to simulate lateral changes in flow including edge water, eddies, side channels, and ponding. 2-D models improve the ability to identify floodplain and gravel pit interactions as well as other situations where computing hydraulics with a uniform cross section does not adequately resolve the physical processes.

Conceptual designs for several aspects of the SJRRP are also being entered into models to analyze hydraulic capacity, sediment transport characteristics, vegetation response, and other physical aspects of potential fish habitat.

The SJRRP has two temperature models available: CE-QUAL-W2 is a vertical 2-D temperature model of Millerton Reservoir, and HEC-5Q is a temperature model of the San Joaquin River

based on 1-D hydraulic routing. These models allow for projection of temperatures depending on different flow release patterns.

Flows

The re-operation of Friant Dam would allow release of Interim and Restoration flows into the San Joaquin River according to the six flow schedules specified in the Exhibit B of the Settlement (Figure 3). The maximum downstream extent and rate of flow releases would be limited to existing downstream channel capacity. As channel or structural modifications are completed flow releases out of Friant Dam would increase until they met full restoration flows. The Implementing Agencies are developing a real-time flow management framework (adaptive process) in preparation for fish reintroduction. Once completed, the real-time flow management framework is intended to make real-time monitoring data available to best manage releases to meet needs for salmon to complete their life cycle.

The hydrograph in the Settlement outlines average targets for each water year type for the SJRRP as well as a provision for the release of pulse flows in Normal-Wet and Wet-Years to attempt to perform geomorphic functions such as flushing spawning gravel (Figure 3). The hydrographs contain flexible flow periods. The spring and fall base flows can be shifted up to four weeks earlier or later than what is depicted in the hydrograph for a given year so long as the total flow volume is not changed. The flushing flows include a peak release of 8,000 cfs for several hours, but the maximum sustained flow would be at 4,500 cfs.

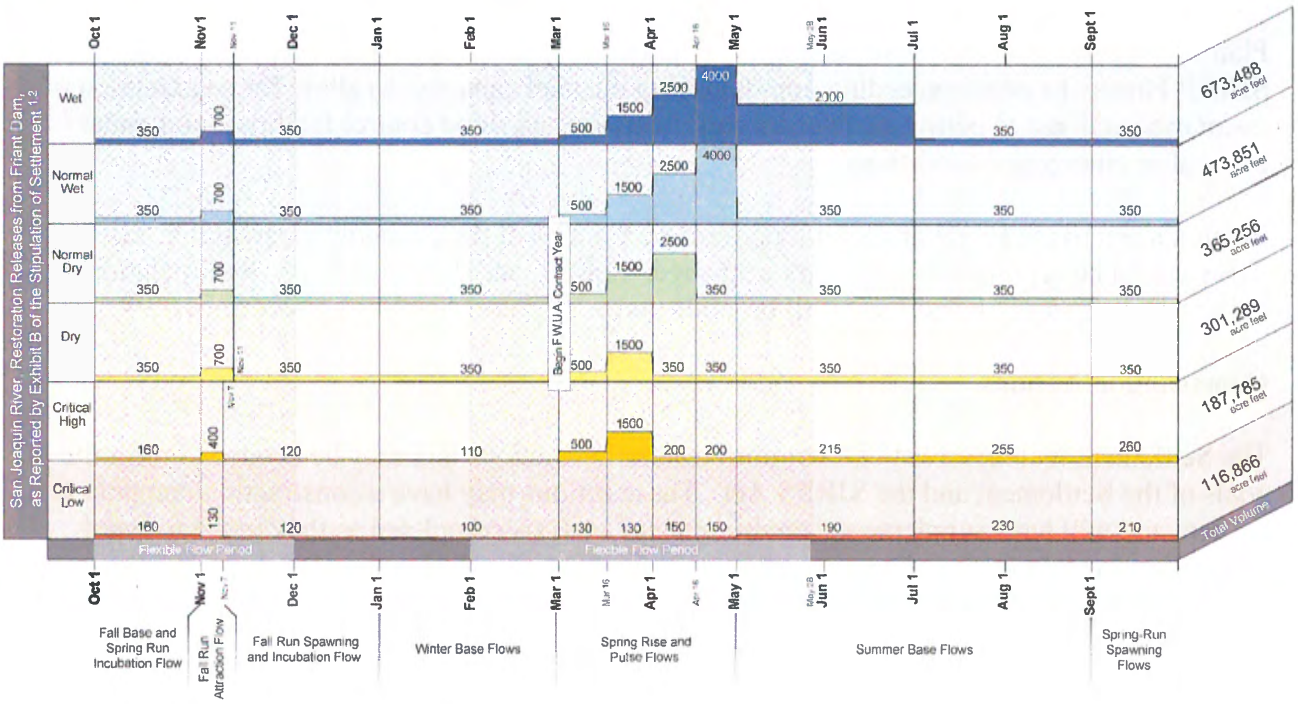
The Settlement has specific flow targets that vary by Restoration Year Type, and range from zero cfs (in Reaches 3, 4A, and 4B in Critical-Low water years) to 4,055 cfs (at the confluence of the Merced River in Wet and Normal-Wet water years). Appendix A shows the San Joaquin River flows by Reach as reported by Exhibit B of the Settlement.

Monitoring

Interim Flows

The Settlement requires "a program of Interim Flows in order to collect relevant data concerning flows, temperatures, fish needs, seepage losses, recirculation, recapture and reuse." The Implementing Agencies are currently collecting relevant data through a monitoring network and a series of studies designed to address uncertainties related to Settlement implementation. Modeling to predict conditions for different conceptual designs and formulate future operations relies on this monitoring data for calibration and validation.

The following is a list of the monitoring activities and other studies that the Program is actively doing or planning for the Interim Flow period: Flow Monitoring, Water Quality Monitoring, Tissue Collection, Invertebrates Sampling, Bathymetry Studies, Temperature Data Logging, Spawning Gravel Evaluation, Bed Material Study, Micro-Habitat Spawning Quality Study, Hills Ferry Barrier Evaluation, Fall-run Chinook Salmon Fish Survival and Migration Pilot Study, Egg Survival, Habitat and Vegetation Mapping, Preparations for a Steelhead Plan, Sediment Sampling, and Groundwater and Seepage Monitoring.



1. NRDC v. Rodgers, Stipulation of Settlement, CIV NO. S 88-1658 - LKK/GGH, Exhibit B, September 13, 2006.
2. Hydrographs reflect assumptions about sensitive species and tributary inflows which are specific to the settlement.

Figure 3. Restoration flow release by restoration water year-type, as specified in Exhibit B of the Settlement.

Restoration Flows

To meet the goals of the Settlement, the Restoration Flows would be monitored at no less than six locations between Friant Dam and the confluence with the Merced River. This monitoring will ensure that the flow targets at or immediately downstream of Friant Dam, at Gravelly Ford, downstream of the Chowchilla Bifurcation Structure, downstream of Sack Dam, at the top of Reach 4B, and at the confluence with the Merced River are being met. Fish populations would be monitored to assess if the goal of a naturally producing and sustainable salmon population has been obtained. Additional monitoring is likely to continue for a variety of water and biological variables that have yet to be determined.

Recapture and Recirculation

The SJRRS Act and the Settlement authorize and direct the Secretary of the Interior to implement a plan for recirculation, recapture, reuse, exchange or transfer of Interim Flows and Restoration Flows for the purpose of reducing or avoiding impacts, caused by the SJRRP, for water deliveries to all of the Friant Division long-term contractors. The plan is also required to, among other things, "ensure that any recirculation, recapture, reuse, exchange or transfer of the Interim Flows and Restoration Flows have no adverse impact on the Restoration Goal, downstream water quality or fisheries."

Recapture of the SJRRP Flows is analyzed at a project-level in the draft PEIS/R and would occur within the Restoration Area (e.g. Mendota Pool), lower San Joaquin River (e.g. Patterson Irrigation District), and/or in the Delta (i.e. William "Bill" Jones and Harvey O. Banks Pumping Plants). Recapture in the Restoration Area would only occur when it is necessary to direct SJRRP Flows: to avoid exceeding non-damaging channel capacity; to allow for construction of restoration actions; to permit maintenance of diversion and flood control facilities; and under unusual or emergency conditions.

Recirculation to the Friant Division long-term contractors of the available recapturable SJRRP flows would be accomplished through exchange, transfer, and direct delivery. Recirculation is evaluated on a program-level and will be evaluated at a project-level in a future document.

Construction Actions

The Settlement includes a list of Common Restoration Actions that may be needed to meet the goals of the Settlement and the SJRRS Act. These actions may have a construction component to them and will have supplemental environmental analysis completed as they move forward. Currently, several of the actions are in the preliminary stages of planning and design. They include: Construct Mendota Pool Bypass/ Reach 2B Channel Improvements, Arroyo Canal Fish Screen and Fish Passage at Sack Dam, Modify Eastside Bypass and Mariposa Bypass for fish passage, Modify Reach 4B1 to convey at least 475 cfs and install temporary fish barriers at Mud and Salt sloughs.

BIOLOGICAL RESOURCES

The San Joaquin Valley historically contained a diverse and productive natural environment. However, the current biological resources of the San Joaquin River Watershed are highly altered from the historical conditions. In order to implement the Settlement and restore California's second-longest river it is important to understand how and why the San Joaquin River has been substantially modified.

The San Joaquin River and the Eastside and Mariposa Bypasses, although highly modified from conditions 60 years ago, support a patchwork of diverse and highly valuable areas for biological resources. Several portions of the river and bypasses are in State or Federal designated protected areas and contain important areas of annual grasslands, riparian forest and scrub-shrub, bare sand and gravel, and portions of the San Joaquin River and associated sloughs and ponds.

HISTORICAL

The natural flow regimes of the Central Valley rivers, including the San Joaquin River, historically had greater variation in the timing and magnitude of stream discharge than under managed flow regimes. The variability in stream flow prior to the construction of dams and increased agricultural production created unique and diverse riverine habitat, providing conditions suitable for salmonids, a variety of native fishes and other aquatic and riparian species. The historical, unregulated flows scoured the stream bed, displaced sediments and

formed new channels during seasonal flood events, and deposited the sediments in downstream reaches on the receding hydrograph. These dynamic processes continually created and maintained high-quality aquatic and terrestrial habitat forming a complex network of side channels, sloughs, and floodplains in the alluvium of the lower reaches, supporting fish, wildlife and diverse riparian vegetation. Extensive marshes were a dominant feature along the water courses of the valley, some large enough to be almost impassable (Ornduff 1974). The most prominent feature was the free flowing San Joaquin River and its riparian and floodplain areas.

The side channels, floodplains and braided network of smaller channels were especially important in the life cycle of salmonids, as these provided spawning areas and quality rearing habitat for salmonid fry and juveniles (McBain and Trush 2002). These habitats often remained inundated for prolonged periods, significantly increasing the total amount of available aquatic habitat and providing spatial and habitat heterogeneity (Sommer et al. 2004; Sommer et al. 2002; Power et al. 1995). Often shallower aquatic habitats offer lower water velocities and warmer temperatures (Turner et al. 1994; Scheidegger and Bain, 1995) providing greater abundance of invertebrate prey (Holland and Huston 1985; Grosholz and Gallo 2006), which research indicates leads to enhanced growth and survival for juvenile fishes (Sommer et al. 2005; Ribeiro et al. 2004). Based on the Central Valley stream native fish assemblages defined by Moyle (2002), the fishes listed in Table 2 may have historically occurred in the San Joaquin River Restoration Area.

When large numbers of Chinook salmon and other native fishes historically spawned in the Central Valley rivers, their carcasses provided significant benefits to the stream and riparian ecosystem. Carcasses provide marine-derived nutrients to invertebrates, wildlife, and aquatic biota (Bilby et al. 1998, Helfield and Naiman 2001, Hocking and Reimchen 2002) and the nutrients are also readily absorbed by adjacent riparian vegetation (Helfield and Naiman 2001, Merz and Moyle 2006).

EXISTING CONDITIONS

The Restoration Area has been significantly altered by changes in land and water use over the past century. Five river reaches have been defined to address the great variation in river characteristics throughout the Restoration Area. The reaches are differentiated by their geomorphology and resulting channel morphology, and by the infrastructure along the river (SJRRP 2010).

Flows

The most dramatic alteration to waterways of the San Joaquin Valley has been the construction of reservoirs on the San Joaquin River and its major tributaries. Dam construction peaked with the initiation of the Central Valley Project (CVP), from the 1930s to the 1960s, with Friant Dam being completed in 1942. Friant Dam was designed to divert most of the San Joaquin River water flows to about 1 million acres of farmland along the eastern portion of the San Joaquin Valley. At present, most of the water that previously flowed through the main stem of the San Joaquin River upstream of the Merced River is now stored in Millerton Lake (the reservoir behind Friant Dam) and is transferred via canals both south to Kern County and north to Madera

Table 2. Potential native and introduced fish species historically or currently occurring in the San Joaquin River Restoration Area			
Species	**Scientific Name**	**Native (N) or Introduced (I)**	**Current Presence[1]**
Spring-run Chinook salmon	*Oncorhynchus tshawytscha*	N	No
Fall-run Chinook salmon	*O. tshawytscha*	N	Periodic
Rainbow trout/ steelhead	*O.mykiss*	N	Yes
Pacific lamprey	*Lampetra tridentata*	N	Yes
River lamprey	*Lampetra ayersi*	N	Unknown
Kern brook lamprey	*Lampetra hubbsi*	N	Yes
Western brook lamprey	*Lampetra richardsoni*	N	Unknown
White sturgeon	*Acipenser transmontanus*	N	Yes[2]
Green sturgeon	*Acipenser medirostris*	N	No
Hitch	*Lavinia exilicauda*	N	Yes
California roach	*Lavinia symmetricus*	N	Yes
Sacramento blackfish	*Orthodon microlepidotus*	N	Yes
Sacramento splittail	*Pogonichthys macrolepidotus*	N	Yes
Hardhead	*Mylopharodon conocephalus*	N	Yes
Sacramento pikeminnow	*Ptychocheilus grandis*	N	Yes
Sacramento sucker	*Catostomus occidentalis*	N	Yes
Threespine stickleback	*Gasterosteus aculeatus*	N	Yes
Prickly sculpin	*Cottus asper*	N	Yes
Riffle sculpin	*Cottus gulosus*	N	Yes
Sacramento perch	*Archoplites interruptus*	N	Extirpated
Tule perch	*Hysterocarpus traski*	N	Yes
Threadfin shad	*Dorosoma petenense*	I	Yes
Common carp	*Cyprinus carpio*	I	Yes
Fathead minnow	*Pimephales promelas*	I	Yes
Red shiner	*Cyprinella lutrensis*	I	Yes
Bullhead catfish	*Ameiurus nebulosus*	I	Yes[3]
Black catfish	*Ameiurus melas*	I	Yes[3]
White catfish	*Ameiurus catus*	I	Yes
Striped bass	*Morone saxatilis*	I	Yes
Black crappie	*Pomoxis nigromaculatus*	I	Yes
Bluegill sunfish	*Lepomis macrochirus*	I	Yes
Green sunfish	*Lepomis cyanellus*	I	Yes
Largemouth bass	*Micropterus salmoides*	I	Yes
Redear sunfish	*Lepomis microlophus*	I	Yes
Spotted bass	*Micropterus punctulatus*	I	Yes
White crappie	*Pomoxis annularis*	I	Yes

Notes:
[1] DFG 2007a
[2] DFG Report Card Data, 2009
[3] USBR 2003

County. Diversions began with the completion of the Madera Canal in 1945 and the Friant-Kern Canal in 1949, which coincides with the demise of the spring-run Chinook salmon population in the San Joaquin River. During most years, there is low to no flow between Friant Dam and Mendota Pool (Clifton and Gilliom, 1989). Downstream riparian water users along the

San Joaquin River now receive water supply from the Delta via the Delta-Mendota Canal to replace the natural flow which used to course down the San Joaquin River. Even with this supplemental imported water, withdrawals during the irrigation season typically eliminate surface flows in portions of the lower San Joaquin River between Mendota Pool and the confluence with the Merced River. These modified environmental conditions have caused considerable changes to the native wildlife and plant communities along the San Joaquin River.

In addition to Friant Dam, numerous other in-stream structures were constructed to facilitate the delivery of water or modify flood flows, and include various diversion dams (Gravelly Ford, Mendota and Sack), bypasses (Eastside and Mariposa), drop structures (Eastside and Mariposa bypasses), head gates (Sand Slough Control Structure), radial gates (Chowchilla Bifurcation Structure) and a seasonal weir at Hills Ferry. These existing structures are clear impediments to the migration of salmonids and many other native fishes historically present in the San Joaquin River system. Thus, the barriers coupled with inadequate flows severely limit the quality and the availability of suitable habitat for native aquatic biota.

Vegetation and Terrestrial Habitat

Plant communities and community composition found in the Restoration Area are described in the draft PEIS/R. Plant communities were classified by DWR (2002) using a modified Holland system (Holland 1986). The dominant plant communities within the five Reaches include: mixed riparian forest, cottonwood riparian forest, willow riparian forest, and riparian scrub (USBR 2009) and are shown in Table 3. Mixed riparian forest is a multilayer winter-deciduous forest generally found on the intermediate terrace of the floodplain of the San Joaquin River. Cottonwood riparian forest is a multilayered riparian forest found on the active low floodplain of the San Joaquin River. Willow riparian forest is dominated by willows, most frequently black willow with dense cover. Riparian scrub includes willow scrub, riparian scrub and elderberry savanna and consists of woody shrubs and herbaceous species and is dominated by different species depending on the reach (USBR 2009b).

A description of the SJRRP reaches and bypasses is below.

