M&T CHICO RANCH/LLANO SECO RANCHO PUMPING PLANT MAINTENANCE OF CHANNEL ALIGNMENT RIVER MILE 192.5

ACTION SPECIFIC IMPLEMENTATION PLAN

Prepared for:
United States Fish and Wildlife Service
and
M&T Chico Ranch/Llano Seco Rancho
3964 Chico River Road
Chico, CA 95928

Prepared by:

HDR | SWRI Surface Water Resources, Inc.
1610 Arden Way, Suite 175
Sacramento, CA 95815

June 2007

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LIST OF ACRONYMS AND ABBREVIATED TERMS

APCDs	Air Pollution Control Districts
AQMDs	Air Quality Management Districts
ASIP	Action Specific Implementation Plan
BMP	Best Management Practices
CARB	California Air Resources Board
CBDA	California Bay-Delta Authority
CCAA	California Clean Air Act
CDFG	California Department of Fish and Game
CEQA	California Environmental Quality Act
CESA	California Endangered Species Act
cfs	cubic feet per second
CNDDB	California Natural Diversity Database
CR	County Road
dB	Decibels
DPS	Distinct Population Segment
DRA	Department of Water Resources
EA/IS	Environmental Assessment/Initial Study
EIR	Environmental Impact Report
EFH	Essential Fish Habitat
FCAA	Federal Clean Air Act
FESA	Federal Endangered Species Act
FMP	Fish Management Plan
GCAPCD	Glenn County Air Pollution Control District
GGS	Giant Garter Snake
HTRW	Hazardous, Toxic, and Radiological Waste
IWM	Instream Woody Material
MBTA	Migratory Bird Treaty Act
MEI	Mussetter Engineering, Inc.
MSCS	Multi-Species Conservation Strategy
NAAQS	National Ambient Air Quality Standards
NCCPA	Natural Community Conservation Planning Act
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanographic and Atmospheric Association
NOx	Oxides of Nitrogen
NPDES	National Pollution Discharge Elimination System
NRHP	National Register of Historic Places
NSVAB	Northern Sacramento Valley Air Basin
NTU	Nephelometric Turbidity Unit
PEIS	Programmatic Environmental Impact Statement
RM	River Mile
ROG	Reactive Organic Gases
RWQCB	Regional Water Quality Control Board
SR	State Route
SRA	Shaded Riverine Aquatic

SRBPP	Sacramento River Bank Protection Project
SWPPP	Storm Water Pollution Prevention Plan
TAC	Technical Advisory Committee
TDS	Total Dissolved Solids
TSS	Total Suspended Solids
USACE	U.S. Army Corps of Engineers
USFWS	United States Fish and Wildlife Service
USGS	U.S. Geological Survey
VELB	Valley Elderberry Longhorn Beetle
WPCP	Water Pollution Control Plant
WWTP	City of Chico Wastewater Treatment Plant

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1.0 INTRODUCTION

The CALFED Bay-Delta Program is a collaborative effort of 23 federal and state agencies that seek to resolve water supply conflicts. The CALFED Bay-Delta Program Programmatic Record of Decision (ROD) set forth a collaborative means for addressing the environmental effects (adverse and beneficial) of CALFED Program actions related to improving water supply reliability and recovery/restoration of the Sacramento-San Joaquin Delta (Delta) environment and species dependent on the Delta. The ROD reflects a final selection of a long-term plan (Preferred Program Alternative), which includes specific actions, to fix the Bay-Delta, describes a strategy for implementing the plan, and identifies complementary actions that CALFED Agencies also will pursue. The Preferred Program Alternative consists of a set of broadly described programmatic actions, which set the long-term, overall direction of the 30-year CALFED Program. The Preferred Program Alternative includes: (1) the Levee System Integrity Program; (2) Water Quality Program; (3) Ecosystem Restoration Program (ERP); (4) Water Use Efficiency Program; (5) Water Transfer Program; (6) Watershed Program; and (7) Storage and Conveyance.

Of particular interest for this document is the ERP, which identifies programmatic actions designed to restore, rehabilitate, or maintain important ecological processes, habitats, and species within 14 ecological management zones, including the Sacramento River. Modifying or eliminating fish passage barriers, including the removal of some dams, construction of fish ladders, and construction of fish screens that use the best available technology, is one of the programmatic actions listed as part of the ERP. The Proposed Action would remove sediment in order to increase sweeping velocities across the intake screens (parallel to screen); rendering the fish screens in compliance with the National Oceanographic and Atmospheric Administration, National Marine Fisheries Service (NMFS) and the California Department of Fish and Game (CDFG) fish screen criteria. Fluvial geomorphic and hydrologic processes (over-bank flows, deposition, erosion) which cause main channel lateral migration and reworking of the floodplain create and sustain riparian floodplain vegetation and habitats. Hence, the Proposed Action would be vital in achieving the goal of the ERP, which is to improve aquatic and terrestrial habitats and natural processes to support stable, self-sustaining populations of diverse and valuable plant and animal species through an adaptive management process.

The Multi-Species Conservation Strategy (MSCS) is an appendix of the CALFED Bay-Delta Program Programmatic Environmental Impact Statement/Environmental Impact Report (PEIS/EIR). One of the goals of the CALFED Program MSCS is to explain how CALFED Program actions will comply with the federal Endangered Species Act (ESA), California Endangered Species Act (CESA) and the California Natural Community Conservation Planning Act (NCCPA) requirements. The MSCS presents a program-level environmental analysis of the CALFED Preferred Program Alternative that expands upon the PEIS/EIR analysis to address the conservation strategy and certain other issues pertinent to ESA and NCCPA compliance. The U.S. Fish and Wildlife Service (USFWS) and NMFS used the MSCS as the program-level biological assessment to develop the programmatic Biological Opinions for the CALFED

Preferred Program Alternative. CDFG used the MSCS for compliance with the CESA and NCCPA.

The MSCS created a two-tiered approach to ESA and NCCPA compliance that corresponds to CALFED Program's two-tiered approach to compliance with the National Environmental Policy Act (NEPA) and the California Environmental Quality Act (CEQA). The first tier of compliance is embodied in the MSCS itself. To complement the second-tier project level environmental review of CALFED actions that is anticipated in the PEIS/EIR, the MSCS identifies a process for development of Action Specific Implementation Plans (ASIPs) to be prepared for each CALFED action or groups of actions as they are proposed for implementation. The ASIP is developed to address the ESA, CESA, and NCCPA consultation requirements of federal and state agencies. As a second tier document, this ASIP focuses on issues specific to the Proposed Action. This ASIP, therefore, addresses the biological assessment requirements related to construction of the Proposed Action described in Chapter 2. NMFS will use this ASIP to develop action-specific Biological Opinion relative to the Proposed Action, and address compliance with the ESA. USFWS also will use this ASIP to address compliance with the ESA. CDFG will use this ASIP to address compliance with CESA and the NCCPA.

1.1 PURPOSE OF THE ACTION SPECIFIC IMPLEMENTATION PLAN

This ASIP has been prepared to conform to CALFED requirements regarding threatened, endangered and covered species and consultation with federal and state regulatory agencies. The Proposed Action received funding assistance from California Bay-Delta Authority (CBDA) through the CALFED Ecosystem Restoration Program Plan (CALFED 1999). Funds also are being secured from the State of California's Proposition 204 (1996).

1.2 BACKGROUND

As part of a major effort to reduce the risk of mortality to native salmonids in Big Chico and Butte creeks, the M&T Chico Ranch/Llano Seco Rancho fish screen and pumping facility was relocated to the Sacramento River in 1997. The relocated diversion was designed with a state-of-art fish screen system supplying a total capacity of 150 cubic feet per second (cfs). As part of the relocation arrangement, the M&T Chico Ranch/Llano Seco Rancho agreed not to divert 40 cfs of their long held water right out of Butte Creek (October 1 through June 30), as long as replacement water would be guaranteed from the Central Valley Project at the new diversion located on the Sacramento River.

The M&T Chico Ranch/Llano Seco Rancho pumping facility is located downstream of the confluence of Big Chico Creek and the Sacramento River, on the east bank of the Sacramento River just south of the Bidwell-Sacramento River State Park, (RM 192.5) about 6 miles southwest of the City of Chico (**Figure 1-1, Figure 1-2, and Figure 1-3**). About 300 feet downstream from the M&T Chico Ranch/Llano Seco Rancho pumping facility is the outfall for the City of Chico wastewater treatment plant (WWTP). The M&T Chico Ranch/Llano Seco Rancho pumping facility provides a reliable water supply to about 15,000 acres of farmland and refuge land, including over 4,000-acres of wetlands owned or managed by USFWS and the CDFG that provides key wetland habitat for waterfowl and other wetland species. Accordingly, USFWS and CDFG have a vested interest in maintaining the viability of the M&T Chico Ranch/Llano Seco Rancho pumping facility.