Reach 1
Reach 1 conveys continuous flows through an incised, gravel-bedded channel. It is generally confined by periodic bluffs and terraces. Subreach 1A, which extends to State Route 99, has the most gravel, and supports continuous riparian vegetation except where the channel has been disrupted by gravel mining and other development. Subreach 1B, continues from State Route 99 to Gravelly Ford and is more narrowly confined by levees. Gravel mining and agriculture are the primary land uses in Subreach 1B.

Reach 2
Reach 2 is a meandering, low-gradient channel, characterized by seasonal drying of the channel in the summer and fall. In most years, Reach 2 is dry except under flood release conditions from Gravelly Ford to Mendota Dam. Mendota Pool is formed from the back water of Mendota Dam. Subreaches 2A and 2B are intermittently wet and sand-bedded with confining levees built to

protect the adjacent agricultural lands. Riparian vegetation in 2A is sparse or absent due to the usually dry conditions of the river and groundwater overdrafting (McBain and Trush 2002).

Table 3. Plant Communities Delineated by Reach for the Restoration Area

Vegetation Type	Reaches and Bypasses (acres)									
	Reach 1A	Reach 1B	Reach 2A	Reach 2B	Reach 3	Reach 4A	Reach 4B1	Reach 4B2	Reach 5	Bypasses
Cottonwood Riparian Forest	166	79	30	48	429	16	18	14	29	0
Cottonwood Riparian Forest LD[1]	27	114	41	1	23	4	2	2	0	0
Willow Riparian Forest	198	119	43	110	116	68	177	330	506	2
Willow Riparian Forest LD	28	0	4	6	8	14	88	100	249	0
Mixed Riparian Forest	439	260	0	0	0	6	0	0	0	0
Mixed Riparian Forest LD	65	19	2	0	0	0	0	0	1	0
Valley Oak Riparian Forest	265	0	0	0	0	0	16	7	35	0
Willow Scrub	214	113	76	38	188	38	101	18	70	0
Willow Scrub LD	73	32	124	15	41	10	0	13	10	0
Riparian Scrub	53	48	209	67	56	61	55	3	71	20
Elderberry Savanna	2	0	3	63	0	0	0	0	0	0
Emergent Wetlands	204	5	11	64	8	41	164	139	217	0
Nonnative Tree	54	22	9	0	0	0	0	0	12	0
Giant Reed[2]	3	4	6	0	0	0	0	0	0	0
Grassland/Pasture	1,513	286	470	227	157	201	620	2,131	2,955	1
Agricultural Uses	1,450	2,821	2,569	1,858	4,669	2,775	3,768	111	580	18
Alkali Sink	0	0	0	0	0	0	0	0	2	0
Open Water	1,307	220	327	279	341	113	140	123	440	5
Riverwash[3]	34	47	170	3	22	68	3	0	6	0
Disturbed	1,998	335	181	243	654	401	452	183	110	1
Urban	158	0	0	0	332	0	0	0	0	0
No Data[4]	2,412	642	255	1,622	1011	780	909	157	41	19,576
Total[5]	10,663	5,166	4,530	4,644	8,058	4,595	6,513	3,331	5,333	19,622
Ratio of Natural Habitat[6] Per River Mile	194.2 acres/m	48.0 acres/m	79 acres/m		47.5 acres/m	14.8 acres/m	512.8 acres/m		508.0 acres/m	unknown

Source: DWR 2002.

Key: LD = low density.

Notes:

[1] Canopy cover less than 30 percent.

[2] In reaches 1A, 1B, and 2A, by 2008, giant reed acreage had increased to 16.4, 7, and 17.5 acres, respectively (R. Stephani, pers. comm.).

[3] Riverwash partially depends on flow at the time of the survey/photograph, and values should not be presumed to be precise.

[4] No data exist for areas within the Restoration Area that were not mapped by DWR (2002).

[5] Columns do not all sum exactly to total acreage because of round off error.

[6] Natural habitat used in this calculation includes all categories except agricultural uses, open water, disturbed, urban, and no data.

Reach 3

Reach 3 receives continuous in-flows from the Delta-Mendota Canal, which are then diverted into the Arroyo Canal at Sack Dam. The sandy river channel meanders through a predominantly agricultural area, except where the City of Firebaugh borders the river's west bank. Here the river has a low stage but is perennial and supports a narrow riparian corridor along the edge of the river channel.

Reach 4

Reach 4 is sand-bedded and usually dewatered because of the diversion at Sack Dam. The upstream portion is bounded by canals and local dikes down to the confluence with the Mariposa Bypass at the San Luis National Wildlife Refuge (NWR). The floodplain of Reach 4A is broad, with levees set back from the active channel and sparsely vegetated. The water table is also

closer to the surface than in the other reaches (DWR 2002). Subreach 4B1 which extends from the Sand Slough Control Structure to the confluence with the Mariposa Bypass has been dry for more than 40 years. Therefore the channel itself is poorly defined because it usually remains dry, with the only exception being when the channel receives varying amounts of agricultural return flow. Only a single fish species, the non-native inland silverside, has been documented in Reach 4 in the past 25 years (Saiki 1984, DFG 2007). Subreach 4B2 begins at the confluence of the Mariposa Bypass, where flood flows in the bypass system rejoin the mainstem of the San Joaquin River and extend to the confluence of the Eastside Bypass.

Reach 5

Reach 5 is perennial because it receives varying amounts of agricultural return flows from Mud and Salt sloughs. It is more sinuous that the other reaches and contains oxbows, side channels and remnant channels. The habitat within Reach 5 includes large expanses of grassland with woody riparian vegetation in the floodplain. Less agricultural land conversion has occurred in Reach 5, with the majority of the land held in Federal and State ownership and managed for wildlife habitat.

Bypasses

The Chowchilla, Eastside and Mariposa bypass systems consist of a series of dams, bifurcation structures, bypasses, levees and portions of the main river channel. The bypass system is managed for flood conveyance, thus any occurrences of fish or establishment of aquatic habitats in the bypasses depends on intermittent routing of flood flows through the bypass system.

Chowchilla Bypass

The Chowchilla Bypass extends from the Chowchilla Bifurcation structure on the San Joaquin River (Reach 2B) and extends to the confluence of Ash Slough, which marks the beginning of the Eastside Bypass. The Chowchilla Bypass is 600-700 feet wide with sand deposits and vegetation that are occasionally dredged and removed (SJRRP 2010). Much of the bypass contains upland vegetation consisting of grasses and ruderal vegetation with some small patches of riparian vegetation.

Eastside Bypass

The Eastside Bypass extends from the confluence of Ash Slough and Chowchilla Bypass to the confluence with the San Joaquin River at the head of Reach 5. Reach 2 of the Eastside Bypass extends from the Sand Slough Bypass confluence to the head of the Mariposa Bypass. Reach 3 of the Eastside Bypass extends from the head of the Mariposa Bypass to the head of San Joaquin River Reach 5 and receives flows from Deadman, Owens, and Bear creeks.

Upland vegetation at the Eastside Bypass consists of grassland and ruderal vegetation. In the Grasslands Wildlife Management Area (WMA), riparian trees and shrubs have a patchy distribution along the banks of the Eastside Bypass. The lower Eastside Bypass has some side channels and sloughs that support remnant patches of riparian vegetation (SJRRP 2010).

Mariposa Bypass
The Mariposa Bypass extends from the Mariposa Bypass Bifurcation Structure to the head of San Joaquin River Reach 4B2. A drop structure located near the downstream end of the Mariposa Bypass dissipates energy from flows before they enter the mainstem San Joaquin River (USBR 2009b).

Aquatic Habitat

The existing fish and wildlife resources have been described in the Biological Assessment dated November 2011 and Memorandum Response and Errata in Response dated May 8, 2012, the Fish Management Plan dated November 2010, and the Draft PEIS/R dated April 2011. Additionally, many reports and papers have been written over the years that discuss the evolution of the San Joaquin River and California's Central Valley. Primarily these reports and papers emphasize how water supply needs have dictated river channelization and control of flows for agricultural needs. The San Joaquin River no longer is a dynamic river system with meandering channels and oxbows. In its current state much of the San Joaquin River is dry almost year round. The high demand for water has depleted the ground water table, increased salt concentrations and can increase contaminant loading at certain times of the year.

Throughout the project area, physical barriers, reaches with poor water quality or no surface flow, and the presence of false migration pathways have reduced habitat connectivity for anadromous and resident native fishes. Structures that impede both upstream and downstream fish movements are located throughout the reaches, and include drop structures, head and radial gates, control structures, gravel mining pits, and dams. Potential false pathways are formed by the bypass and canal systems, including Salt Slough, Mud Slough, Bear Creek, Lone Willow Slough, Mariposa Bypass, Eastside Bypass, and Arroyo Canal.

These modifications to the river channel, coupled with stream flow regulations, have altered the fish assemblages in the San Joaquin River by providing habitat for non-native species, including largemouth bass, spotted bass, green sunfish, black crappie, and striped bass (McBain and Trush 2002, DFG 2007). Furthermore, current land use practices and associated modifications have substantially reduced the size and diversity of riparian habitat along the river channel, thus limiting habitat for riparian and floodplain dependent species and providing less shaded riverine aquatic (SRA) cover area for native stream fishes, resulting in higher water temperatures. The current and past gravel mining operations likely increase fine sediment deposition in the San Joaquin River, which potentially embeds spawning gravels and reduces aquatic invertebrate production by filling in the interstitial space between gravels where invertebrates reside.

Water Quality

Water quality in the San Joaquin River is degraded by point and non-point discharges from agricultural runoff (tailwater and subsurface irrigation water), urban runoff of pesticides and other organic compounds, with additional contributions from other industrial sources not completely characterized. The California State Water Resources Control Board designated 100 miles of the San Joaquin River, including the reach in Merced County, as an impaired water body in 1990 (SJVDP 1990). Additionally, the river is currently listed as impaired for

53 pollutants such as metals, pesticides and pathogens, but only 14 of the listed pollutants have approved Total Maximum Daily Load requirements. The stretch of river downstream of the confluence with the Merced River is impaired by around half of these 53 pollutants; upstream of Mud Slough, by 16 of the 53 pollutants. The major source of selenium contamination downstream of Mud Slough is from agricultural subsurface drainwater discharge, managed mainly by the ongoing Grassland Bypass Project.

Endangered Species

There are 38 special status species that may occur in the project area according to the Service's species list and the California Natural Diversity Database, and include: blunt-nosed leopard lizard (*Gambelia sila*), giant garter snake (*Thamnophis gigas)*, vernal pool crustaceans (*Branchinecta* spp.), California tiger salamander (*Ambystoma californiense*), and valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*). Critical habitat is designated within the area for several species including: vernal pool plants and crustaceans, California tiger salamander, delta smelt (*Hypomesus transpacificus*), San Joaquin kit fox (*Vulpes macrotis mutica*), blunt-nosed leopard lizard, and palmate-bracted birds beak (*Cordylanthus palmatus*). The Service has jurisdiction for all of the species listed above under the ESA. A list of all the special status species and habitats and proposed conservation measures can be found in Appendix B.

The DFG has responsibility for State-listed species and species of concern such as the delta-button celery (*Eryngium racemosum*) and Swainson's hawk (*Buteo swainsoni).* The DFG should be contacted regarding any State-listed species or species of concern that may be impacted by project activities.

Per the Settlement and the SJRRS Act, NMFS has responsibility to permit the reintroduction of Central Valley spring-run Chinook salmon (*Oncorhynchus tshawytscha*) a threatened species within their jurisdiction, along with designating an experimental population. This permitting process is on-going. NMFS also has responsibility for four species that may occur in the project area including: green sturgeon (*Acipenser medirostris),* Central Valley steelhead *(Oncorhynchus mykiss*), Sacramento Valley winter-run Chinook salmon (*Oncorhynchus tshawytscha*) and Central Valley spring-run Chinook salmon, in addition to critical habitat for Central Valley steelhead under the ESA.

Under the Magnuson-Stevens Fishery Conservation and Management Act, NMFS also has responsibility for Essential Fish Habitat for Pacific salmonids and starry flounder (*Platichthys stellatus)*, both of which are present in the SJRRP footprint.

FISH AND WILDLIFE RESOURCES WITHOUT THE PROJECT

If the Project was not implemented, the overall degraded aquatic habitat conditions would remain throughout most of the Reaches, invasive plant species would continue to spread, and wildlife value within the riparian corridor would decline. Furthermore, aggregate mining activities

within the floodplain would continue until aggregate sources were depleted. Agricultural and grazing activities in the river floodplain and adjacent lands would continue.

Flow

Water releases from Friant Dam into the San Joaquin River would likely remain minimal without the Project. The only flows into the Restoration Area would be the occasional release of flood flows and the releases to meet the riparian rights holding contracts between Friant Dam and Gravelly Ford, as well as agriculture return water and Delta water via the Delta-Mendota Canal operations. Much of the year the remaining Program reaches would remain dry.

Aquatic Habitat

Reclamation proposed that, without the project, the Restoration Area would continue to be managed under the current operations strategy. As a result, fishery resources downstream of Friant Dam within the area would likely decline, as adequate flows and temperatures would not be present during peak spawning and migration periods, and habitat availability would continue to be severely limited during critical larval and juvenile fish rearing periods. The current warm water fishery and trout fishery would continue to be supplemented by DFG.

Vegetation and Terrestrial Habitat

The remnant patches of riparian forest and shrub-scrub would likely undergo some changes typically associated with a riparian system, but constrained and limited by the restriction associated with water demands and regulated flow releases. Regeneration of riparian species, especially willows and cottonwoods, in the area downstream of the dam would slowly decline, as this area is limited in its exposure to flooding because of the dam and water demands. This area would also continue to lose older heritage trees as they reach senescence and die off.

There would likely be no change to the types of wildlife species found in the area under existing conditions and without the project.

Water Quality

Currently water quality within the San Joaquin River system is impaired on many levels. Without additional flows into the system it is anticipated that the water quality would remain impaired and likely worsen as the demand for water increases and current programs to capture and reuse drain water expands across the Central Valley.

FISH AND WILDLIFE RESOURCES WITH THE PROJECT

The restoration goal of the SJRRP is to restore and maintain fish populations in "good condition" within the Restoration Area. To achieve this goal, the SJRRP will implement a number of

actions that will substantially alter not only the aquatic ecosystem of the San Joaquin River, but also could substantially alter the river's riparian, wetland and some adjacent upland ecosystems.

Under the Settlement, riparian floodplain restoration is required in both the 2B and 4B Reaches of the San Joaquin River, which would incorporate about 8.5 river miles and 32.6 river miles, respectively, for a total of at least 40 miles of river restoration. The restoration of riparian areas adjacent to the San Joaquin River, and the preservation of current riparian habitat, could provide habitat for migratory and resident birds, nesting sites for birds of prey and colonial nesting waterbirds, and migratory corridors for forest-dependent wildlife. Restoration of the floodplain and creation of subsequent riparian vegetation within Reach 4B would potentially result in conversion of between 1,265 acres and 10,150 acres of agricultural lands to floodplain or riparian habitats. Restoration of the floodplain within Reach 2B would potentially result in conversion of between 1,000 acres and 1,600 acres of agricultural lands to floodplain or riparian habitats. Routing flows through the Eastside Bypass could result in modification or restrictions to sand mining operations within the reach. It should be noted however that, the Program is still in the early planning and alternative development stages for many of these actions, thus specific details and acreages will be addressed in subsequent documents.

Flows

Under the existing conditions, the San Joaquin River channel is not a hydrologically connected system, as bypass structures are currently used to divert water around sections of the historical river channel. The restoration and the re-connection of the San Joaquin River with its historical river channel in Reach 4B1 would provide substantial benefits for both fish and wildlife species. The riparian corridor along the historical channel can offer shaded overhead cover for aquatic biota and diverse habitat for terrestrial species, heterogeneous aquatic habitat, and a greater abundance of food resources for both aquatic and terrestrial biota. Furthermore, the naturally formed pools in the historical channel can stratify water temperatures, thus offering unique and suitable in-stream conditions for aquatic biota that cannot be duplicated in the uniform, riparian-deficient channels of the bypasses and flood conveyance networks.

In Normal-Dry, Normal-Wet and Wet years (based on the Restoration water-year type), Spring Rise and Pulse Flows in March and April would inundate floodplain areas and provide vital side channel habitats that could be used for spawning and rearing by salmonids and other native fishes (Moyle 2002). With higher flows in wetter years, the spring pulse could also increase vegetation recruitment by dispersing seeds above base flow water levels, and facilitate their germination (Kondolf 2005).

The numerous in-stream structures that were constructed to facilitate the delivery of water or modify flood flows (i.e., diversion dams, bypasses, drop structures, head gates, and radial gates) would be evaluated as part of the Project. The removal or the modification of these existing structures would provide clearer migratory pathways for adult salmonids, and greatly enhance passage for other native fishes and the outmigrating juvenile Chinook salmon.

Using the 1-D modeling, preliminary inundation maps have been developed. The mapping was developed to provide initial estimates of potential inundation depths and acres of existing areas along the San Joaquin River. The difference between water surface elevation and terrain

elevation created a depth map. Several assumptions were made in the development of the preliminary mapping and include: removal of areas not considered existing floodplain or low-flow channel habitat (agricultural lands and gravel pits); all areas within levees are habitat; steady-state Friant releases. The results of the 1-D modeling over 3-D terrain surfaces ignores barriers to flow that could limit inundation in side channel at periods of lower flows. The preliminary inundation mapping results are displayed in Figure 4 and Figure 5.

A large amount of floodplain habitat exists in Reach 1A and Reach 5. About 17,000 acres would be inundated at 4,500 cfs without any channel improvements for Reaches 2B and 4B.

Aquatic Habitat

As documented in the Draft PEIS/R, the restoration activities, floodplain creation, structural modifications, and Restoration flows associated with the Project would provide an array of benefits for the aquatic biota of the San Joaquin River.

In general, the re-creation of the historical floodplain of the San Joaquin River could provide a significant benefit, as floodplains can harbor flood flows and buffer flood risk, and increase the amount and diversity of available aquatic areas, by providing low-velocity refuge, overhead cover and an abundant food source for aquatic organisms. These factors could enhance the populations of declining Central Valley fish species and imperiled fauna, such as the Federally-listed spring-run Chinook salmon and the State-listed western pond turtle.

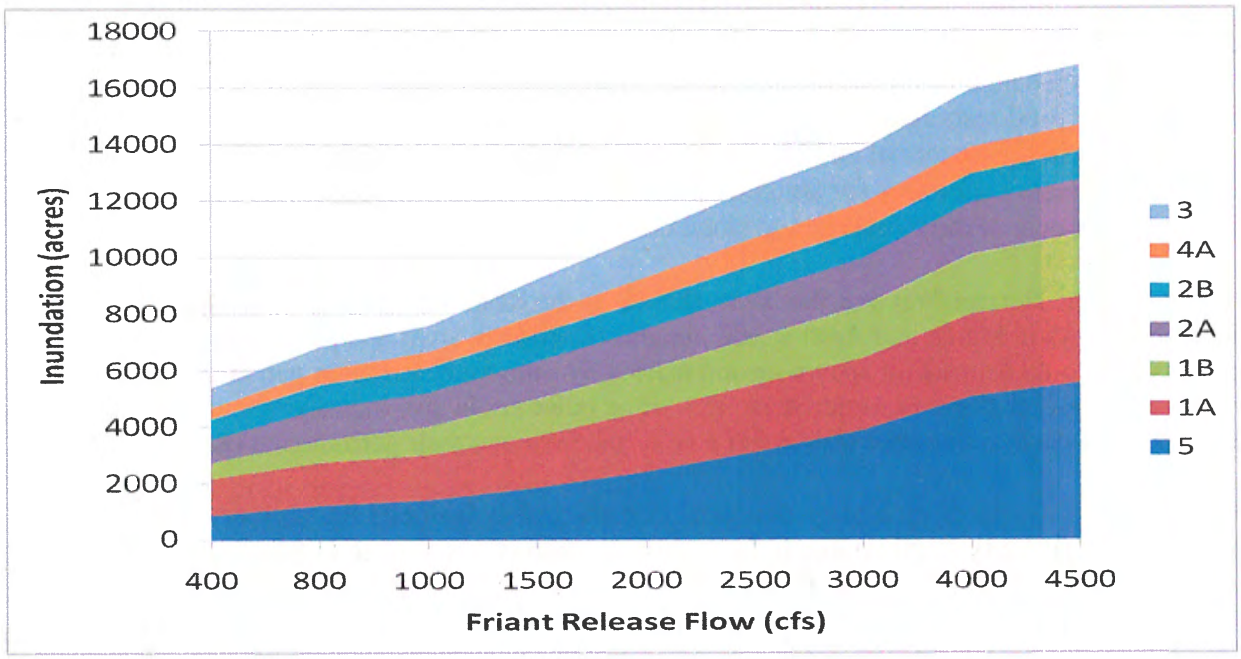


Figure 4. Total inundated acres by SJRRP Reach, under existing conditions.

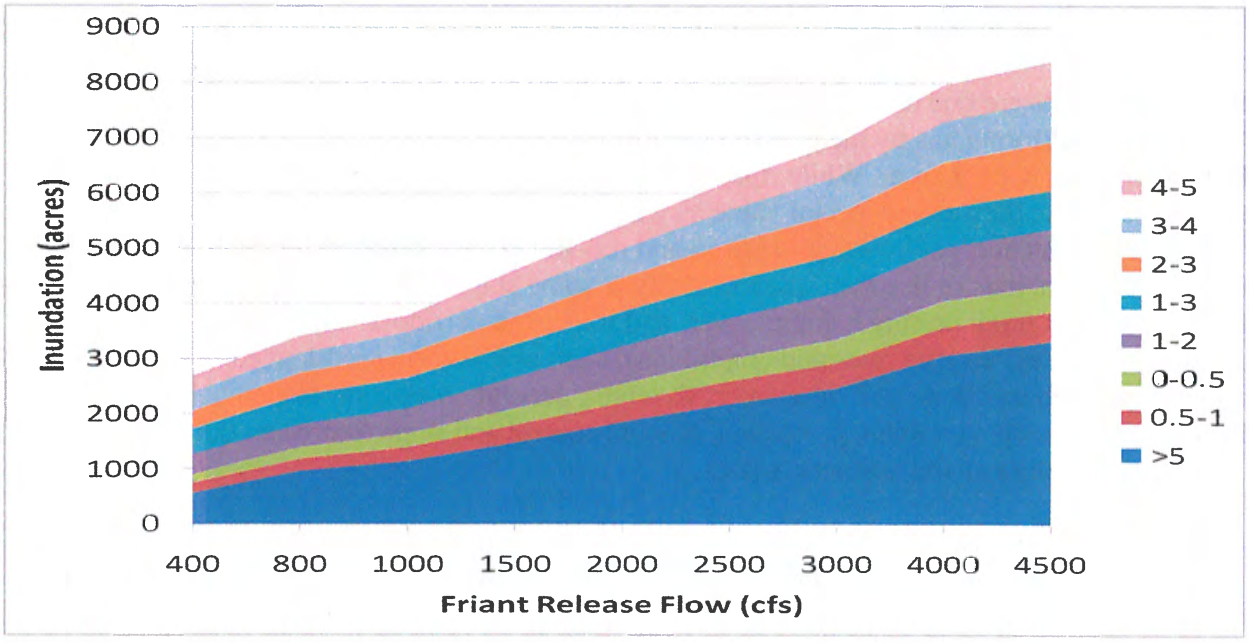


Figure 5. Total inundation acreages by depth (in feet) for the entire Restoration Area, under existing conditions.

The availability of floodplain habitat along the San Joaquin River may enhance juvenile salmonid survival and increase the likelihood of adults returning to spawn, thus achieving one of the Settlement goals by restoring naturally reproducing, viable spring and fall-run Chinook salmon populations. The Fisheries Management Plan (SJRRP 2010) describes in more detail how Restoration flows can further assist in achieving this Settlement goal and thus provide conditions suitable for the enhancement of salmonid populations and those of other native fauna. By implementing and adaptively managing the Restoration flows, releases could provide sufficient flows to ensure habitat connectivity throughout the San Joaquin River system and allow for unimpeded upstream passage and migration of salmonids and other fishes.

Once spring-run Chinook salmon are established in the San Joaquin River system, the range of spring-run would be substantially increased and could provide a possible future source of fish to help bolster declining populations, if local habitat conditions or climate change impacts occur in other tributaries. The return of salmonids to the San Joaquin River could also have substantial localized effects on the riverine system as well. The marine derived nutrients from carcasses deposited in the San Joaquin system would likely increase the diversity, abundance and fitness of species utilizing that system. For instance, it could increase macroinvertebrate abundance and thus provide a greater food source for numerous species.

Vegetation and Terrestrial Habitat

2,265 acres to 11,750 acres (Reaches 2B and 4B combined) of restored floodplain and riparian vegetation would not only provide shaded habitat for instream biota, but could connect historic riparian tracts and woodlands that serve as forested habitat for a diversity of breeding and

migratory songbirds, provide nesting sites for birds of prey and colonial nesting waterbirds, and act as travel corridors for wildlife.

Riparian systems are one of the most important and most neglected natural resources in California. California has by many estimates lost between 92 percent and 95 percent of its historic riparian habitat area. While riparian habitat is small in total area when compared to California's size, they are of special value as wildlife habitat. Over 135 species of birds such as the willow flycatcher, yellow-billed cuckoo and red-shouldered hawk either completely depend upon riparian habitats or use them preferentially at some stage of their life history. Riparian habitat provides food, nesting habitat, cover, and migration corridors. Another 90 species of mammals, reptiles, invertebrates and amphibians; such as California red-legged frog, valley elderberry longhorn beetle and riparian brush rabbit, depend on riparian habitats. Riparian habitat also provides riverbank protection, erosion control and improved water quality, as well as numerous recreational and aesthetic values.

The SJRRP Invasive Species Management Plan (ISMP) includes ways to remove and control invasive and exotic species as well as monitoring for the potential spread of invasive due to restored flows. Reclamation is working to develop and implement the ISMP.

Water Quality

The Restoration Flows in the San Joaquin River channel would provide continuous flows throughout the year, which would help buffer high temperatures and provide adequate dissolved oxygen levels for aquatic species during the summer months. With increased releases, the agricultural run-off would be diluted, and effects of in-stream contaminants would be reduced. However, more water quality monitoring is still needed to gain a better overall understanding of the system and to inform decisions regarding the timing and magnitude of Restoration Flow releases to obtain appropriate water quality standards.

FISH AND WILDLIFE PLANNING OBJECTIVES

Planning Objectives

Public trust doctrine obligates the State and Federal governments to actively manage and conserve fish and wildlife resources for current and future public benefits. The States have broad responsibilities for all wildlife within their borders, and the Service has particular responsibility for certain species and habitats under the Migratory Bird Treaty Act (MBTA), ESA, and the designated National Wildlife Refuge lands.

To fulfill public trust responsibilities, the Service has regulations and policies that recognize the importance of riparian and wetland habitats to fish and wildlife. Thus, one of the Service's long-term planning objectives is to maintain existing habitats and enhance and restore degraded habitats. These objectives are consistent with section 2(a) of the FWCA "...with a view to the

conservation of wildlife resources by preventing loss of and damage to such resources as well as providing for the development and improvement thereof in connection with such water-resource development."

The mission of the National Wildlife Refuge System is to conserve a network of lands and water for the conservation and management of fish, wildlife and plant resources of the United States for the benefit of present and future generations. As part of the system, the three units – Merced NWR, San Luis NWR and Grasslands WMA - addressed in the Comprehensive Conservation Plan provide a haven for a unique assemblage of both wetland (particularly waterfowl and other waterbirds) and upland dependent wildlife species of California's Central Valley.

Responsibilities and Evaluation

Reclamation is the lead Federal agency responsible for compliance with NEPA. Compliance with NEPA and CEQA has resulted in preparation of the Draft PEIS/R. Reclamation has also consulted with the Service and NMFS pursuant to section 7 of the ESA.

The Service is one of five Implementing Agencies responsible for the implementation and management of the SJRRP and has been participating in the planning associated with the NEPA/CEQA process for this project for some time. The Service will continue to provide technical assistance and recommendations to the SJRRP planning and permitting processes through the staff working in the co-located SJRRP Office, the Environmental Compliance and Permitting Working Group, and the Fisheries Management Work Group. The Service has provided comments and recommendations to Reclamation regarding the SJRRP since October 2006. The partnership opportunities fostered by this coordination have served as a key underpinning of successful efforts to streamline environmental reviews and help create positive solutions for the Program and natural resource conservation.

DISCUSSION

The decisions and recommendations regarding impacts and compensation by specific habitat type cannot be determined at this time. Further development of the Program level actions and investigation of the Common Restoration Actions mentioned in the Settlement needs to occur. Additionally, other considerations may arise through further modeling and monitoring and these may influence future SJRRP planning. These include: new understanding about the specific needs of salmon for the San Joaquin River, vegetation and planting plans, toxicity monitoring of the system, fish passage needs, and groundwater stabilization. The Implementing Agencies will continue to work together in the development of the SJRRP and additional environmental compliance, including FWCA reports, will be completed which evaluate impacts on site specific actions.

Service Mitigation Policy

The recommendations provided herein for the protection of fish and wildlife resources are in accordance with the Service's Mitigation Policy as published in the Federal Register (46:15; January 23, 1981). The Mitigation Policy provides Service personnel with guidance in making

recommendations to protect or conserve fish and wildlife resources. The policy helps ensure consistent and effective Service recommendations, while allowing agencies and developers to anticipate Service recommendations and plan early for mitigation needs. The intent of the policy is to ensure protection and conservation of the most important and valuable fish and wildlife resources, while allowing reasonable and balanced use of the Nation's natural resources.

Under the Mitigation Policy, resources are assigned to one of four distinct Resource Categories, each having a mitigation planning goal which is consistent with the fish and wildlife values involved. The Resource Categories cover a range of habitat values from those considered to be unique and irreplaceable to those believed to be much more common and of relatively lesser value to fish and wildlife. The Mitigation Policy does not apply to threatened and endangered species, Service recommendations for completed Federal projects or projects permitted or licensed prior to enactment of Service authorities, or Service recommendations related to the enhancement of fish and wildlife resources.

In applying the Mitigation Policy during an impact assessment, the Service first identifies each specific habitat or cover-type that may be impacted by the project. Evaluation species which utilize each habitat or cover-type are then selected for Resource Category analysis. Selection of evaluation species can be based on several rationales, as follows: (1) species known to be sensitive to specific land- and water-use actions; (2) species that play a key role in nutrient cycling or energy flow; (3) species that utilize a common environmental resource; or (4) species that are associated with Important Resource Problems, such as anadromous fish and migratory birds, as designated by the Director or Regional Directors of the Fish and Wildlife Service. (Note: Evaluation species used for Resource Category determinations may or may not be the same evaluation species used in a Habitat Evaluation Procedures (HEP) application, if one is conducted). Based on the relative importance of each specific habitat to its selected evaluation species, and the habitat's relative abundance, the appropriate Resource Category and associated mitigation planning goal are determined.

Mitigation planning goals range from "no loss of existing habitat value" (i.e., Resource Category 1) to "minimize loss of habitat value" (i.e., Resource Category 4). The planning goal of Resource Category 2 is "no net loss of in-kind habitat value;" to achieve this goal, any unavoidable losses would need to be replaced in-kind. "In-kind replacement" means providing or managing substitute resources to replace the habitat value of the resources lost, where such substitute resources are physically and biologically the same or closely approximate those lost.

In addition to mitigation planning goals based on habitat values, Region 8 of the Service, which includes California, has a mitigation planning goal of no net loss of acreage and value for wetland habitat. This goal is applied in all impact analyses.

In recommending mitigation for adverse impacts to fish and wildlife habitat, the Service uses the same sequential mitigation steps recommended in the Council on Environmental Quality's regulations. These mitigation steps (in order of preference) are: avoidance, minimization, rectification of measures, measures to reduce or eliminate impacts over time, and compensation.

Resource Categories

Table 4 shows a breakdown of the potential cover-types, Resource Category designation and mitigation goal for the habitats in the Restoration Area. Open water was not placed in a Resource Category because it would be benefitted by the project.

Table 4. Resource categories and mitigation planning goal for the habitats possibly impacted by the proposed SJRRP.

COVER-TYPE	RESOURCE CATEGORY	MITIGATION GOAL
Riparian Scrub Shrub	2	No net loss of in-kind habitat value or acreage.
Riparian Forest	2	No net loss of in-kind habitat value or acreage.
Emergent Marsh	2	No net loss of in-kind habitat value or acreage.
Seasonal Wetlands and Vernal Pools	2	No net loss of in-kind habitat value or acreage
Annual grassland	3	No net loss of habitat value while minimizing loss of in-kind habitat value.
Agriculture/Orchard	4	Minimize loss of habitat value

Riparian Forest and Riparian Scrub Shrub

Evaluation species for the riparian forest and riparian scrub-shrub habitats that would be impacted are: red-shouldered hawks, wood ducks, and Bullock's orioles. Woody riparian vegetation provides important cover, roosting, foraging, and nesting habitat for these species. Large diameter trees also provide critical nesting sites for species such as wood ducks and red-shouldered hawks. Riparian forest and riparian scrub-shrub cover-types are of generally high value to the evaluation species, and are overall, extremely scarce (less than 2 percent remaining from pre-development conditions). Therefore, the Service designates that any riparian forest or riparian scrub-shrub cover-type that would be impacted by the project should be placed in Resource Category 2, with an associated mitigation planning goal of "no net loss of in-kind habitat value."

Emergent Marsh

The emergent marsh habitat in the project area consists of narrow areas of cattails and bulrush on the edge of the river channels, around sloughs and upstream of Mendota Pool. Evaluation species selected for the emergent marsh cover-type are the marsh wren, red-winged blackbird, and song sparrow. These species were selected because of the Service's responsibility for the protection and management of these species under the Migratory Bird Treaty Act. The Service designates the emergent marsh areas in the project as Resource Category 2. Our associated mitigation goal for these areas is "no net loss of in-kind habitat value."

Seasonal Wetlands and Vernal Pools
Seasonal wetlands and vernal pool landscapes provide important habitat for resident and migratory birds. Waterfowl and shorebirds use different types of wetlands habitats in relation to their annual behavioral and energy cycle. Seasonal wetlands are critical to waterbird survival and recruitment as they provide high quality food during spring migration and prior to nesting.

The seasonal wetlands and vernal pools within the project area remain wet longer into California's dry season (either with ponded surface water or with shallow subsurface water) than surrounding upland areas. This makes them more biologically rich and productive for a variety of native plant and animal species for a longer time period than the surrounding annual grasslands, which are largely dominated by non-native plant species.

Evaluation species selected for the seasonal wetlands and vernal pool cover-type are the mallard, lesser yellow-legs, and killdeer. These species were selected because of the Service's responsibility for the protection and management of these species under the Migratory Bird Treaty Act. The Service designates the seasonal wetlands and vernal pool areas in the project as Resource Category 2. Our associated mitigation goal for these areas is "no net loss of in-kind habitat value."

Annual Grassland
Annual grassland areas include grasslands, levee slopes, and other mainly herbaceous areas. The evaluation species for the grassland habitat type is the red-tailed hawk, which utilizes these areas for foraging. This species was selected because of the Service's responsibility for its protection and management under the Migratory Bird Treaty Act. Grassland areas potentially impacted by the project would vary in their relative values to the evaluation species, depending on the degree of human disturbance, plant species composition, availability of prey species, juxtaposition, and magnitude and frequency of flooding and irrigation. Therefore, the Service designates the grassland areas in the project as Resource Category 3. Our associated mitigation goal for these areas is "no net loss of habitat value while minimizing loss of in-kind habitat value."