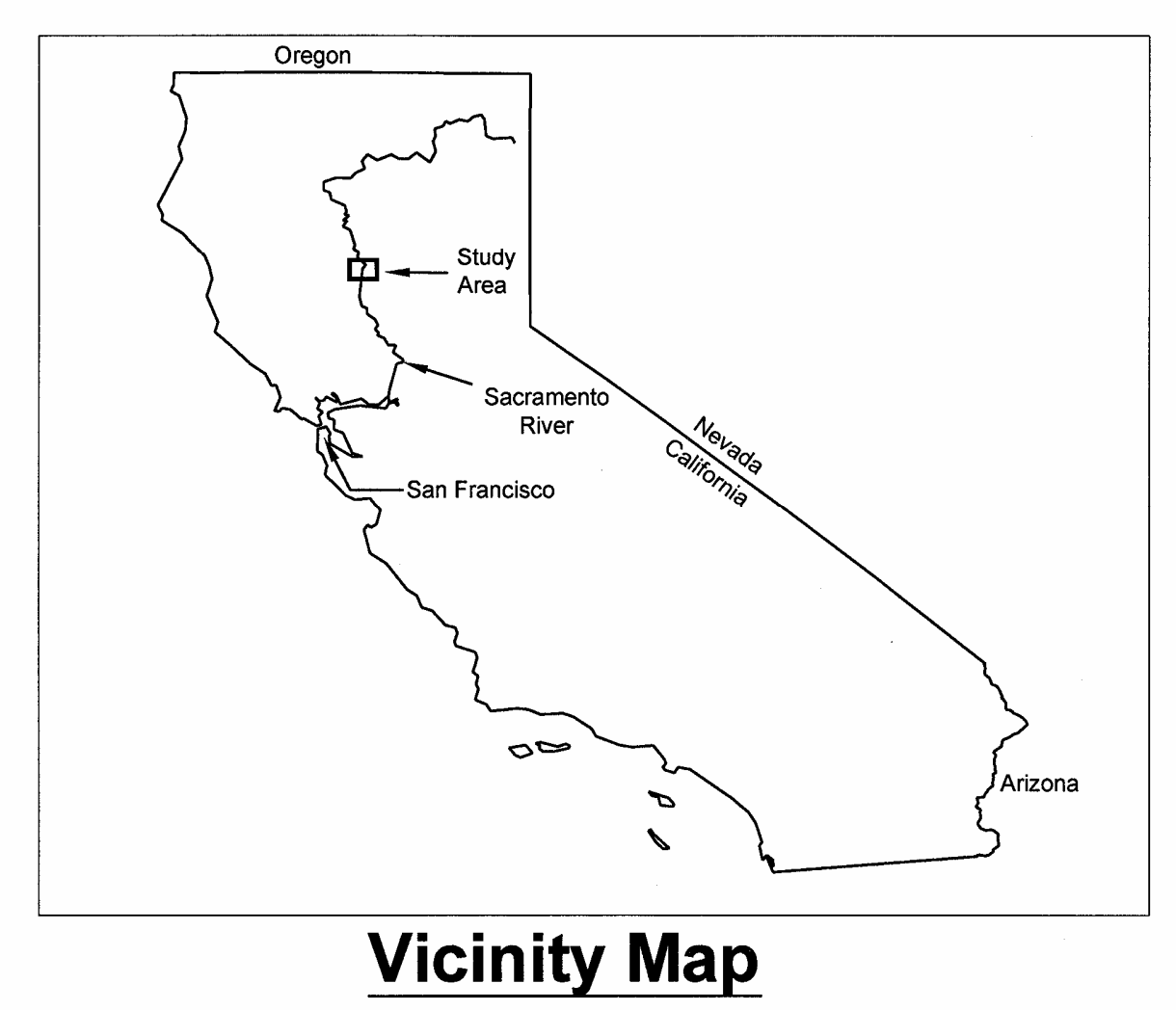

Figure 1-1 Regional Location Map

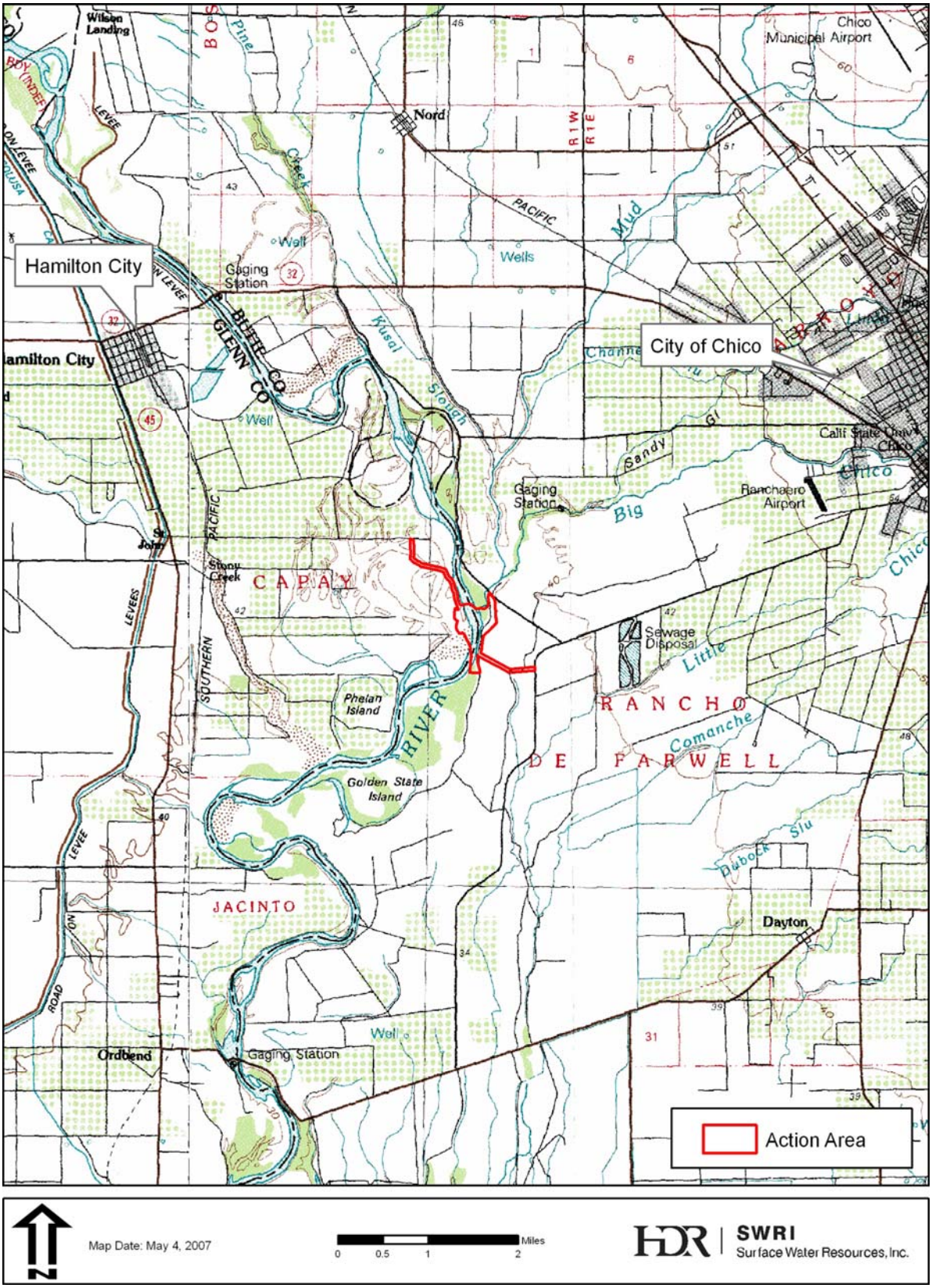

Figure 1-2 Vicinity Map

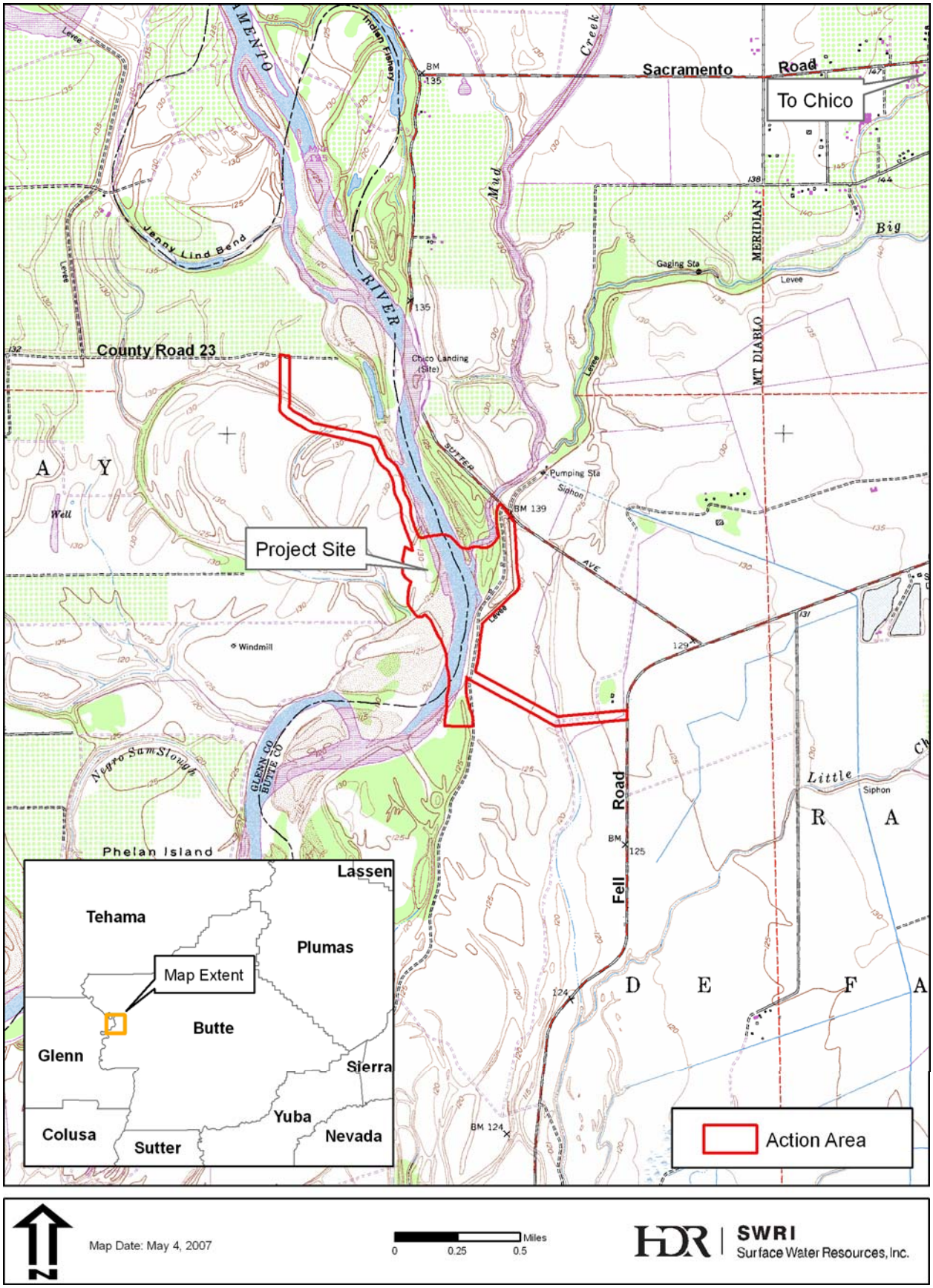

Figure 1-3 Location Map

Sediment deposition has posed a threat to the normal operation of the new fish screened diversion and the City of Chico WWTP outfall. An encroaching gravel bar adjacent to the Bidwell-Sacramento River State Park is migrating toward the vicinity of the diversion and WWTP outfall at an unpredictable rate. The rate at which the sediment is accumulating near the fish screened intake is mostly dependant on flow conditions in the Sacramento River because the gravel bar growth and rate of migration is accelerated during wet years. Additionally, due to river morphologic changes, the river is meandering away from the pumping facility and the WWTP outfall, isolating the facilities from the Sacramento River. As a result of continued sediment deposition and river meander, the intake screens and WWTP outfall diffusers would potentially be buried by sands and gravel, and no longer receive sufficient sweeping flows, rendering the facilities incompliant with the NMFS and the CDFG fish screen criteria of at least two times the allowable approach velocity. Continued operation of an incompliant facility could result in an impact to anadromous fish in the Sacramento River and Big Chico Creek; thereby potentially curtailing pumping and water delivery. As a result, competing uses would arise from the need to protect ecosystem functions, the natural processes of the river and anadromous fish species, and the need to preserve operations of the pumping facility to provide water to agricultural and refuge lands and the WWTP outfall.

1.3 OBJECTIVES OF THE PROPOSED ACTION

Specific objectives of the Proposed Action include:

- Reduce the risk of mortality to native anadromous salmonids in Butte and Big Chico creeks and the Sacramento River
- Removal of sediment resulting in increasing sweeping velocities across the intake screens, which would keep the fish screens in compliance with NMFS and the CDFG fish screen criteria.
- Removal of the unpredictable encroaching gravel bar that is migrating toward the vicinity of the diversion and WWTP outfall at Bidwell-Sacramento River State Park.
- Stabilize the meandering river, which moves 20 to 60 feet per year, to sustain the functionality of the existing pumping and the WWTP outfall.
- Retain downstream movement of point bars.
- Implement measures to maintain viability of the M&T Chico Ranch/Llano Seco Rancho pumping facilities reliable water supply, which sustains approximately 15,000 acres of farmland, refuge land, and wildlife management areas including over 4,000 acres of wetlands owned or managed by the USFWS and CDFG.

1.4 IMPLEMENTING ENTITIES

The M&T Chico Ranch/Llano Seco Rancho pumping facility provides a reliable water supply to approximately 15,000 acres of farmland and refuge land, including over 4,000 acres of wetlands owned or managed by USFWS and the CDFG. The Proposed Action Area is within the Sacramento River Conservation Area (SRCA), also called the SB1086 Program. The SCRA currently is administered by the Sacramento River Conservation Area Forum (SRCAF). However, the SRCAF has no legal authority to manage the lands within the Proposed Action

Area. A portion of the study area is within the Capay Unit of the Sacramento River National Wildlife Refuge, which is owned and operated by USFWS and the California Department of Parks and recreation (California State Parks). Additionally, a portion of the Proposed Action Area is located on the Bidwell-Sacramento River State Park, which is owned and operated by California State Parks.

Because the proposed actions evaluated in this document would occur on federal property, would be fully or partially funded by Federal agencies, and would require federal permits and approvals, environmental documentation under NEPA is required. Compliance with CEQA also is required because: (1) the Proposed Action was funded by the CBDA; and (2) the Proposed Action requires permitting approval from several state agencies including CDFG.

1.5 ACTION SPECIFIC IMPLEMENTATION PLAN CONTENTS

To fulfill the requirements of ESA Section 7 and California Fish and Game Code Sections 2835 and 2081, as applicable, the ASIP must adhere to the following outline (CALFED 2000c):

- A detailed description of the Proposed Action (Chapter 2).
- A discussion of alternative actions considered that would not result in take, and the reasons why such alternatives are not being utilized (Chapter 2).
- The additional measures USFWS, NMFS and CDFG may require as necessary or appropriate for compliance with ESA, CESA and NCCPA, and a description of how and to what extent the Proposed Action will help the CALFED Program to achieve the MSCS' goals for the affected species (Chapters 2 and 4).
- The conservation measures the Action Agencies will undertake to minimize adverse effects to species (Chapters 2 and 4).
- The list of covered species and any other special-status species that occur in the Proposed Action Area (Chapter 1 and Chapter 3).
- A discussion of essential fish habitat (EFH) (Chapter 1, 3 and 4).
- The analyses identifying the direct, indirect and cumulative impacts on the covered species, other special-status species occurring in the Proposed Action Area (along with an analysis of effects on any designated critical habitat) likely to result from the Proposed Action, as well as actions related to, and dependent on the Proposed Action (Chapters 4 and 5).
- A plan to monitor the effects and the implementation and effectiveness of these measures (Chapter 6).
- The funding that will be made available to undertake the measures (Chapter 6).
- A list of those persons making substantial contributions to the preparation of this document (Chapter 7).