Agriculture/Orchard
The agriculture/orchard cover-type for this project consists of managed almond, apricot, pistachio and citrus orchards, and row crops such as tomatoes and alfalfa. The evaluation species for this cover-type includes northern harrier, Swainson's hawk, and mourning doves. Agricultural fields and orchards provide raptors and mourning doves perching sites, cover and/or foraging areas. This cover-type in the project area is assumed to be low to moderate quality and value. The Service designates the agricultural and orchard habitat types as Resource Category 4. Our associated mitigation planning goal is "minimize loss of habitat value."

Determination of Mitigation Ratios

Mitigation recommendations provided by Service are made pursuant to the FWCA and are consistent with the Service's Mitigation Policy. Avoiding, minimizing, and/or rectifying adverse impacts to fish and wildlife species is the Service's goal in making mitigation recommendations. When compensatory mitigation is recommended it is generally quantified using a habitat assessment procedure such as HEP. The HEP is a methodology developed by the Service and

other State and Federal resource and water development agencies which can be used to document the quality and quantity of available habitat for selected fish and wildlife species. The HEP provides information for two general types of habitat comparisons: (1) the relative value of different areas at the same point in time; and (2) the relative value of the same areas at future points in time. By combining the two types of comparisons, the impacts of proposed or anticipated land-use and water-use changes on habitat can be quantified. In a similar manner, any compensation needs (in terms of acreage) for the project can also be quantified, provided a mitigation plan has been developed for specific alternative mitigation sites.

For planning purposes, an understanding of possible compensatory mitigation scenarios associated with habitat types which may be impacted from construction and changes in inundation is important. The footprints for the various elements of the SJRRP are still in development; therefore a habitat assessment to attain specific values for those habitats has not been completed. However, as the Common Restoration Actions are investigated further and developed, a HEP could be completed.

Some plausible mitigation ratios that could be used for current planning needs are the general mitigation standards for California Bay-Delta Program (CALFED) related projects that are contained in the Programmatic Record of Decision (CALFED 2000a) and Multi-Species Conservation Strategy (MSCS) (CALFED 2000b). These standards and recommendations include compensation ratios for adverse effects on habitats (Table 5).

Table 5. A range of compensation ratios for potential impacts to habitats from the SJRRP, for planning purposes.

Habitat Types	Compensation Ratios (acres) CALFED MSCS
Riparian Forest/Scrub	2:1 to 5:1
Woodland/Savanna	2:1 to 5:1
Emergent Marsh	2:1 to 5:1
Seasonal Wetland and Vernal Pool	2:1 to 5:1
Annual Grassland	1:1 to 3:1
Agriculture/Orchard	1:1 to 3:1

The following benefits are expected from the SJRRP and thus would influence the ratios and compensation recommendations in future supplemental FWCA reports for the SJRRP.

1. SJRRP is expected to Benefit Riparian Vegetation. Increased instream flows from the Restoration Project are expected to benefit riparian vegetation. To assume a benefit, present flow regimes must be assumed to limit the area and/or quality of riparian habitat. This assumption appears valid since prior to the SJRRP Interim Flows, the flow regime was much reduced. The SJRRP will release flows into Reaches 2A, 4A and 4B1, which have historically been dry, and will increase flows in Reach 1, 2B, and 3, which historically only included water supply deliveries except during flood releases. Riparian ecosystems are also maintained, in part, by groundwater (Ewing 1978). Higher flows provided by the Project could potentially increase levels of groundwater along the San Joaquin River and area tributaries over time, and enable establishment of more riparian

vegetation and wider riparian corridor than at present. Because newly established vegetation must keep close contact with groundwater as instream flows recede in the summer, higher elevations of groundwater also should increase survival of newly established vegetation.

In addition, research suggests that riparian vegetation is especially sensitive to minimum and maximum instream flows (Auble et al. 1994). Flows would be increased dramatically (up to 3000 percent in some locations) during the primary growing season of riparian vegetation. Because positive correlations between rate of instream flow and rate of tree ring growth have been observed for riparian vegetation in California (Stromberg and Patten 1990), increased minimum flows would be expected to increase growth rates of riparian habitat. Pulse flows to move sediment can create aquatic habitat downstream that can be colonized by pioneering riparian vegetation, but also used as important fish habitat. To assume a riparian habitat benefit from increased minimum flows combined with pulse flows, it must be assumed that the net effect on riparian habitat over time would be positive due to large areas of increased instream flow provided by the Project.

2. Spatial Extent of Expected Benefit is Large. Increased minimum instream flows and floodplains are expected to re-establish and/or enhance riparian habitat over a substantial spatial area. The extent of possible restored floodplain within existing levees is about 17,000 acres. However, the existing levee system may not be sufficient to hold the sustained flows called for in the Settlement, so new levee alignments may be developed for sections of the Restoration Area.

   The distance that riparian habitat would be benefited perpendicular to the river varies depending on geologic composition and topography. The land area that would be affected by increased groundwater and have suitable slopes and soils for establishing riparian vegetation is unknown, but a positive correlation might exist between this area and wetted habitat area.

3. Expected Benefit Would Occur in Proximity to Adverse Effects. The location of expected habitat benefits is within the Project area.

4. Expected Habitat Benefits Are In-kind. Benefits from the Restoration to riparian habitat would be in-kind with riparian habitat values lost. It is expected that riparian habitat that is re-established and/or enhanced due to increased instream flows would have similar plant composition and be used by similar assemblages of animal species as habitat lost.

5. Expected Benefits to Habitat Would Benefit Fish and Wildlife. Establishment of new riparian habitat areas and enhanced growth of existing riparian vegetation would be expected to benefit fish and wildlife species affected by, or using, the riparian zone. The multiple layers of riparian vegetation along rivers and streams, in association with edges of adjacent plant communities and streams, create a diverse physical structure that provides food, water, cover, and shade for a diversity of amphibians, reptiles, birds, mammals, and invertebrates, including neotropical migrant birds, special status bats, and

the valley elderberry longhorn beetle (USFWS 2003). Riparian communities also function as dispersal and migration corridors for many wildlife species.

An important associate of riparian habitat is SRA cover, which has ecosystem-level values. This near shore aquatic area occurring at the stream-riparian habitat interface consists of vegetation that either overhangs or protrudes into the water; instream woody debris, such as leaves, logs, branches and roots; and often substantial amounts of detritus (USFWS 1992). SRA cover provides high quality food and cover for fish, amphibians, and terrestrial wildlife that use riparian and aquatic edge habitat (USFWS 1992). The amount of SRA cover present along the San Joaquin River has not been inventoried. Because SRA cover is largely associated with riparian vegetation and wetted habitat area, higher minimum instream flows and groundwater levels from the Project would be expected to enhance SRA cover.

6. The Restoration Project is Expected to Benefit Riparian Ecological Processes. Restoring larger flows to the San Joaquin River System may not restore riparian ecosystems to pre-dam conditions (Shafroth et al. 2002), but would restore valuable components of riparian ecosystems. Enhanced SRA cover would be expected to provide greater input of leaves, woody material, and insects into the stream ecosystem. Increased minimum flows should better transport and distribute these materials downstream. Additionally, riparian vegetation in side channels and backwaters areas could be sustained, and these habitats combined with other riparian habitats on the San Joaquin River, could provide better connectivity, and more effective filtering for better water quality.

7. Expected Riparian Habitat Benefits Would be Monitored. The SJRRP would develop a strategy to monitor riparian habitat for both benefits and adverse effects from the Project. This strategy would become part of the Project's Adaptive Management Plan. The strategy could include aerial photograph analyses of riparian habitat throughout the project area for existing conditions and at some specified intervals following Project construction and release of full Restoration Flows, ground monitoring of the riparian vegetation community, and invasive species monitoring. This strategy could also include an operations and maintenance plan for any habitat created within the newly created floodplain. This plan should be coordinated with the Service and the entity responsible for long-term maintenance of the site.

   Studies along the Sacramento River have shown not only are localized restoration projects successful in providing habitat for species fairly rapidly, but they also produce positive spill-over effects. For example increases in abundances of bird species occur not only locally, but also across the larger riparian landscape (Gardali et al. 2006). Equally important is restoring the natural riverine processes where possible within the San Joaquin River. This is needed so that riparian areas, and their remnant counterparts, experience a full range of successional stages (i.e. bare ground such as found on depositional point bars to decadent gallery riparian forest) in order to meet the diverse life-history needs of the native species that have evolved in the system. Additionally, the Service would like to see the restored floodplain remain hydraulically connected to the

river, allowed to meander somewhat, and the flow regime managed to meet ecological as well as human needs.

RECOMMENDATIONS

Based on the information contained in the draft PEIS/R, the Conservation Strategy, and the Fish Management Plan, the SJRRP has the potential to vastly improve the diversity, quality, and quantity of habitat along the San Joaquin River system, thus benefiting a variety of resident and migratory wildlife species, especially riparian dependent species such as migratory birds, amphibians, and fish species.

The Service recommends:

- Construction or modification of riverine structures, such as fish ladders at dams, incorporate designs that accommodate and improve passage for all native fishes, including lamprey. Lamprey struggle to negotiate standard sharp-edged fish ladder baffles and thus require specific modifications, such as rounded corners and "lamprey slots," like those used at the Coleman National Fish Hatchery on the new barrier weir (Pers. Comm. Damon Goodman 3/4/2010).

- Terrestrial restoration actions should be optimized for bird conservation. Restoration should take into account the surrounding land use and surrounding landscape conditions, such as the proximity and prevalence of other natural areas, urban areas, agricultural areas, or brown-headed cowbird foraging areas (RHJV 2004). For example, areas near unimproved parks/open spaces (provided substantial invasive species issues do not exist) and appropriately managed grazing areas. Brown-headed cowbirds may commute more than 12 kilometers (7.45 miles) between foraging grounds and the nest sites of their hosts (Mathews and Gougen 1997). Brown-headed cowbirds can have a significant impact on the reproductive success of species including the least bell's vireo, whose small populations are frequently parasitized by brown-headed cowbirds.

- Flow releases should be managed, to the extent possible, to align with the near natural hydrograph (i.e., mimic natural flood events) sufficient to support scouring, deposition, and point bar formation. However, timing of pulse flows should be time managed to avoid detrimental impacts to bank swallow nesting colonies and should not raise levels more that 2-3 feet during the breeding season (April-July) (RHJV 2004).

- Continuance of the collaborative approach to the planning and implementation of this Program with the Service.

LITERATURE CITED

Auble, G. T., J. M. Friedman, and M. L. Scott. 1994. Relating riparian vegetation to present and future streamflows. Ecological Applications 4(3):544-554.

Bilby, R.E., Fransen, B.R., Bisson, P.A., and J.K. Walter. 1998. Response of juvenile coho salmon (*Oncorhynchus kisutch*) and steelhead (*Oncorhynchus mykiss*) to the addition of salmon carcasses to two streams in southwestern Washington, USA. Canadian Journal of Fisheries and Aquatic Sciences 55:1909-1918.

California Department of Fish and Game (DFG). 2007. San Joaquin River fishery and aquatic resources inventory, September 2003 – September 2005. Final report. Cooperative Agreement 03FC203052.

California Department of Water Resources (DWR). 2002. Riparian Vegetation of the San Joaquin River. Technical Information Record SJD-02-1. California Department of Water Resources, San Joaquin District, Environmental Services Section. Fresno, California. Prepared for San Joaquin River Riparian Habitat Restoration Program, U.S. Bureau of Reclamation, Fresno, California.

CALFED. 2000a. Programmatic record of decision. CALFED Bay-Delta Program, Sacramento, Calif.

CALFED. 2000b. Multi-species conservation strategy. CALFED Bay-Delta Program, Sacramento, Calif.

Clifton, D.G., and R.J. Gilliom. 1989. Sources and Concentrations of Dissolved Solids and Selenium in the San Joaquin River and its Tributaries, California, October 1985 to March 1987. U.S. Geological Survey Water-Resources Investigations Report 88-4217, p. 33.

Ewing, K. L. 1978. Riparian Ecosystems: Conservation of their unique characteristics. *In* R. R. Johnson and J. F. McCormack, editors. Strategies for protection and management of floodplain wetlands and other riparian ecosystems. Washington, DC: U.S. Forest Service General Technical Report. WO-12.

Gardali, T., A. Holmes, S. Small, N. Nur. G.R. Geupel, and G.H. Golet. 2006. Abundance patterns of landbirds in restored and remnant riparian forests on the Sacramento River, California, U.S.A. Restoration Ecology 14(3):391-403.

Grosholz, E. & E. Gallo. 2006. The influence of flood cycle and fish predation on invertebrate production on a restored California floodplain. Hydrobiologia, **568**, 91-109.

Helfield, J. M, and R. J. Naiman. 2001. Effects of salmon-derived nitrogen on riparian forest growth and implications for stream productivity. Ecology. 82:2403-2409.

Holland, R.F. 1986. Preliminary Descriptions of the Terrestrial Natural Communities of California. California Department of Fish and Game, Non-game Heritage Division, Sacramento, California.

Holland, L. & M. Huston. 1985. Distribution and food habits of YOY fishes in a backwater lake of the upper Mississippi River. Journal of Freshwater Ecology, 3, 81-91.

Hocking, M.D., and T.E. Reimchen. 2002. Salmon-derived nitrogen in terrestrial invertebrates from coniferous forests of the Pacific Northwest. BMC Ecology.

Kondolf, G.M. 2005. Expert Report of Professor Mathias Kondolf, Ph.D. E.D. Cal. No. Civ. 88-1658 LKK. 122pp.

Mathews, N. and C. Gougen. 1997. Cowbird parasitism and cattle grazing in New Mexico. Quarterly Programmatic Report, April 24, 1998, Project #87-118. National Fish and Wildlife Foundation, Washington, D.C.

McBain, S. and W. Trush. 2002. San Joaquin River restoration study background report. Prepared for Friant Water Users Authority, Lindsay, California and Natural Resources Defense Council, San Francisco, California. Arcata, California. December.

Merz, J.E., and P.B. Moyle. 2006. Marine-derived nutrients in human-dominated ecosystems of Central California. Ecological Applications 16:999-1009.

Moyle, P.B. 2002. Inland Fishes of California. University of California Press, Berkeley. 502pp.

Ornduff, R. 1974. Introduction to California Plant Live. UC Press, Berkeley. 152pp.

Power, M., A. Sun, G. Parker W. Dietrich, & J. Wootton. 1995. Hydraulic food-chain models: an approach to the study of food-web dynamics in larger rivers. Bioscience, **45**, 159-167.

Ribeiro, F., P. K. Crain, P.B. Moyle. 2004. Variation in condition factor and growth in young-of-year fishes in floodplain and riverine habitats of the Cosumnes River, California. Hydrobiologia, **527**, 77-84.

Riparian Habitat Joint Venture (RHJV). 2004. The Riparian Bird Conservation Plan: A strategy for reversing the decline of riparian associated birds in California. California Partners in Flight. Accessed on March 28, 20111 from http://www.prob.org/calpif/htmldocs/riparian.html

Reclamation (USBR). 2009. Water Year 2010 Biological Assessment, San Joaquin River Restoration Program.

Reclamation (USBR). 2009b Second Administrative Draft Environmental Impact Statement and Environmental Impact Report for the San Joaquin River Restoration Program. September 2009.

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.

San Joaquin River Restoration Program (SJRRP). 2010. Fisheries Management Plan: A Framework for Adaptive Management in the San Joaquin River Restoration Program, November 2010.

San Joaquin Valley Drainage Program (SJVDP). 1990. Fish and Wildlife Resources and Agricultural Drainage in the San Joaquin Valley, California. Vols. I, II.707 pp. +appendices

Scheidegger, K.J. & M.B. Bain. 1995. Larval fish distribution and microhabitat use in free-flowing and regulated rivers. Copeia, **1**, 125-135.

Shafroth, P. B., J. M. Friedman, G. T. Auble, M. L. Scott, and J. H. Braatne. 2002. Potential responses of riparian vegetation to dam removal. BioScience 52(8):703-712.

Sommer, T., W. Harrell, A. Mueller-Solger, B. Tom, & W. Kimmerer. 2004. Effects of flow variation on the channel and floodplain biota and habitats of the Sacramento River, California, USA. Aquatic Conservation: Marine and Freshwater Ecosystems, **14**, 247-261.

Sommer, T., W. Harrell & M. Nobriga. 2005. Habitat use and stranding risk of juvenile chinook salmon on a seasonal floodplain. North America Journal of Fisheries Management, **25**, 1493-1504.

Sommer, T., L. Conrad, G. O'Leary, F. Feyrer, & W. Harrell. 2002. Spawning and rearing of splittail in a model floodplain wetland. Transactions of the American Fisheries Society, **131**, 966-974.

Stromberg, J. C. and D. T. Patten. 1990. Riparian vegetation instream flow requirements. Environmental Management 14(2):185-194.

Turner, T.F., J.C. Trexler, G.L. Miller, & K.E. Toyer. 1994. Temporal and spatial dynamics of larval and juvenile fish abundance in a temperate floodplain river. Copeia, **1994**, 174-183.

USFWS. 1992. Shaded riverine aquatic cover of the Sacramento River system: Classification as Resource Category 1 under the FWS Mitigation Policy. October. Sacramento Fish and Wildlife Office, U.S. Fish and Wildlife Service, Sacramento, Calif.

USFWS. 2003. Draft Fish and Wildlife Coordination Act Report. Battle Creek Salmon and Steelhead Restoration Project. July. Sacramento.

Personal Communication

Damon Goodman, Arcata Fish and Wildlife Service; Arcata, CA 95521, July 2009.