The ASIP has been developed to be consistent with the species goals, prescriptions, and conservation measures in the MSCS for covered species affected by the Proposed Action. Conservation measures developed for the MSCS have been reviewed for use in minimizing or eliminating the effects of Proposed Action measures. The ASIP includes additional conservation

measures to address actions not considered in the MSCS relative to Proposed Action construction and implementation.

1.6 ASIP PROCESS

The relationship of the ESA, CESA and NCCPA is illustrated on **Figure 1-4**. Because neither the programmatic Biological Opinions nor the programmatic NCCPA determination for the CALFED Program authorized incidental take of MSCS covered species, individual consultation documents, or ASIPs, are required for each project. Take authorization for entities implementing CALFED Program actions will follow a simplified compliance process that tiers from the MSCS and programmatic determinations. Entities implementing actions that may affect covered species are required to prepare an ASIP for each action or group of actions. The ASIP will be based on and tier from the data, information, analyses, and conservation measures in the MSCS. The implementing entity will coordinate development of the ASIP with USFWS, NMFS, and CDFG to ensure that the ASIP incorporates appropriate conservation measures for the proposed CALFED Program action(s), consistent with the MSCS.

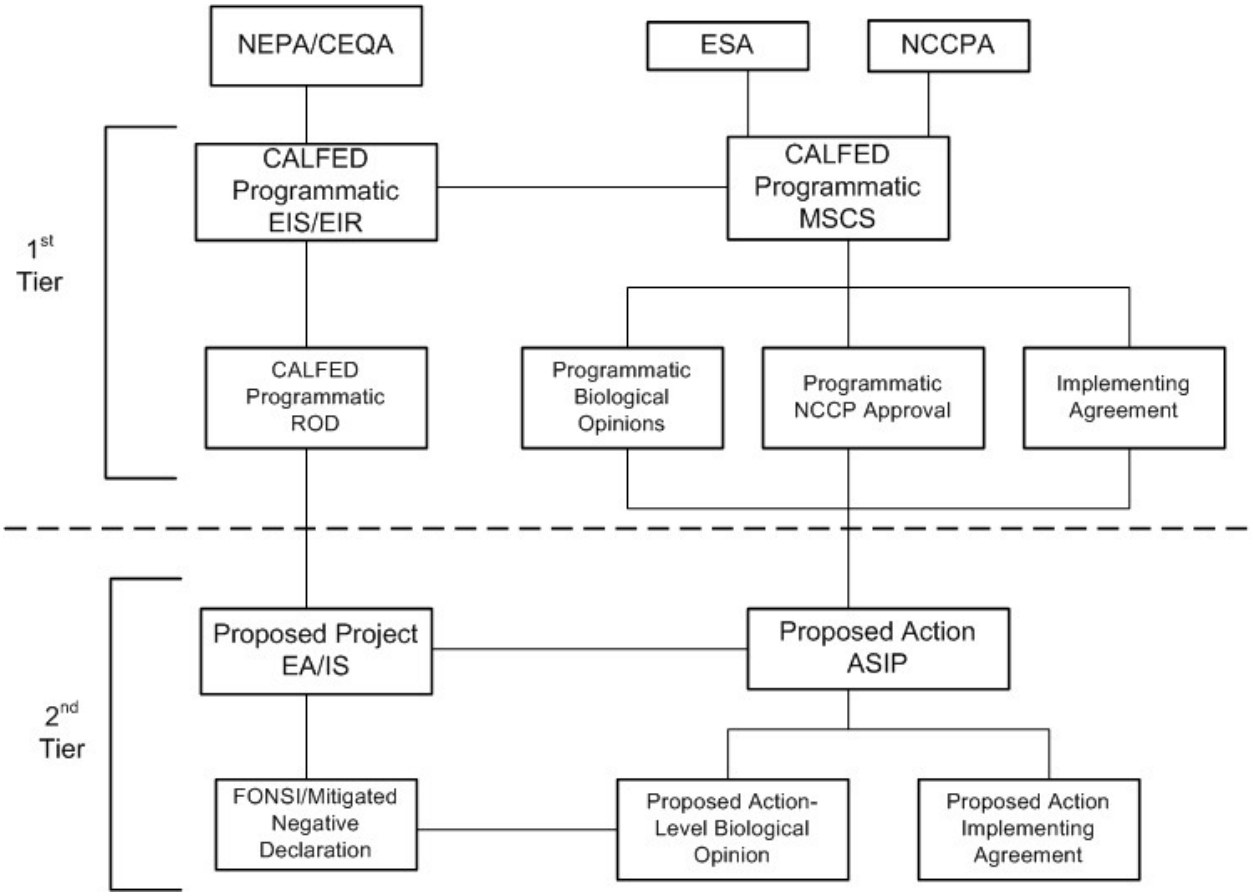

Figure 1-4. Relationships of CALFED Programmatic and the Proposed Action Compliance with NEPA/CEQA and ESA

1.6.1 Current Management Direction

The Proposed Action and ASIP have been developed against a backdrop of existing and ongoing Federal, State, and local efforts intended to conserve covered and other sensitive species within

the Proposed Action Area. Implementation of the Proposed Action would be consistent with existing wildlife protection and recovery programs.

Consultation with USFWS, NMFS, and CDFG regarding effects of the Proposed Action on special-status species is based on the ESA policy for each agency and existing biological opinions (BOs) and NCCPA guidance. The opinions and guidance documents used to support the development of the Proposed Action ASIP are listed below:

- The November 26, 1996, Recovery Plan for the Sacramento/San Joaquin Delta Native Fishes.
- The March 11, 1997, USFWS Formal Programmatic Consultation Permitting Projects with Relatively Small Effects on the Valley Elderberry Longhorn Beetle within the Jurisdiction of the Sacramento Field Office.
- The August 1997 NMFS Proposed Recovery Plan for the Sacramento River Winter-Run Chinook Salmon.
- The July 2000 CALFED Programmatic EIS/EIR.
- The July 2000 CALFED MSCS.
- The August 28, 2000, Programmatic Endangered Species Act Section 7 Biological Opinion on the CALFED Bay-Delta Program, USFWS.
- The August 28, 2000, Programmatic Endangered Species Act Section 7 Biological Opinion on the CALFED Bay-Delta Program, NMFS.
- The August 28, 2000, CDFG's NCCPA Approval of the CALFED Bay-Delta Program MSCS.

1.6.2 Consultation, Pre-Consultation, and Coordination to Date

Issues pertaining to the development of the ASIP and other ESA-compliance issues were discussed throughout multiple Steering Committee meetings, which included representatives from CALFED, USFWS, NMFS, the Department of Water Resources and CDFG.

- *November 12, 2003* – The Steering Committee met for a site visit and discussed the next steps.
- *November 13, 2003* – The Steering Committee discussed project hypothesis, conceptual model, project goals, reviewed existing conditions and existing studies, preliminary performance measures and conflicts or uncertainties associated with simultaneously protecting river meander, pumping plant capacity and fish protection.
- *November 14, 2003* - The Steering Committee met to discuss project alternatives developed for current pumping plant installation, project deliverables and timelines, and the process for Steering Committee interaction and reporting.
- *March 17, 2004* - The Steering Committee met for an information workshop and continued discussion on Proposed Action.
- *March 18, 2004* - The Steering Committee reviewed steering committee charge, questions to be addressed, goals and objectives, hypothesis testing and technical review.

The Steering Committee also tested the technical reviews with the hypotheses and conceptual models.

- *March 19, 2004* - The Steering Committee prioritized major findings, conclusions, and recommendations; discussed the next steps; and set a date and made an agenda to reconvene.
- *February 16, 2005* - The Steering Committee met at the Proposed Action site to evaluate gravel bar movement. A discussion of alternatives followed and included: (1) City of Chico Wastewater Treatment Plant Outfall alternatives; (2) Off-Stream and In-Stream alternatives; (3) Groundwater alternatives (long-term solution); (4) Potential River Training Works at M&T Pumping Plant ; and (5) Installation of Rock Groins (long-term solution).
- *February 17, 2005* - The Steering Committee discussed challenges, uncertainties and risks involved with long-term solution alternatives. The Steering Committee had a collaborative study evaluation of the action alternatives.
- *February 18, 2005* - The Steering Committee discussed the major findings, conclusions and preliminary recommendations from the collaborative study evaluation of action alternatives.
- *April 24, 2006* - The Steering Committee met for a project and technical review update followed by presentations of refined alternatives that included: (1) evaluation of potential river training works at M&T pumping plant; (2) evaluation of river training works within decision matrix with two-dimension modeling; (3) evaluation of Ranney collectors within decision matrix; (4) evaluation of dredging and fish screen within decision matrix.
- *April 25, 2006* – The Steering Committee met to select the preferred alternative, develop the preferred alternative conceptual model framework, and develop the proposal framework.
- *November 30, 2006* – The Steering Committee met to discuss the current engineering survey results, possible scenarios for moving the project ahead, and gravel bar removal. The meeting ended with a consensus to pursue the action.
- *February 09, 2007* – The Steering Committee met to discuss changes to the Proposed Action construction dates, permits needed, environmental documentation, and possible mitigation.
- *May 02, 2007* –USFWS provided direction regarding magnitude of potential terrestrial effects.

1.6.3 Compliance with Federal Endangered Species Act

USFWS and NMFS share responsibility for administering ESA compliance. NMFS has primary responsibility for implementing ESA with respect to marine fishes and mammals, including migratory or anadromous fish species such as salmon and steelhead. USFWS has primary responsibility for other species.

The purpose of the ESA Section 7(a)(2) consultation requirement is to ensure that any action authorized, funded, or carried out by a federal agency is not likely to jeopardize the continued existence of any covered species or result in the destruction or adverse modification of critical

habitat. Typically, a biological assessment is prepared to analyze the effects on listed and proposed species and designated and proposed critical habitat in order to comply with ESA. This ASIP is intended to act as a biological assessment and fulfill the requirements of the Proposed Action pursuant to the ESA, as amended.

1.6.4 Compliance with California Endangered Species Act and the Natural Community Conservation Planning Act

The CESA (Fish and Game Code Sections 2050 to 2097) is similar to the federal ESA. California's Fish and Game Commission is responsible for maintaining lists of threatened and endangered species under the CESA. CESA prohibits the "take" of listed and candidate (petitioned to be listed) species. "Take" under California law means to "hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch capture, or kill" (California Fish and Game Code, section 86). Because CDFG may authorize incidental take of listed species pursuant to a CDFG-approved NCCP, the involved resource agencies will not require a separate incidental take permit pursuant to CESA for ASIP-covered species if the Proposed Action adheres to MSCS goals and CDFG's NCCP Approval.

The NCCPA, California Fish and Game Code, Section 2800, et seq., was enacted to form a basis for broad-based planning to provide for effective protection and conservation of the State's wildlife heritage, while continuing to allow appropriate development and growth. State of California NCCP General Process Guidelines define an NCCP as "…A plan for the conservation of natural communities that takes an ecosystem approach and encourages cooperation between private and governmental interests." The plan identifies and provides for the regional or area-wide protection and perpetuation of plants, animals, and their habitats, while allowing compatible land use and economic activity. An NCCP seeks to anticipate and prevent the controversies caused by species' listings by focusing on the long-term stability of natural communities". The purpose of natural community conservation planning is to sustain and restore those species and their habitat identified by CDFG that are necessary to maintain the continued viability of biological communities impacted by human changes to the landscape. An NCCP identifies and provides for those measures necessary to conserve and manage natural biological diversity within the plan area while allowing compatible use of the land. CDFG may authorize the take of any identified species, including listed and non-listed species, pursuant to Section 2835 of the NCCPA, if the conservation and management of such species is provided for in an NCCP approved by CDFG.