Appendix A

San Joaquin River flows by Reach

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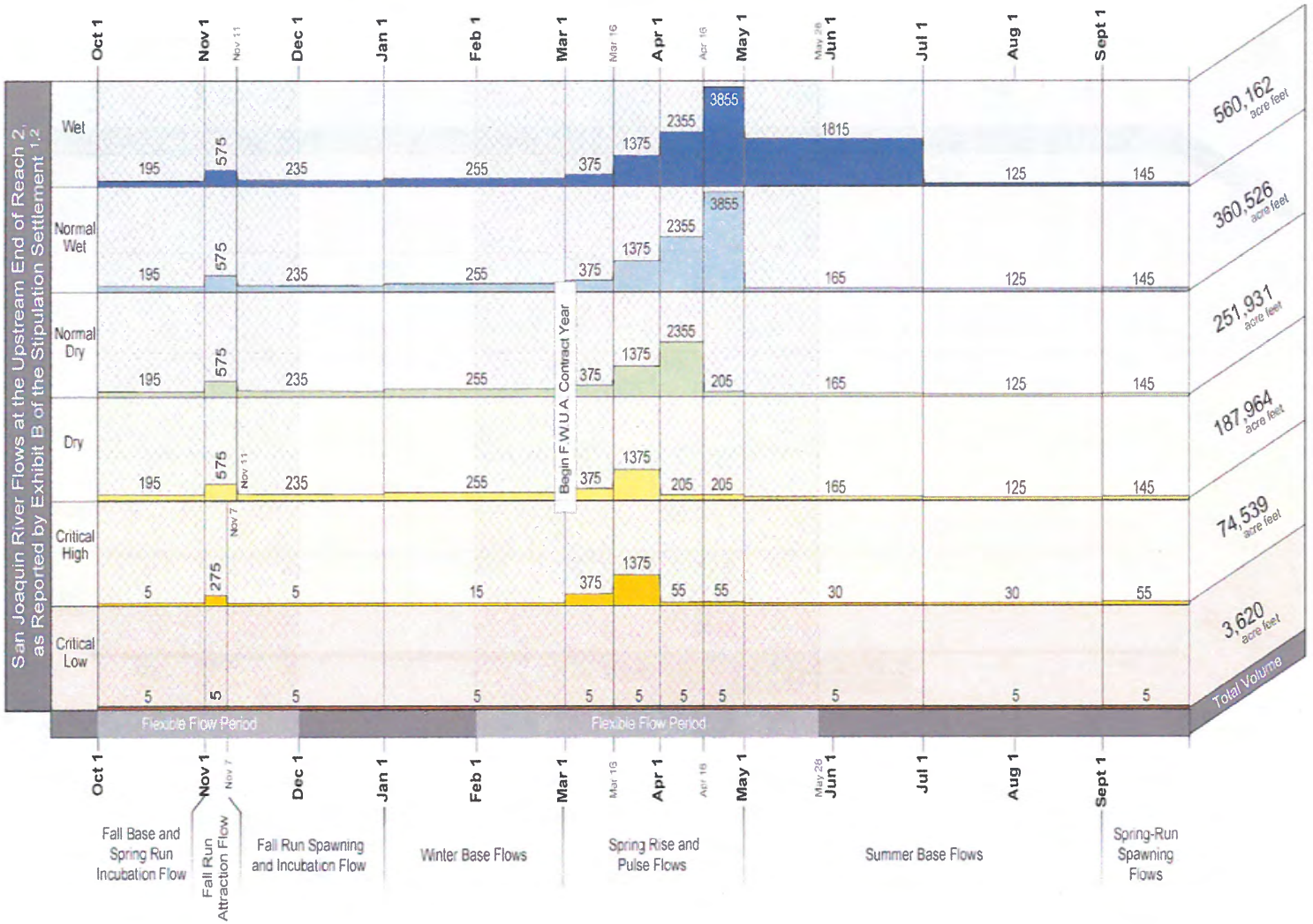
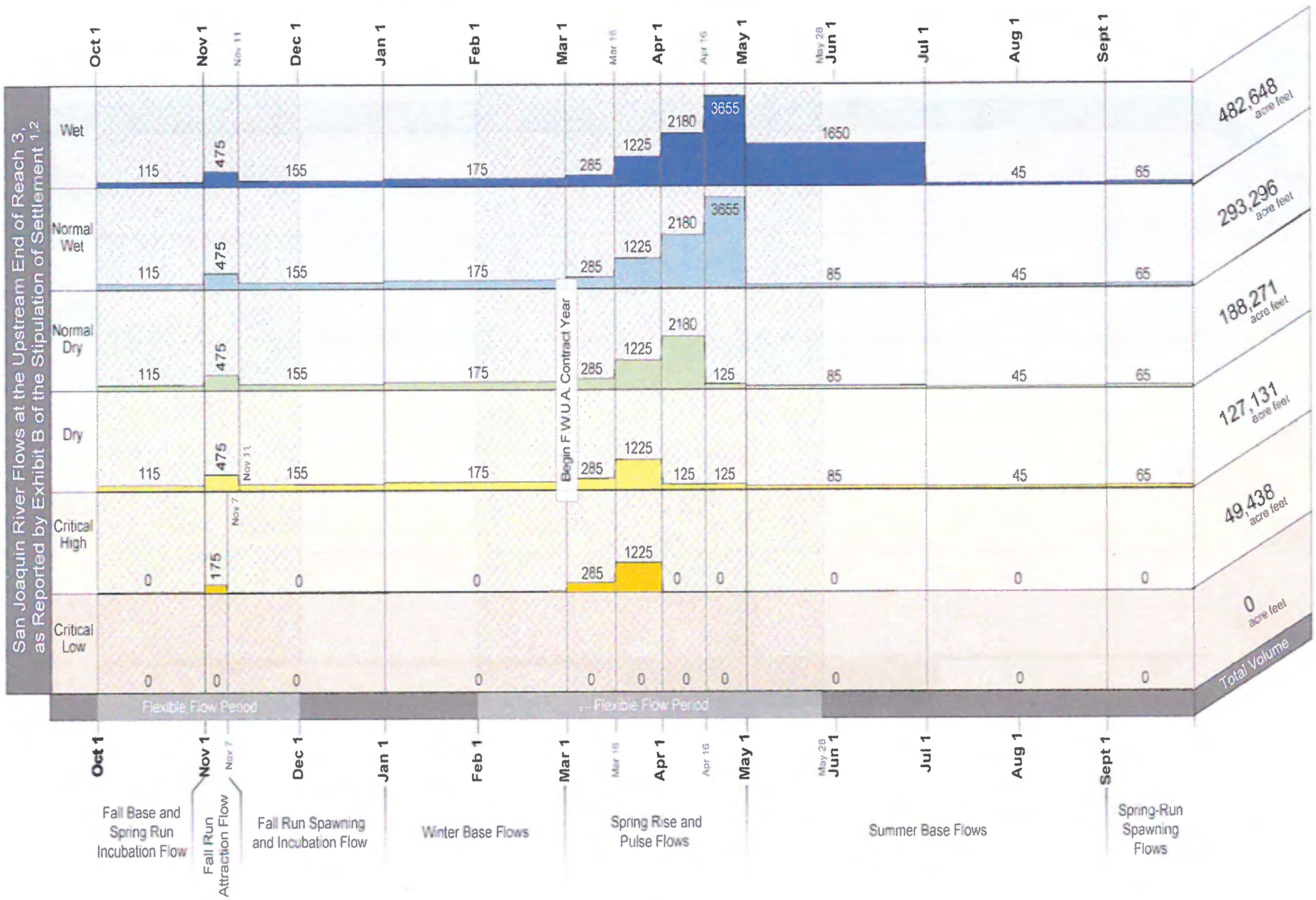
San Joaquin River Flows at the Upstream End of Reach 2, as Reported by Exhibit B of the Stipulation of Settlement[1,2]



1 - NRDC v Rodgers, Stipulation of Settlement, CIV NO. S-88-1658 - LKK/GGH, Exhibit B, September 13, 2006

2 - Hydrographs reflect assumptions about seepage losses and tributary inflows which are specified in the settlement

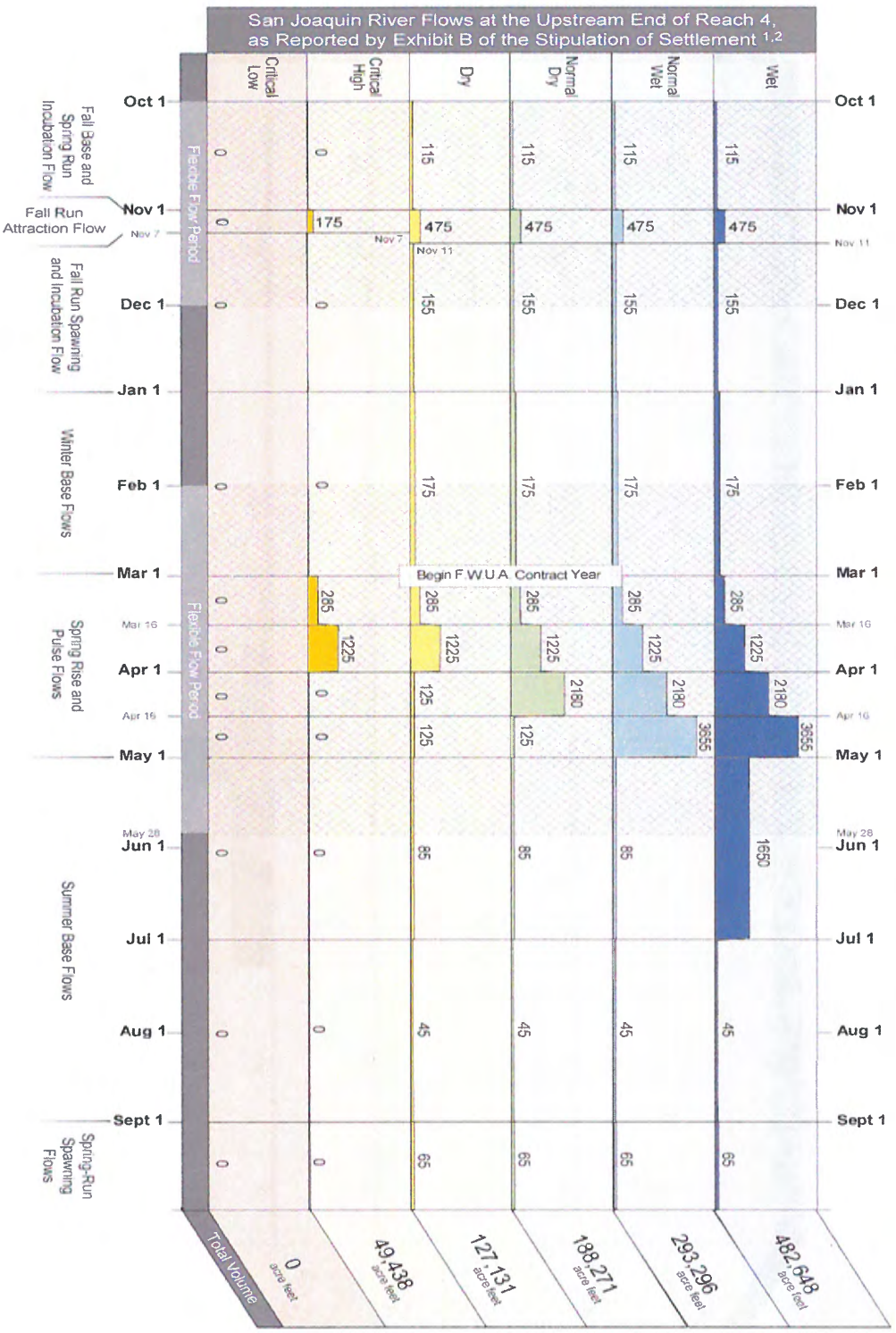
San Joaquin River Flows at the Upstream End of Reach 3, as Reported by Exhibit B of the Stipulation of Settlement[1,2]



1 - NRDC v. Rodgers, Stipulation of Settlement, CIV NO. S-88-1658 - LKK/GGH, Exhibit B, September 13, 2006

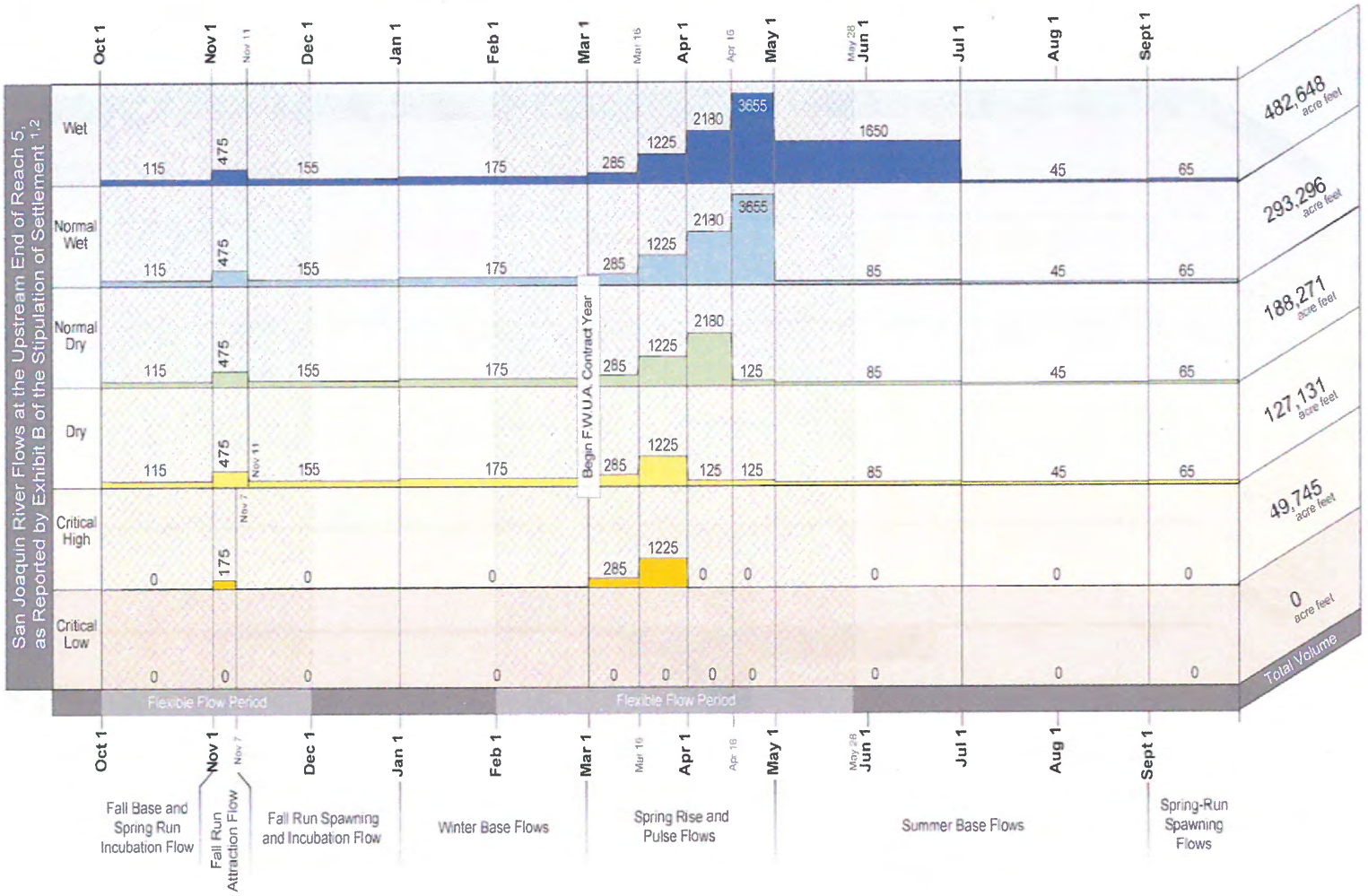
2 - Hydrographs reflect assumptions about seepage losses and tributary inflows which are specified in the settlement

San Joaquin River Flows at the Upstream End of Reach 4, as Reported by Exhibit B of the Stipulation of Settlement[1,2]



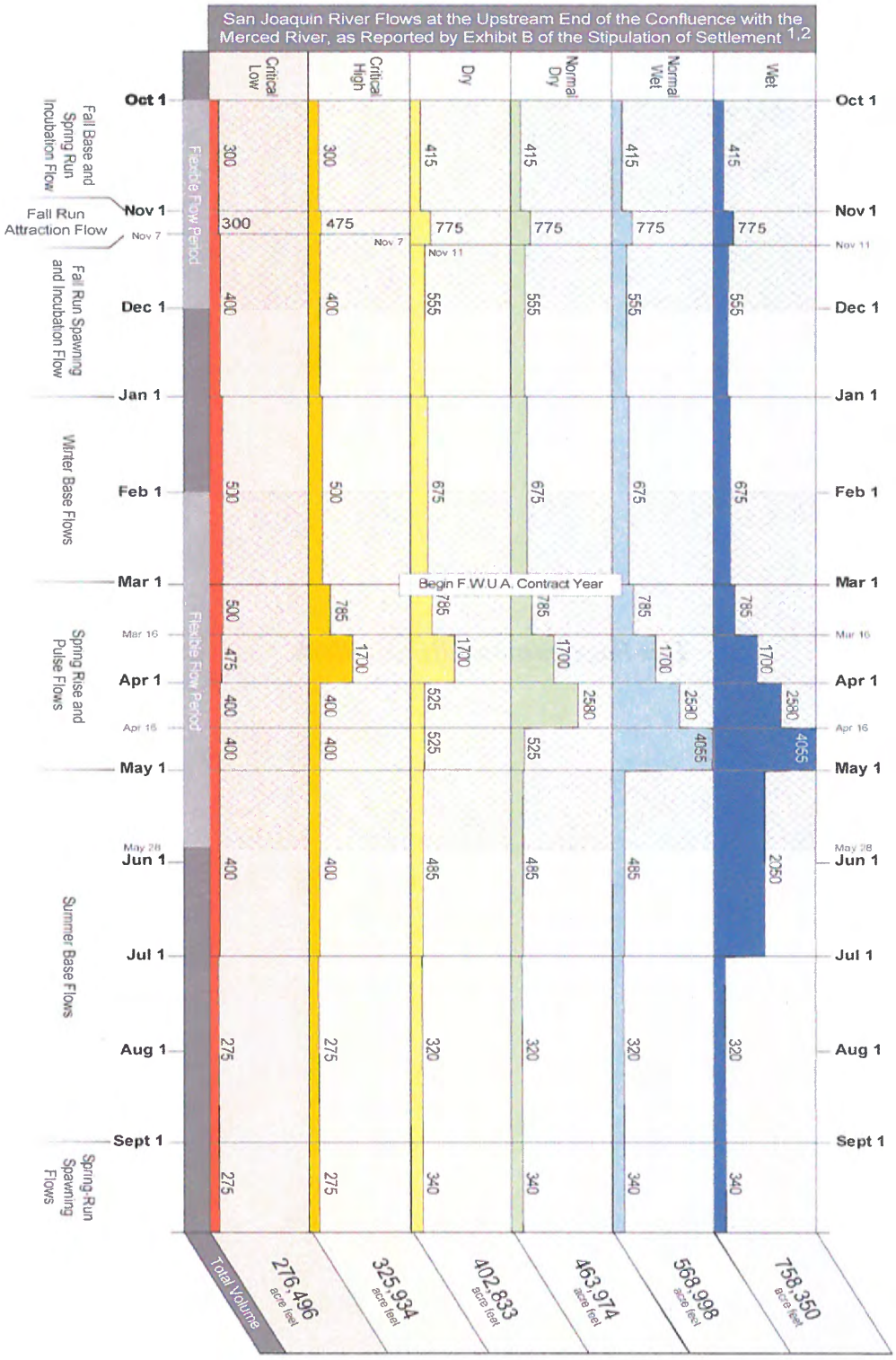
1 - NRDC v. Rodgers Stipulation of Settlement, CIV NO S-88-1658 - LKK/GGH, Exhibit B, September 13, 2006.
2 - Hydrographs reflect assumptions about seepage losses and tributary inflows which are specified in the settlement.