1.6.5 Compliance with Magnuson-Stevens Fishery Conservation and Management Act

The Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA), as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267), established procedures designated to identify, conserve and enhance EFH. Federal agencies are required to consult with NMFS on all actions that may adversely affect EFH (MSFCMA Section 305 [b][2]). The EFH mandate applies to all species managed under a federal Fishery Management Plan (FMP). In California, there are three FMPs covering Pacific salmon, coastal pelagic species and groundfish. Because of the limited Proposed Action Area of the Proposed Action, the Pacific salmon FMP will be the only FMP covered in this ASIP. NMFS, under section 305(b)(1) of the MSFCMA, is required to provide EFH conservation and enhancement recommendations to federal and state agencies for actions that adversely affect EFH.

The objective of an EFH assessment is to determine whether the proposed actions *"may adversely affect"* designated EFH for relevant commercially, federally managed fisheries species within the Proposed Action Area. It also describes conservation measures proposed to avoid, minimize or otherwise offset potential adverse effects to designated EFH resulting from the Proposed Action.

This ASIP will meet the compliance requirements that have been identified for consulting with NMFS on effects to EFH, as outlined in the MSFCMA.

1.7 RELATIONSHIP TO CALFED PROGRAM AND CALFED DOCUMENTS

Several documents establish the CALFED Program's compliance with the ESA, CESA, and NCCPA: (1) The MSCS; (2) the USFWS' Programmatic Biological Opinion; (3) the NMFS' Programmatic Biological Opinion; (4) the Programmatic NCCP Determination; and (5) the Conservation Agreement Regarding the CALFED Bay-Delta Program MSCS Conservation Agreement. These documents are briefly described below.

- The MSCS is a technical appendix to the Programmatic EIS/EIR that explains how the CALFED Program will meet the requirements of the ESA, CESA, and the NCCPA. The Proposed Action EA/IS and ASIP stand alone and include independently developed analyses of potential impacts of the Proposed Action and avoidance, minimization, and compensation measures to mitigate those potential impacts. The MSCS was used in this ASIP only to provide guidance for developing mitigation for the impacts of the Proposed Action on ASIP-covered species and natural communities. The MSCS served as the CALFED Programmatic Biological Assessment under Section 7 of the ESA. The MSCS conservation measures include measures to avoid, minimize, and compensate for the impacts of the CALFED Program project actions. A compensation conservation measure is a type of mitigation measure that replaces an affected resource value.
- The USFWS Programmatic Biological Opinion covers 90 ESA-listed, proposed, and candidate species that were evaluated in the MSCS.
- The NMFS Programmatic Biological Opinion covers four ESA-listed species that were evaluated in the MSCS.
- The Programmatic NCCP Determination covers 79 species, including 25 species covered under the programmatic biological opinions that were evaluated in the MSCS.
- The Conservation Agreement is an agreement entered into by the CALFED agencies that ensures that the MSCS will be implemented in a manner consistent with the statutory authority of each signatory agency. The Conservation Agreement includes a commitment that a CALFED project proponent and lead agencies (if different from the project proponent) will prepare an ASIP if the project could affect species covered under the programmatic biological opinions or NCCP Determination.

Mitigation measures presented in this ASIP are consistent with the following programmatic conservation measures in the MSCS:

- Measures necessary to meet the requirements of the programmatic biological opinion;

- Conservation measures to avoid, minimize, and compensate for impacts on ASIP-covered species; and
- Conservation measures to enhance ASIP-covered species.

1.8 SPECIES ADDRESSED IN THIS ACTION SPECIFIC IMPLEMENTATION PLAN

To comply with the requirements of the California ESA, Federal ESA, and NCCPA, special-status species have been identified for evaluation in this ASIP. Species were selected according to the following criteria:

- MSCS-covered species identified in the programmatic biological opinions and NCCP approval for the CALFED Program;
- Listed as threatened or endangered under either the California or Federal ESAs;
- Proposed for listing; are candidates for listing; have been identified to have associated EFH by NMFS;
- Plants listed as rare under the California Native Plant Protection Act;
- California species of special concern;
- Plants included on California Native Plant Society (CNPS) List 1A, 1B, 2, or 3; or are native species of concern under the CALFED Program;
- Special-status species determined by California Natural Diversity Database (CNDDB); and
- Field surveys completed by qualified biologists

1.8.1 Species Considered For Inclusion in the Action Specific Implementation Plan

Table 1-1 lists all the species that have the potential of inhabiting in the Proposed Action Area.

Table 1-1. Species considered for inclusion in the ASIP

Multi-Species Conservation Strategy Evaluated Species	Legal Status[1]		
	Federal	State	Other
PLANTS			
Fox Sedge (*Carex vulpinoidea*)	–	–	CNPS List 2
Columbian Watermeal (*Wolffia brasiliensis*)	–	–	CNPS List 2
Four Angled Spikerush (*Eleocharis quadrangulata*)	–	–	CNPS List 2
Rose-Mallow (*Hibiscus lasiocarpus*)	–	–	CNPS List 2
Ferris's Milk-Vetch (*Astragalus tener ferrisiae*)	–	–	CNPS List 1B
INVERTEBRATES			
Valley Elderberry Longhorn Beetle (*Desmocerus californicus dimorphus*)	T	–	USFS: Sensitive
Antioch Dunes Anthicid Beetle (*Anthicus antiochensis*)	–	–	–
Sacramento Anthicid Beetle (*Anthicus sacramento*)	–	–	–
FISH			
Central Valley Spring-Run Chinook Salmon (*Oncorhynchus tshawytscha*)	T	T	Magnuson Stevens Act
Central Valley Spring-Run Chinook Salmon Critical Habitat *(Oncorhynchus tshawytscha)*	X	–	
Central Valley Steelhead *(Oncorhynchus mykiss)*	T	–	–
Central Valley Steelhead Critical Habitat *(Oncorhynchus mykiss)*	X	–	–
Sacramento River Winter-Run Chinook Salmon *(Oncorhynchus tshawytscha)*	E	E	Magnuson Stevens Act
Sacramento River Winter-Run Chinook Salmon Critical Habitat	X		