San Joaquin River Flows at the Upstream End of Reach 5, as Reported by Exhibit B of the Stipulation of Settlement[1,2]



1 - NRDC v Rodgers, Stipulation of Settlement, Civ NO. S-88-1658 - LKK/GGH, Exhibit B, September 13, 2006
2 - Hydrographs reflect assumptions about seepage losses and tributary inflows which are specified in the settlement

San Joaquin River Flows at the Upstream End of the Confluence with the Merced River, as Reported by Exhibit B of the Stipulation of Settlement[1,2]



1 - NRDC v. Rodgers, Stipulation of Settlement, CIV NO. S-88-1658 - LKK/GGH, Exhibit B, September 13, 2006.
2 - Hydrographs reflect assumptions about seepage losses and tributary inflows which are specified in the settlement.

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APPENDIX B-

From the Project Description in the draft EIS/R Conservation Measures for Biological Resources that may be affected by SJRRP Actions

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Conservation Measure and Identifier	Description	Program or Project-Level Action	Implementing Agency	Reporting Agency
VP	Vernal pool habitats, fleshy (succulent) owl's clover, Hoover's spurge, Bogg's Lake hedge-hyssop, Colusa grass, San Joaquin Valley Orcutt grass, hairy Orcutt grass, Conservancy fairy shrimp, longhorn fairy shrimp, vernal pool fairy shrimp, vernal pool tadpole shrimp, and western spadefoot toad			
VP-1. Avoid effects to species for implementation of the SJRRP	a. A qualified biologist shall identify and map vernal pool and seasonal wetland habitat potentially suitable for listed vernal pool plants, invertebrates, and western spadefoot toad within the project footprint. b. Facility construction and other ground-disturbing activities shall be sited to avoid core areas identified in the Vernal Pool Recovery Plan (USFWS 2005) because conservation of these areas is a high priority for recovering listed vernal pool species	Project & Program	Lead Agency	USFWS DFG
VP-2. Minimize effects to species for implementation of the SJRRP	a. If vernal pools are present, a buffer around the microwatershed or a 250-foot wide buffer, whichever is greater, will be established prior to ground-disturbing activities around the perimeter of vernal pools and seasonal wetlands that provide suitable habitat for vernal pool crustaceans or vernal pool plants and remain until ground-disturbing activities in that area are completed. Suitable habitat and buffer areas will be clearly identified in the field by staking, flagging, or fencing. b. Appropriate fencing will be placed and maintained around all preserved vernal pool habitat buffers during ground-disturbing activities to prevent impacts from vehicles and other construction equipment. c. Additional worker awareness training and on-site biological monitoring shall occur during ground-disturbing activities to ensure buffer areas are being maintained.	Program	Lead Agency	Lead Agency
VP-3. Compensate for temporary or permanent loss of habitat for implementation of the SJRRP	a. If activities occur within the microwatershed or250 foot buffer for vernal pool habitat would be affected by the SJRRP, the Lead Agency will develop and implement a compensatory mitigation plan, consistent with USACE's and EPA's April 10, 2008 *Final Rule for Compensatory Mitigation for Losses of Aquatic Resources* (33 CFR Parts 325 and 332 and 40 CFR Part 230) and other applicable regulations and rules at the time of implementation that will result in no net loss of acreage, function, and value of affected vernal pool habitat. Unavoidable effects will be compensated through a combination of creation, preservation, and restoration of vernal pool habitat or purchase of credits at a mitigation bank approved by the applicable regulatory agency/agencies. b. Project effects and compensation will be determined in consideration of the Vernal Pool Recovery Plan goals for core areas, which call for 95 percent preservation for habitat in the Grasslands Ecological Area and Madera core areas, and 85 percent habitat preservation in the Fresno core area (USFWS 2005). c. Appropriate compensatory ratios for loss of habitat both in and out of core areas would be determined during coordination and consultation with USFWS and/or DFG, as appropriate. d. If off-site compensation includes dedication of conservation easements, purchase of mitigation credits, or other off-site conservation measures, the details of these measures will be included in credits, or other off-site	Project & Program	Lead Agency	USFWS DFG

Conservation Measure and Identifier	Description	Program or Project-Level Action	Implementing Agency	Reporting Agency
	conservation measures, the details of these measures will be included in and developed as part of the USFWS and/or DFG coordination and consultation process. The plan will include information on responsible parties for long-term management, holders of conservation easements, long-term management requirements, and other details, as appropriate, for the preservation of long-term viable populations. Any impacts that result in a compensation purchase will be required to do so with an endowment for land management in perpetuity prior to any project groundbreaking activities.			
CH	Critical habitat			
CH-1. Avoid and minimize effects to critical habitat for implementation of the SJRRP	a. Designated critical habitats shall be identified and mapped. b. All SJRRP actions will be designed to avoid direct and indirect adverse modifications to these areas. c. Minimization measures, such as establishing and maintaining buffers around areas of designated critical habitat shall be implemented in the event that avoidance is not feasible.	Project & Program	Lead Agency	USFWS
CH-2. Compensate for unavoidable adverse effects on Federally designated critical habitat	a. If critical habitat may be adversely modified by the implementation of SJRRP actions, the area to be modified will be evaluated by a qualified biologist to determine the potential magnitude of the project effects (e.g., description of primary constituent elements present and quantification of those affected) at a level of detail necessary to satisfy applicable environmental compliance and permitting requirements. b. Implement compensatory conservation measures developed through section 7 consultation with USFWS. If off-site compensation includes dedication of conservation easements, purchase of mitigation credits, or other off-site conservation measures. The details of these measures will be included in and developed as part of the USFWS and/or DFG coordination and consultation process. The plan will include information on responsible parties for long-term management, holders of conservation easements, long-term management requirements, and other details, as appropriate, for the preservation of long-term viable populations. Any impacts that result in a compensation purchase will be required to do so with an endowment for land management in perpetuity prior to any project groundbreaking activities.	Project & Program	Lead Agency	USFWS
CTS	California tiger salamander			
CTS-1. Avoid and minimize effects to species for implementation of the SJRRP	a. Within one year prior to project construction activities, a qualified biologist shall identify and map California tiger salamander habitat within the project footprint. One week prior to ground-disturbing activities, a qualified biologist will survey for and flag the presence of ground squirrel and gopher burrow complexes. Where burrow complexes are present, a 250-foot buffer shall be placed in order to ensure avoidance and minimization of disturbance to the species. b. Facility construction and other ground-disturbing activities shall be sited to avoid areas of known California tiger salamander habitat and avoidance buffers.	Program	Lead Agency	USFWS DFG

Conservation Measure and Identifier	Description	Program or Project-Level Action	Implementing Agency	Reporting Agency
	c. To eliminate an attraction to predators of the California tiger salamander, all food-related trash items such as wrappers, cans, bottles, and food scraps must be disposed of in closed containers and removed at least once every day from the entire project site.			
CTS-2: Minimize effects to species for implementation of the SJRRP	a. Before and during construction activities, construction exclusion fencing will be installed just outside of the work limit or around vernal pools where California tiger salamander may occur. This fencing shall be maintained throughout construction and will be removed at the conclusion of ground-disturbing activities. No vehicles will be allowed beyond the exclusion fencing. A USFWS-approved biological monitor shall be present on site, during intervals as recommended by USFWS, to provide inspection of the fencing. b. The biological monitor will be onsite each day during any wetland restoration or construction, and during initial site grading or development of sites where California tiger salamanders have been found. c. Before the start of work each day, the biological monitor will check for animals under any equipment to be used that day, such as vehicles or stockpiles of items such as pipes. If California tiger salamanders are present, they will be allowed to leave on their own, prior to the initiation of construction activities for the day. To prevent inadvertent entrapment of California tiger salamanders during construction, all excavated, steep-walled holes or trenches more than 1 foot deep shall be covered at the close of each working day by plywood or similar materials, or provided with one or more escape ramps constructed of earth fill or wooden planks. Before such holes or trenches are filled, they must be thoroughly inspected for trapped animals. d. Plastic monofilament netting (erosion control matting) or similar material shall not be used at the project site because California tiger salamanders may become entangled or trapped. Acceptable substitutes include coconut coir matting or tackified hydroseeding compounds. e. All ground-disturbing work shall occur during daylight hours. Clearing and grading will be conducted between April 15 and October 15, in coordination with USFWS and DFG, and depending on the level of rainfall and site conditions. f. Revegetation of project areas temporarily disturbed by construction activities will be conducted with locally-occurring native plants.	Program	Lead Agency	USFWS

Conservation Measure and Identifier	Description	Program or Project-Level Action	Implementing Agency	Reporting Agency
CTS-3: Compensate for temporary or permanent loss of habitat for implementation of the SJRRP	a. If California tiger salamander or areas within 250 feet of California tiger salamander habitat would be affected by the SJRRP, the Lead Agency will develop and implement a compensatory mitigation plan in coordination with USFWS and DFG, as appropriate. Unavoidable effects will be compensated through a combination of creation, preservation, and restoration of habitat or purchase of credits at a mitigation bank approved by the regulatory agencies. b. If off-site compensation includes dedication of conservation easements, purchase of mitigation credits, or other off-site conservation measures, the details of these measures will be included in and developed as part of the USFWS and/or DFG coordination and consultation process. The plan will include information on responsible parties for long-term management, holders of conservation easements, long-term management requirements, and other details, as appropriate, for the preservation of long-term viable populations. Any impacts that result in a compensation purchase will be required to do so with an endowment for land management in perpetuity prior to any project groundbreaking activities.	Program	Lead Agency	USFWS DFG
DBC	Delta button-celery			
DELTA-1. Avoid and minimize loss of habitat and individuals due to the implementation of the SJRRP	a. Comprehensive surveys to identify, quantify, and map occurrences of Delta button-celery will be conducted prior to potential impacts or inundation of Delta button-celery plants within the bypasses. Surveys will include remapping and recensus of the documented occurrences within Reaches 4B and 5 and the Eastside and Mariposa bypasses (DFG 2003) during at least 2 consecutive or nonconsecutive years when habitat conditions are favorable to detect the species to determine the population trend. Status updates for these occurrences will be provided to DFG. b. A Delta button-celery conservation plan will be developed and implemented that includes a preservation and adaptive management strategy for existing occurrences within the Restoration Area. The conservation plan will be developed in collaboration with DFG and other species experts and be supported by review of the existing literature, including information on species' life history characteristics, historic and current distribution, and microhabitat requirements.	Project & Program	Lead Agency	DFG
DELTA-2. Avoid and minimize loss of habitat and risk of take for implementation of SJRRP construction activities	a. If Delta button-celery plants are found on or adjacent to the project site, a 100-foot wide buffer will be established during construction activities that is clearly identified in the field by staking, flagging, or fencing around depressions, swales, or other features containing Delta button-celery plants. Construction-related activity will not occur within the occupied habitat and buffer areas. b. Additional worker awareness training and on-site biological monitoring shall occur to ensure buffer areas are being maintained.	Program	Lead Agency	Lead Agency

Conservation Measure and Identifier	Description	Program or Project-Level Action	Implementing Agency	Reporting Agency
DELTA-3. Compensate for temporary or permanent loss of habitat for implementation of the SJRRP	a. Compensatory mitigation for Delta button-celery will be developed in consultation with DFG. Mitigation will include the development and implementation of habitat creation and enhancement designs to incorporate habitat features for Delta button-celery (e.g., depressions within seasonally-inundated areas) into floodplains with potentially suitable habitat conditions. Compensatory mitigation may also include efforts to establish additional populations in the Restoration Area or to enhance existing populations on or off site. Mitigation sites will avoid areas where future SJRRP activities are likely. The lead agency will obtain site access through a conservation easement or in-lieu fee title and will provide adequate funding to implement the required compensation measures and to monitor compliance with and success of the conservation measures. b. Establishment of new occurrences will be attempted by transplanting seed and plants from affected locations to created habitat or suitable, but unoccupied, existing habitat. c. Monitoring, performance criteria, and protective measures will be applied to compensatory mitigation sites. The replacement requirements, as well as any additional conservation and mitigation measures, will be determined in coordination with DFG.	Project & Program	Lead Agency	DFG
PALM	Palmate-bracted bird's beak			
PALM-1. Avoid and minimize effects to species for implementation of the SJRRP	a. A qualified botanist will identify and map the location of palmate-bracted bird's beak plants within the project footprint, within 1 year prior to the start of activities that may cause disturbance from either release of flows over 1,660 cfs or from ground disturbing actions. b. A 500-foot buffer shall be placed around occurrences of palmate-bracted bird's beak during construction activities, consistent with recommendations in the Recovery Plan for Upland Species of the San Joaquin Valley, California (USFWS 1998). The 500-foot wide buffer will be clearly identified in the field by staking, flagging, or fencing. Project activity will avoid buffer areas, and work awareness training and biological monitoring will be conducted to ensure that the buffer area is not being encroached upon and that effects are being avoided.	Project & Program	Lead Agency	USFWS DFG
PALM-2. Compensate for temporary or permanent loss of occupied habitat	a. A compensatory conservation plan shall be developed in coordination with USFWS and DFG, as appropriate. The conservation plan will require the Lead Agency to maintain viable plant populations in the Restoration Area and will identify compensatory measures for any populations affected. The conservation plan shall include monitoring and reporting requirements for populations to be preserved in or adjacent to construction areas or populations to be protected or enhanced off site. b. If relocation efforts are part of the conservation plan, the plan will include details on the methods to be used: collection, relocation/transplant potential, storage, propagation, preparation of receptor site, installation, long-term protection and management, monitoring and reporting requirements, and remedial action responsibilities should the initial effort fail to meet	Project & Program	Lead Agency	USFWS DFG

Conservation Measure and Identifier	Description	Program or Project-Level Action	Implementing Agency	Reporting Agency
	compensation requirements. c. If off-site compensation includes dedication of conservation easements, purchase of mitigation credits, or other off-site conservation measures, the details of these measures will be included in the conservation plan and must occur with full endowment for management in perpetuity prior to groundbreaking. The plan will include information on responsible parties for long-term management, holders of conservation easements, long-term management requirements, and other details, as appropriate, for the preservation of long-term viable populations.			
VELB	Valley elderberry longhorn beetle			
VELB-1. Avoid and minimize effects to species for implementation of the SJRRP	a. Within 1 year prior to the commencement of ground-disturbing activities a qualified biologist shall identify any elderberry shrubs in the project footprint. Qualified biologist(s) will survey potentially affected shrubs for valley elderberry longhorn beetle exit holes in stems greater than I- inch in diameter. b. If elderberry shrubs are found on or adjacent to the construction project site, a 100-foot wide avoidance buffer – measured from the dripline of the plant - will be established around all elderberry shrubs with stems greater than 1-inch diameter at ground level and will be clearly identified in the field by staking, flagging, or fencing. No activities will occur within the buffer areas and worker awareness training and biological monitoring will be conducted to ensure that avoidance measures are being implemented.	Project & Program	Lead Agency	USFWS
VELB -2. Compensate for temporary or permanent loss of habitat	a. The Lead Agency will consult with USFWS to determine appropriate compensation ratios. Compensatory mitigation measures will be consistent with the Conservation Guidelines for Valley Elderberry Longhorn Beetle (USFWS 1999a), or current guidance. b. Compensatory mitigation for adverse effects may include the transplanting of elderberry shrubs during the dormant season (November 1 to February 15), if feasible, to an area protected in perpetuity as well as required additional elderberry and associated native plantings and approved by the USFWS. c. If off-site compensation includes dedication of conservation easements, purchase of mitigation credits, or other off-site conservation measures, the details of these measures will be included in the mitigation plan and must occur with full endowments for management in perpetuity. The plan will include information on responsible parties for long-term management, holders of conservations easements, long-term management requirements, and other details, as appropriate, for the preservation of long-term viable populations.	Project & Program	Lead Agency	USFWS
BNLL	Blunt-nosed leopard lizard			

Conservation Measure and Identifier	Description	Program or Project-Level Action	Implementing Agency	Reporting Agency
BNLL-1. Avoid and minimize effects to species for implementation of the SJRRP.	a. Within 1 year prior to the commencement of the proposed project, a qualified biologist shall provide a general habitat assessment survey to identify and map potentially suitable habitat for blunt-nosed leopard lizard within the project footprint and where populations may be affected by the actions. b. If areas of suitable habitat could be affected by the project actions, focused surveys will be conducted in coordination with USFWS and DFG. USFWS and DFG will be consulted to develop additional avoidance and habitat minimization measures, as appropriate. c. If suitable burrow habitat is found for blunt-nosed leopard lizard within the project footprint, prior to the commencement of activities that may cause disturbance, a minimum 491-foot buffer will be established around the burrows and will be clearly identified in the field by staking, flagging, or fencing. Activities will not occur within the buffer areas and worker awareness training and biological monitoring will be conducted to ensure that avoidance measures are being implemented.	Project & Program	Lead Agency	USFWS DFG
PLANTS	Other special-status plants			
PLANTS-1. Avoid and minimize effects to special-status plants for implementation of the SJRRP.	a. Within one year prior to the commencement of ground disturbing activities, habitat assessment surveys for the special-status plants listed in Table 1 of Appendix L, Biological Resources-Vegetation and Wildlife, will be conducted by a qualified botanist, in accordance with the most recent USFWS and DFG guidelines and at the appropriate time of year when the target species would be in flower or otherwise clearly identifiable. b. Locations of special-status plant populations will be clearly identified in the field by staking, flagging, or fencing a 100-foot wide buffer around them prior to the commencement of activities that may cause disturbance. No activity shall occur within the buffer area and worker awareness training and biological monitoring will be conducted to ensure that avoidance measures are being implemented. Some special-status plant species are annual plants, meaning the plant completes its entire lifecycle in one growing season. Other special-status plant species are perennial plants that return year after year until they reach full maturity. Due to the differences in life histories, all general conservation measures will be developed on a case-by-case basis and will include strategies that are species and site-specific in order to avoid impacts to special-status plants.	Program	Lead Agency	USFWS DFG

Conservation Measure and Identifier	Description	Program or Project-Level Action	Implementing Agency	Reporting Agency
PLANTS-2. Compensate for temporary or permanent loss of special-status plants	a. USFWS and/or DFG will be consulted to determine appropriate compensation measures for the loss of special-status plants, as appropriate. b. Appropriate mitigation measures may include the creation of offsite populations through seed collection or transplanting, preservation and enhancement of existing populations, restoration or creation of suitable habitat, or the purchase of credits at a regulatory agency-approved mitigation bank. If off-site compensation includes dedication of conservation easements, purchase of mitigation credits, or other off-site conservation measures, the details of these measures will be included in the mitigation plan and must occur with full endowments for management in perpetuity. The plan will include information on responsible parties for long-term management, holders of conservations easements, long-term management requirements, and other details, as appropriate, for the preservation of long-term viable populations.	Program	Lead Agency	USFWS DFG
GGS	Giant garter snake			
GGS-1. Avoid and minimize loss of habitat for giant garter snake for implementation of the SJRRP	a. Pre-construction surveys will be completed by a qualified biologist approved by USFWS and DFG within a 24-hour period prior to any ground disturbance of potential giant garter snake habitat. If construction activities stop on the project site for a period of 2 weeks or more, a new giant garter snake survey will be completed no more than 24 hours prior to the re-start of construction activities. Avoidance of ponds, streams, lakes and other wetland and water courses, and their immediately adjacent upland habitats that may provide suitable breeding and foraging habitat will occur by demarcating and maintaining a 300-foot buffer around these areas. b. For projects within potential giant garter snake habitat, all activity involving disturbance of potential giant garter snake habitat will be restricted to the period between May 1 and October 1, the active season for giant garter snakes. The construction site shall be re-inspected when a lapse in construction activity of two weeks or greater has occurred. c. Clearing will be confined to the minimal area necessary to facilitate construction activities. Giant garter snake habitat within or adjacent to the project will be flagged, staked, or fenced and designated as an Environmentally Sensitive Area. No activity shall occur within this area and USFWS approved worker awareness training and biological monitoring will be conducted to ensure that avoidance measures are being implemented. Construction activities shall be minimized within 200 feet of the banks of giant garter snake habitat. Movement of heavy equipment will be confined to existing roadways to minimize habitat disturbance. d. Vegetation shall be hand cleared in areas where giant garter snakes are suspected to occur. Exclusionary fencing with one-way exit funnels shall be installed at least one month prior to activities to allow the species to passively leave the area and to prevent re-entry into work zones, per USFWS and/or DFG guidance. e. If a giant garter snake is found during construction	Program	Lead Agency	Lead Agency USFWS DFG

Conservation Measure and Identifier	Description	Program or Project-Level Action	Implementing Agency	Reporting Agency
	activities, the USFWS, DFG, and the project's biological monitor will immediately be notified. The biological monitor, or his/her assignee, will stop construction in the vicinity of the find and allow the snake to leave on its own. The monitor will remain in the area for the remainder of the work day to ensure the snake is not harmed. Escape routes for giant garter snake should be determined in advance of construction and snakes will be allowed to leave on their own. If a giant garter snake does not leave on its own within one working day, USFWS and DFG will be consulted. f. All construction-related holes shall be covered to prevent entrapment of individuals. Where applicable, construction areas shall be dewatered two weeks prior to the start of activities to allow giant garter snakes and their prey to move out of the area prior to any disturbance.			
GGS-2. Compensate for temporary or permanent loss of habitat.	a. Temporarily affected giant garter snake aquatic habitat will be restored in accordance with criteria listed in the USFWS *Mitigation Criteria for Restoration and/or Replacement of Giant Garter Snake Habitat* (Appendix A to Programmatic Formal Consultation for U.S. Army Corps of Engineers 404 Permitted Projects with Relatively Small Effects on the Giant Garter Snake within Butte, Colusa, Glenn, Fresno, Merced, Sacramento, San Joaquin, Solano, Stanislaus, Sutter, and Yolo Counties, California (USFWS 1997) or the most current criteria from the agencies. b. Permanent loss of giant garter snake habitat will be compensated at a ratio and at a manner consulted on with USFWS and DFG. Compensation may include preservation and enhancement of existing populations, restoration or creation of suitable habitat, or purchase of credits at a regulatory agency approved mitigation bank in a sufficient quantity to compensate for the effect. Credit purchases, land preservation or enhancement to minimize effects to giant garter snakes should occur geographically close to the impact area.	Program	Lead Agency	USFWS DFG
WPT	Western pond turtle			
WPT-1. Avoid and minimize loss of individuals due to implementation of the SJRRP	a. A qualified biologist will conduct surveys in aquatic habitats to be dewatered and/or filled during project construction. Surveys would be conducted immediately after dewatering and before fill of aquatic habitat suitable for pond turtles. If pond turtles are found, the biologist will capture them and move them to nearby USFWS and/or DFG-approved areas of suitable habitat that will not be disturbed by project construction.	Program	Lead Agency	DFG
EAGLE	Bald eagle and golden eagle			

Conservation Measure and Identifier	Description	Program or Project-Level Action	Implementing Agency	Reporting Agency
EAGLE-1. Avoid and minimize effects to bald and golden eagles (as defined in the Bald and Golden Eagle Protection Act)	a. Surveys for bald and golden eagle nests will be conducted within 2 miles of any proposed project within areas supporting suitable nesting habitat and important eagle roost sites and foraging areas. These surveys will be conducted in accordance with the USFWS's Protocol for Evaluating Bald Eagle Habitat and Populations in California and DFG's Bald Eagle Breeding Survey Instructions or current guidance (*USFWS Draft Project Design Criteria and Guidance for Bald and Golden Eagles).* b. If an active eagle's nest is found, project disturbance will not occur within ½ mile of the active nest site during the breeding season (typically December 30th until July 1st) or any disturbance if that action is shown to disturb the nesting birds. A no-disturbance buffer will be established around the nest site for construction activities in consultation with USFWS and DFG and will depend on ecological factors, including topography, surrounding vegetation, nest height, and distance to foraging habitat; as well as the type and magnitude of disturbance. c. Project activity will not occur within the ½ mile buffer areas and worker awareness training and biological monitoring will be conducted to ensure that avoidance measures are being implemented.	Program	Lead Agency	USFWS DFG
SWH	Swainson's hawk			
SWH-1. Avoid and minimize impacts to Swainson's Hawk	a. Pre-construction surveys for active Swainson's hawk nests will be conducted in area supporting potentially suitable nesting habitat. b. If active nests are identified through pre-construction surveys, a ½ mile no-disturbance buffer shall be established around all active nest sites if construction cannot be limited to occur outside of the nesting season (March 1 through September 15). c. Worker awareness training and biological monitoring will be conducted to ensure that avoidance measures are being implemented.	Program	Lead Agency	DFG
SWH-2. Compensate for loss of nest trees and foraging habitat	a. If foraging habitat for Swainson's hawk is removed in association with project implementation, foraging habitat compensation will occur in coordination with DFG. Foraging habitat mitigation may consist of the planting and establishment of alfalfa, row crops, pasture, or fallow fields. b. If potential nesting trees are to be removed during construction activities, removal will take place outside of Swainson's hawk nesting season and the lead agency will develop a plan to replace known Swainson's hawk nest trees with a number of equivalent native trees that were previously determined to be impacts through consultation with DFG.	Program	Lead Agency	DFG
RAPTOR	Other nesting raptors			
RAPTOR-1. Avoid and minimize loss of individual raptors due to implementation of the SJRRP	a. Construction activity, including vegetation removal, will only occur outside the typical breeding season for raptors (September 1 to February 28), if raptors are determined to be present. b. Pre-construction surveys will be conducted by a qualified biologist in areas of suitable habitat in order to identify active nests in the project footprint.	Program	Lead Agency	DFG

Conservation Measure and Identifier	Description	Program or Project-Level Action	Implementing Agency	Reporting Agency
	c. If active nests are located in the project footprint, a no-disturbance buffer will be established until a qualified biologist determines that the nest is no longer active. The size of the buffer shall be established by a qualified biologist in coordination with DFG based on the sensitivity of the resource, the type of disturbance activity, and nesting stage. No activity shall occur within the buffer area and worker awareness training and biological monitoring will be conducted to ensure that avoidance measures are being implemented.			
RAPTOR-2. Compensate for loss of nest trees	a. Native trees removed during project activities will be replaced with an appropriate number of native trees, in coordination with DFG.	Program	Lead Agency	DFG
MBTA	Other birds protected by the Migratory Bird Treaty Act			
MBTA-1. Avoid and minimize effects to species due to implementation of the SJRRP	a. Native nesting birds will be avoided by not conducting project activity, including vegetation removal, during the typical breeding season (February 1 to September 1), if species covered under the Migratory Bird Treaty Act are determined to be present. b. An Avian Protection Plan shall be established in coordination with USFWS and DFG. Any overhead utility companies within the project area, whose lines, poles, or towers may be moved in association with the project, would also be Consulted as part of the Avian Protection Plan.	Program	Lead Agency	USFWS
BRO	Burrowing Owl			
BRO-1. Avoid loss of species due to implementation of the SJRRP	a. Pre-construction surveys for burrowing owls will be conducted in area supporting potentially suitable habitat and within 30 days prior to the start of construction activities. If ground-disturbing activities are delayed or suspended for more than 30 days after the pre-construction survey, the site should be resurveyed. b. Occupied burrows shall not be disturbed during the breeding season (February 1 through August 31). A 160-foot buffer shall be placed around occupied burrows during the non-breeding season (September 1 through January 31), and a 250-foot buffer shall be placed around occupied burrows during the breeding season. Ground-disturbing activities shall not occur within the designated buffers.	Program	Lead Agency	DFG
BRO-1. Minimize impacts to species due to implementation of the SJRRP	a. If a DFG-approved biologist can verify through non-invasive methods that the owls have not begun egg-laying and incubation, or that juveniles from the occupied burrows are foraging independently and are capable of independent survival, a plan shall be coordinated with DFG to offset the burrow habitat and foraging area on the project site if burrows and foraging areas are taken by the SJRRP actions. b. If destruction of occupied burrows occurs, existing unsuitable burrows should be enhanced (enlarged or cleared of debris) or new burrows created. This should be done in consultation with DFG. c. Passive owl relocation techniques must be implemented. Owls should be excluded from burrows in the immediate impact zone within a 160-foot buffer zone by installing one-way doors in burrow entrances. These doors shall be in place at least 48 hours prior to excavation to insure the	Program	Lead Agency	DFG

Conservation Measure and Identifier	Description	Program or Project-Level Action	Implementing Agency	Reporting Agency
	owls have departed. d. The project area shall be monitored daily for one week to confirm owl departure from burrows prior to any ground-disturbing activities. e. Where possible, burrows should be excavated using hand tools and refilled to prevent reoccupation. Sections of flexible plastic pipe should be inserted into the tunnels during excavation to maintain an escape route for any animals inside the burrow.			
BAT	Special-status bats			
BAT-1: Avoid and minimize loss of species due to implementation of the SJRRP.	a. If suitable roosting habitat for special-status bats will be affected by project construction (e.g., removal or buildings, modification of bridges), surveys for roosting bats on the project site will be conducted by a qualified biologist. The type of survey will depend on the condition of the potential roosting habitat and may include visual surveys or use of acoustic detectors. Visual surveys may consist of a daytime pedestrian survey looking for evidence of bat use (e.g., guano) and/or an evening emergence survey to note the presence or absence of bats. The type of survey will depend on the condition of the potential roosting habitat. If no bat roost are found, then no further study is required. b. If evidence of bat use is observed, the number and species of bats using the roost will be determined. Bat detectors may be used to supplement survey efforts. c. If roosts are determined to be present and must be removed, the bats will be excluded from the roosting site before the facility is removed. A mitigation program addressing compensation, exclusion methods, and roost removal procedures will be developed in consultation with DFG prior to implementation. Exclusion methods may include use of one-way doors at roost entrances (bats may leave, but not re-enter), or sealing roost entrances when the site can be confirmed to contain no bats. Exclusion efforts may be restricted during periods of sensitive activity (e.g., during hibernation or while females in maternity colonies are nursing young).	Program	Lead Agency	DFG
BAT-2: Compensate for loss of habitat	a. The loss of each roost will be replaced in consultation with DFG and may include construction and installation of bat boxes suitable to the bat species and colony size excluded from the original roosting site. Roost replacement will be implemented before bats are excluded from the original roost sites. Once the replacement roosts are constructed and it is confirmed that bats are not present in the original roost sites, the structure may be removed.	Program	Lead Agency	DFG
SJAS	San Joaquin antelope squirrel			
SJAS-1: Avoid and minimize loss of individuals due to implementation of the SJRRP	a. Preconstruction surveys will be conducted by a qualified biologist per DFG survey methodology to determine if active potential burrows for San Joaquin antelope squirrel are present in the project footprint. Surveys will be conducted within 30 days prior to ground-disturbing activities. The biologist will conduct burrow searches by systematically walking transects, which shall be adjusted based on vegetation height and topography, and in coordination with DFG. Transects shall be used to	Program	Lead Agency	DFG

Conservation Measure and Identifier	Description	Program or Project-Level Action	Implementing Agency	Reporting Agency
	identify the presence of burrows. When a burrow is found, the biologist will measure the diameter of the burrow(s); evaluate the shape of the burrow and entrance(s); and note tracks, scat, and tail drags at the site. Scat may be collected for later confirmation of species by known experts. Focused surveys, which may involve live trapping, may be required in coordination with DFG, as appropriate. Additional conservation measures may developed pending the results of surveys and in consultation with DFG. b. Construction activities shall be conducted at a time that is least likely to affect the species (i.e., after the normal breeding season). This timing shall be coordinated with USFWS and DFG.			
FKR	Fresno kangaroo rat			
FKR-1: Avoid and minimize effects to species due to implementation of the SJRRP	a. Preconstruction surveys will be conducted by a qualified biologist per USFWS and DFG survey methodology to determine if potential burrows for Fresno kangaroo rat are present in the project footprint. Surveys will be conducted within 30 days prior to ground-disturbing activities. The biologist will conduct burrow searches by systematically walking transects, which shall be adjusted based on vegetation height and topography, and in coordination with USFWS and DFG. Transects shall be used to identify the presence of burrows. When a burrow is found, the biologist will measure the diameter of the burrow(s); evaluate the shape of the burrow and entrance(s); and note tracks, scat, and tail drags at the site. Scat may be collected for later confirmation of species by known experts. Focused surveys, which may involve live trapping, may be required in areas of potential habitat in coordination with USFWS and DFG, as appropriate. Additional conservation measures may be developed pending the results of surveys and in consultation with USFWS and DFG. b. Construction activities shall be conducted at a time that is least likely to affect the species (i.e., after the normal breeding season). This timing shall be coordinated with USFWS and DFG.	Program	Lead Agency	USFWS DFG
FKR-2: Avoid disturbance of designated critical habitat	a. Facility construction and modification and other restoration projects shall be sited to avoid primary constituent elements of designated critical habitat for Fresno kangaroo rat.	Program	Lead Agency	USFWS DFG
SJKF	San Joaquin kit fox			
SJKF-1: Avoid and minimize effects to species due to the implementation of the SJRRP	a. A qualified biologist will conduct preconstruction surveys no less than 14 days and no more than 30 days prior to the commencement of activities to identify potential dens more than 5 inches in diameter. The lead agency shall implement USFWS' (1999b) *Standardized Recommendations for Protection of San Joaquin Kit Fox Prior to or During Ground Disturbance.* The lead agency will notify USFWS and DFG in writing of the results of the preconstruction survey within 30 days after these activities are completed. b. If dens are located within the proposed work area and	Program	Lead Agency	USFWS DFG

Conservation Measure and Identifier	Description	Program or Project-Level Action	Implementing Agency	Reporting Agency
	cannot be avoided during construction activities, a Service-approved biologist will determine if the dens are occupied. c. If occupied dens are present within the proposed work, their disturbance and destruction shall be avoided. Exclusion zones will be implemented following the latest USFWS procedures (currently USFWS 1999b). d. The lead agency will notify USFWS and DFG immediately if a natal or pupping den is found in the survey area. The lead agency will present the results of preactivity den searches within 5 days after these activities are completed and before the start of construction activities in the area. e. Construction activities shall be conducted at a time that is least likely to affect the species (i.e., after the normal breeding season). This timing shall be coordinated with USFWS and DFG.			
SJKF-2: Compensate for loss of habitat	a. The lead agency, in coordination with USFWS and/or DFG, will determine if kit fox den removal is appropriate. If unoccupied dens need to be removed, the Service-approved biologist shall remove these dens by hand-excavating them in accordance with USFWS procedures (USFWS 1999b). b. Additional conservation measures will be coordinated with USFWS and DFG and may include replacement of dens, installation of off-site artificial dens, or other options to be determined. c. The lead agency will present the results of den excavations to USFWS and DFG within 5 days after these activities are completed.	Program	Lead Agency	USFWS DFG
PL	Pacific Lamprey			
PL-1: Avoid and minimize effects to species due to the implementation of the SJRRP	a. A qualified biologist will conduct preconstruction surveys as outlined in Attachment A of USFWS' *Best Management Practices to Minimize Adverse Effects to Pacific Lamprey (Entosphenus tridentatus), April 2010.* The biologist shall conduct electrofishing to determine the presence of ammoceoetes in the project area. b. Work in documented areas of Pacific Lamprey presence will be timed to avoid in-channel work during typical lamprey spawning, March 1 to July 1. c. If temporary dewatering in documented areas of lamprey presence is required for instream channel work, salvage methods shall be implemented to capture and move Ammocoetes to a safe area, in consultation with USFWS.	Program	Lead Agency	USFWS
DS	Delta Smelt			
DS-1: Avoid and minimize effects to species due to the implementation of the SJRRP	a. All in-water work within Delta smelt habitat shall be confined to a seasonal work window of August 1 - November 30 when delta smelt are least likely to be present. Because this species does not regulate its movements strictly within this time frame, modifications to the work windows may be approved by the USFWS prior to project implementation based on information from the various in-Delta monitoring programs. b. Prevention of shading suitable shallow water habitat by the project will be taken, if activities occur within Delta smelt habitat. The project will also avoid areas deemed suitable for Delta smelt habitat that have established	Program	Lead Agency	USFWS DFG

Conservation Measure and Identifier	Description	Program or Project-Level Action	Implementing Agency	Reporting Agency
	aquatic vegetation or have not been previously disturbed.			
RHSNC	Riparian Habitat and Other Sensitive Natural Communities			
RHSNC-1. Avoid and minimize loss of riparian habitat and other sensitive natural communities	a. Biological surveys will be conducted to identify, map, and quantify riparian and other sensitive habitats in potential construction areas. b. Construction activities will be avoided in areas containing sensitive natural communities, as appropriate. c. If effects occur to riparian habitat, emergent wetland, or other sensitive natural communities associated with streams, the State lead agency will comply with Section 1602 of the California Fish and Game Code which may include measures to protect fish and wildlife resources while conducting the project.	Project & Program	Lead Agency	DFG
RHSNC-2: Compensate for loss of riparian habitat and other sensitive natural communities	a. The Riparian Habitat Mitigation and Monitoring Plan for the SJRRP will be developed and implemented in coordination with DFG. Credits for increased acreage or improved ecological function or riparian and wetland habitats resulting from the implementation of SJRRP actions will be applied as compensatory mitigation before additional compensatory measures are required. b. If losses of other sensitive natural communities (e.g., recognized as sensitive by CNDDB, but not protected under other regulations or policies) would not be offset by the benefits of the SJRRP, then additional compensation will be provided through creating, restoring, or preserving in perpetuity in-kind communities at a sufficient ratio for no net loss of habitat function or acreage. The appropriate ratio will be determined in consultation swith USFWS or DFG, depending on agency jurisdiction.	Project & Program	Lead Agency	DFG
WUS	Waters of the United States/waters of the State			
WUS-1. Identify and quantify wetlands and other waters of the United States prior to the implementation of SJRRP actions	a. Prior to SJRRP actions that may affect waters of the United States or waters o the State, Reclamation will map the distribution of wetlands (including vernal pools and other seasonal wetlands) in the Eastside and Mariposa bypasses. b. The Lead Agency will determine, based on the mapped distribution of these wetlands and hydraulic modeling and field observation, the acreage of effects, if any, on waters of the United States. c. If it is determined that vernal pools or other seasonal wetlands will be affected by the SJRRP, the lead agency will conduct a delineation of waters of the United States, and submit the delineation to USACE for verification. The delineation will be conducted according to methods established in the USACE Wetlands Delineation Manual (Environmental Laboratory, 1987) and Arid West Supplement (Environmental Laboratory 2008). d. Construction and modification of road crossings, control structures, fish barriers, fish passages, and other structures will be designed to minimize effects on waters of the United States and waters of the State and will employ best management practices to avoid indirect effects on water quality.	Project & Program	Lead Agency	USACE
WUS-2. Obtain permits and compensate for any loss of	a. The lead agency, in coordination with USACE, will determine the acreage of effects on waters of the United States and waters of the State that will result from implementation of the SJRRP.	Project & Program	Lead Agency	USACE

Conservation Measure and Identifier	Description	Program or Project-Level Action	Implementing Agency	Reporting Agency
wetlands and other waters of the United States/waters of the State	b. The Lead Agency will adhere to a "no net loss" basis of the acreage of wetlands and other waters of the United States and waters of the State that will be removed and/or degraded. Wetland habitat will be restored, enhanced, and/or replaced at an acreage and location and by methods agreeable to USACE and CVRWQCB, as appropriate, depending on agency jurisdiction. c. The Lead Agency will obtain Section 404 and Section 401 permits and comply with all permit terms. The acreage, location, and methods for compensation will be determined during the Section 401 and Section 404 permitting processes. d. The compensation will be consistent with recommendations in the Fish and Wildlife Coordination Act Report.			
INV	Invasive Plants			
INV-1. Implement an invasive vegetation monitoring and management plan for the implementation of the SJRRP	a. Reclamation and the project lead agencies will implement the Invasive Vegetation Monitoring and Management Plan for the SJRRP, which includes measures to monitor, control, and where possible eradicate, invasive plant infestations during flow releases and construction activities. b. The implementation of the Invasive Vegetation Monitoring and Management Plan will include monitoring procedures, thresholds for management responses, success criteria, and adaptive management measures for controlling invasive plant species. c. The control of invasive weeds and other recommended actions in the Invasive Vegetation Monitoring and Management Plan will be consistent with recommendations in the Fish and Wildlife Coordination Act Report.	Project & Program	Lead Agency	Lead Agency
CP	Conservation Plans			
CP-1. Remain consistent with approved conservation plans	a. Facility siting and construction activities will be conducted in a manner consistent with the goals and strategies of adopted Habitat Conservation Plans, Natural Community Conservation Plans, or other approved local, regional, or State habitat conservation plans to the extent feasible. Coordination shall occur with USFWS and/or DFG, as appropriate.	Program	Lead Agency	USFWS DFG
CP-2. Compensate effects consistent with approved conservation plans	a. The lead agency shall compensate effects consistent with applicable conservation plans and implement all applicable measures required by the plan.	Program	Lead Agency	USFWS DFG
GS	Southern Distinct Population Segment of North American green sturgeon			
GS-1. Avoid and minimize loss of habitat and individuals due to the implementation of the SJRRP	a. The SJRRP will be operated in such a way that actions related to the Program in the vicinity of green sturgeon habitat shall be done in accordance with existing operating criteria of the CVP and SWP, and prevailing and relevant laws, regulations, BOs, and court orders in place at the time the action is performed.	Project & Program	Lead Agency	NMFS

Conservation Measure and Identifier	Description	Program or Project-Level Action	Implementing Agency	Reporting Agency
CVS	Central Valley steelhead			
CVS-1. Avoid loss of habitat and risk of take of species due to the implementation of the SJRRP	a. Impacts to habitat conditions (i.e., changes in flows potentially resulting in decreased flows in the Tributaries, increases in temperature, increases in pollutant concentration, change in recirculation/recapture rates and methods, decrease in floodplain connectivity, removal of riparian vegetation, decreased in quality rearing habitat, and similar impacts) must be analyzed in consultation with NMFS. b. Maintain and operate Hills Ferry Barrier to exclude Central Valley steelhead from Restoration Area during construction activities and until suitable habitat conditions are restored. c. Maintenance of conservation measures will be conducted to the extent necessary to ensure that the overall long-term habitat effects of the project are positive. d. Prior to implementation of site-specific actions, the action agency shall conduct an education program for all agency and contracted employees relative to the federally listed species that may be encountered within the Action Area and required practices for their avoidance and protection. A NMFS-appointed representative shall be identified to employees and contractors to ensure that questions regarding avoidance and protection measures are addressed in a timely manner. e. Disturbance of riparian vegetation will be avoided to the greatest extent practicable. f. A spill prevention plan will be prepared describing measures to be taken to minimize the risk of fluids or other materials used during construction (oils, transmission and hydraulic fluids, cement, fuel, and similar materials) from entering the San Joaquin River or contaminating riparian areas adjacent to the river itself. In addition to a spill prevention plan, a cleanup protocol will be developed before construction begins and shall be implemented in case of a spill. g. Stockpiling of materials, including portable equipment, vehicles and supplies, including chemicals, shall be restricted to the designated construction staging areas, exclusive of any riparian and wetland areas. h. A qualified biological monitor will be present during all construction activities including clearing and grubbing and pruning and trimming of vegetation at each job site during construction initiation, midway through construction, and at the close of construction to monitor implementation of conservation measures and water quality. i. The San Joaquin River channel shall be designed to decrease or eliminate predator holding habitat, in coordination with NMFS.	Project & Program	Lead Agency	NMFS
CVS-2. Minimize loss of habitat and risk of take of species from implementation of SJRRP.	a. In-channel construction activities which could affect designated critical habitat for Central Valley steelhead will be limited to the low-flow period between June 1 and October 1 to minimize potential for adversely affecting federally listed anadromous salmonids during their emigration period. b. In-channel construction activities which could affect	Program	Lead Agency	NMFS

Conservation Measure and Identifier	Description	Program or Project-Level Action	Implementing Agency	Reporting Agency
	designated critical habitat for Central Valley steelhead will be limited to daylight hours during weekdays, leaving a nighttime and weekend period of passage for federally listed fish species. c. Construction Best Management Practices (BMPs) for off-channel staging and storage of equipment and vehicles will be implemented to minimize the risk of contamination of the waters of the San Joaquin River by spilled materials. BMPs will also include minimization of erosion and stormwater runoff, as appropriate. d. Riparian vegetation removed or damaged will be replaced at a ratio, coordinated with the Service, within the immediate area of the disturbance to maintain habitat quality. e. If individuals of listed species are observed present within a project area, then NMFS must be notified. NMFS personnel shall have access to construction sites during construction and following completion in order to evaluate species presence and condition and/or habitat conditions. f. If bank stabilization activities should be necessary, then such stabilization shall be constructed to minimize predator habitat, minimize erosion potential, and contain material suitable for supporting riparian vegetation.			
WRCS	Sacramento Valley winter-run Chinook salmon			
WRCS-1. Avoid and minimize loss of habitat and individuals due to the implementation of the SJRRP	a. The Program will be operated in such a way that actions related to the SJRRP in the vicinity of winter-run Chinook salmon habitat shall be done in accordance with existing operating criteria of the CVP and SWP, and prevailing and relevant laws, regulations, BOs, and court orders in place at the time the action is performed.	Project & Program	Lead Agency	NMFS DFG
SRCS	Central Valley spring-run Chinook salmon			
SRCS-1. Avoid and minimize loss of habitat and individuals due to the implementation of the SJRRP	a. The SJRRP will be operated in such a way that actions in the vicinity of spring-run Chinook salmon habitat shall be done in accordance with existing operating criteria of the CVP and SWP, and prevailing and relevant laws, regulations, BOs, and court orders in place at the time the action is performed. b. SJRRP actions shall be performed in accordance with the Experimental Population 4(d) rule as it is developed and where applicable.	Project & Program	Lead Agency	NMFS DFG
EFH	Essential Fish Habitat (Pacific salmonids & starry flounder)			
EFH-1. Avoid loss of habitat and risk of take of species due to the implementation of the SJRRP	a. Impacts to habitat conditions (i.e., changes in flows potentially resulting in decreased flows in the Tributaries, increases in temperature, increases in pollutant concentration, change in recirculation/recapture rates and methods, decrease in floodplain connectivity, removal of riparian vegetation, decreased in quality rearing habitat, and similar impacts) must be analyzed in consultation with NMFS. b. Maintain and operate Hills Ferry Barrier to exclude Pacific salmonids from Restoration Area during construction activities and until suitable habitat conditions are restored.	Project & Program	Lead Agency	NMFS

Conservation Measure and Identifier	Description	Program or Project-Level Action	Implementing Agency	Reporting Agency
	c. Maintenance of conservation measures will be conducted to the extent necessary to ensure that the overall long-term habitat effects of the project are positive. d. Prior to implementation of site-specific actions, the action agency shall conduct an education program for all agency and contracted employees relative to the federally listed species that may be encountered within the Action Area and required practices for their avoidance and protection. A NMFS-appointed representative shall be identified to employees and contractors to ensure that questions regarding avoidance and protection measures are addressed in a timely manner. e. Disturbance of riparian vegetation will be avoided to the greatest extent practicable. f. A spill prevention plan will be prepared describing measures to be taken to minimize the risk of fluids or other materials used during construction (oils, transmission and hydraulic fluids, cement, fuel, and similar materials) from entering the San Joaquin River or contaminating riparian areas adjacent to the river itself. In addition to a spill prevention plan, a cleanup protocol will be developed before construction begins and shall be implemented in case of a spill. g. Stockpiling of materials, including portable equipment, vehicles and supplies, including chemicals, shall be restricted to the designated construction staging areas, exclusive of any riparian and wetland areas. h. A qualified biological monitor will be present during all construction activities including clearing and grubbing and pruning and trimming of vegetation at each job site during construction initiation, midway through construction, and at the close of construction to monitor implementation of conservation measures and water quality. i. The bottom topography of the San Joaquin River channel will be designed to decrease or eliminate predator holding habitat.			
EFH-2. Minimize loss of habitat and risk of take from implementation of SJRRP construction activities	a. In-channel construction activities which could affect habitat for will be limited to the low-flow period between June 1 and October 1 to minimize potential for adversely affecting federally listed anadromous salmonids during their emigration period. b. In-channel construction activities which could affect habitat for starry flounder and Pacific salmonids will be limited to daylight hours during weekdays, leaving a nighttime and weekend period of passage for federally listed fish species. c. Construction Best Management Practices (BMPs) for off-channel staging and storage of equipment and vehicles will be implemented to minimize the risk of contamination of the waters of the San Joaquin River by spilled materials. BMPs will also include minimization of erosion and stormwater runoff, as appropriate. d. Riparian vegetation removed or damaged will be replaced at a ratio, coordinated with the Service, within the immediate area of the disturbance to maintain habitat quality.	Program	Lead Agency	NMFS

Conservation Measure and Identifier	Description	Program or Project-Level Action	Implementing Agency	Reporting Agency
	e. If individuals of listed species are observed present within a project area, then NMFS must be notified. NMFS personnel shall have access to construction sites during construction and following completion in order to evaluate species presence and condition and/or habitat conditions. f. If bank stabilization activities should be necessary, then such stabilization shall be constructed to minimize predator habitat, minimize erosion potential, and contain material suitable for supporting riparian vegetation.			
	References: CNPS. See California Native Plant Society. California Department of Fish and Game. 2003. Eastside Bypass Monitoring Report for Delta Button-Celery (Eryngium racemosum) 2001–2003. Prepared by San Joaquin District, Environmental Services Section. Fresno, California. California Native Plant Society. 1998. Mitigation guidelines regarding impacts to rare, threatened, and endangered plants. California Native Plant Society Scientific Advisory Committee. Prepared February 1991, revised April 1998. Available: http://www.cnps.org/cnps/archive/mitigation.pdf> Accessed: August 24, 2008. DFG. See California Department of Fish and Game. U.S. Fish and Wildlife Service. 2010 (April). Best Management Practices to Minimize Adverse Effects to Pacific Lamprey (Entosphenus tridentatus). U.S. Fish and Wildlife Service. 1999a. Conservation Guidelines for the Valley Elderberry Longhorn Beetle. Sacramento Fish and Wildlife Office, Sacramento, California. U.S. Fish and Wildlife Service. 2009 (March 25). Blunt-nosed Leopard Lizard Survey Protocols for the San Joaquin River Restoration Program: Including WY 2010 Interim Flow, Interim Flows, and Restoration Flows. Memo to U.S. Bureau of Reclamation from U.S. Fish and Wildlife Service, Sacramento Fish and Wildlife Field Office. USFWS. See U.S. Fish and Wildlife Service.			