Multi-Species Conservation Strategy Evaluated Species	Legal Status[1]		
	Federal	**State**	**Other**
(Oncorhynchus tshawytscha)			
Central Valley Fall/Late Fall-Run Chinook Salmon *(Oncorhynchus tshawytscha)*	SC	SSC	Magnuson Stevens Act
Green Sturgeon (*Acipenser medirostris*)	T	SSC	–
River Lamprey (*Lampetra ayresi*)	–	SSC	–
Sacramento Splittail (*Pogonichthys macrolepidotus*)	D	SSC	–
Hardhead (*Mylopharodon conocephalus*)	–	SSC	–
REPTILES AND AMPHIBIANS			
Giant Garter Snake (*Thamnophis gigas*)	T	T	–
Northwestern Pond Turtle (*Clemmys marmorata marmorata*)	–	SSC	USFS: Sensitive
Western Spadefoot Toad (*Spea hammondii*)	–	SSC	BLM: Sensitive
BIRDS			
Bald Eagle (*Haliaeetus leucocephalus*)	T	E	–
Western Yellow-Billed Cuckoo (*Coccyzus americanus occidentalis*)	C	T	USFS: Sensitive
Bank Swallow (*Riparia riparia*)	–	T	–
Oak Titmouse (*Baeolophus inornatus*)	–	–	–
Swainson's Hawk (*Buteo swainsoni*)	–	T	–
White-Tailed Kite (*Elanus caeuleus*)	–	–	DFG: Fully Protected (Nesting)
Lawrence's Goldfinch (*Carduelis lawrencei*)	–	–	–
Loggerhead Shrike (*Lanius ludovicianus*)	–	SSC	–
Prairie Falcon (*Falco mexicanus*)	–	SSC	–
Nuttall's Woodpecker (*Picoides nuttallii*)	–	–	–
Lewis' Woodpecker (*Melanerpes lewis*)	–	SSC	–
Tricolored Blackbird (*Agelaius tricolor*)	–	SSC	–
Western Burrowing Owl (*Athene cunicularia*)	–	SSC	–
Osprey (*Pandion haliaetus*)	–	SSC	–
California Yellow Warbler (*Dendroica petechia brewsteri*)	–	SSC (nesting)	–
Yellow-Breasted Chat (*Icteria virens*)	–	SSC (nesting)	–
Little Willow Flycather (*Empidonax traillii brewsteri*)	–	E	–
Cooper's Hawk (*Accipiter cooperi*)	–	SSC	USFS: Sensitive
Sharp-Shinned Hawk (*Accipiter striatus*)	–	SC	USFS: Sensitive
Northern Harrier (*Circus cyanus*)	–	SSC	–
MAMMALS			
Greater Western Mastiff (*Eumpos perotis*)= (*Eumpos perotis californicus)*	–	–	–
Long-Eared Myotis (*Myotis evotis*)	–	–	BLM: Sensitive
Pale Townsend's Big-Eared (*Corynorhinus townsendii*)= (*Plecotus townsendii pallescens*)	–	SSC	USFS: Sensitive BLM: Sensitive
California Myotis (*Myotis californicus)*	–	–	–
Small-Footed Myotis (*Myotis ciliolabrum*)	–	–	BLM: Sensitive
Fringed Myotis (*Myotis thysanodes*)	–	–	BLM: Sensitive
Long-Legged Myotis (*Myotis volans*)	–	–	–
Yuma Myotis (*Myotis yumanensis*)	–	–	BLM: Sensitive

[1] Status explanation:

C = Candidate for listing under the federal ESA
E = Listed as endangered under the federal or state ESA.
T = Listed as threatened under the federal or state ESA.
D = Federally delisted
X = Critical habitat has been designated for this species.
SC = NMFS' species of concern;
SSC = State species of special concern
CNPS List 2 = Rare, threatened, or endangered in California, but more common elsewhere.
USFS = U.S. Forest Service
BLM = Bureau of Land Management
– = No status

1.8.2 Location of Species and/or Suitable Habitat within the Proposed Action Area

In addition to species lists provided by the USFWS, and a quadrangle-by-quadrangle review of records in the CNDDB was undertaken, field surveys were conducted covering an area well beyond the immediate footprint of the Proposed Action. The scope of literature review and of field survey for plant and wildlife species conducted in the vicinity of the Proposed Action are summarized on **Table 1-2.** The findings of the literature review and field surveys are as follows:

- There are 34 elderberry shrubs in the Proposed Action Area (**Figure 1-5**) including several with VELB exit holes;
- During 2005 and 2007, bank swallows nested in the Proposed Action Area (**Figure 1-5**);
- Although several plant species of special concern have been found within 5 miles of the Proposed Action Area (i.e., fox sedge, Columbian watermeal, four-angled spikerush, rose-mallow, and Ferris's milk-vetch), no special status-plants occur in the Proposed Action Area;
- Riparian, agricultural and grassland habitats occur within and adjacent to the Proposed Action Area, which are suitable for Swainson's hawk nesting and foraging; however, no nesting Swainson's hawk were found nesting within 0.25 mile of the Proposed Action Area;
- An active osprey nest was observed during June 2006 surveys within the Proposed Action Area along the dredging access road near the Big Chico Creek Sacramento River confluence;
- Sacramento River winter-run Chinook salmon, Central Valley spring-run Chinook salmon, Central Valley steelhead and the Southern Distinct Population Segment (DPS) of North American green sturgeon are known to occur in the main stem of the Sacramento River and thus may be affected by the Proposed Action Area; and
- Critical Habitat for Sacramento River winter-run Chinook salmon, Central Valley spring-run Chinook salmon, and Central Valley steelhead and EFH for Chinook salmon occur in the Proposed Action Area.

Table 1-2. Summary and findings of literature review and field surveys.

Study	Dates	Methods
CNDDB Review	8/1/2005, 6/15/2006	Review of species occurrence data for the Ord Ferry, Foster Island, Nord, Richardson Springs, Hamilton City, Chico, Glenn, Llano Seco and Nelson USGS quadrangles
Field Survey (Proposed Action Area))	8/10/2005	Reconnaissance-level survey of revetment in Proposed Action Area.
	8/12/2005	Focused survey for VELB within 100 feet of revetment in Proposed Action Area.
	10/4/2005	Focused survey for VELB within 100 feet of revetment Proposed Action Area and access road.
	6/15/2006	Focused survey for VELB within 100 feet of dredging in Proposed Action Area; nesting raptor survey within 800 meters of dredging in Proposed Action Area where accessible; vegetation survey of the dredging in Proposed Action Area; giant garter snake habitat assessment.
	6/27/2006	Vegetation survey of the revetment in the Proposed Action Area; nesting raptor survey within 800 meters of revetment in the Proposed Action Area where accessible; giant garter snake habitat assessment.
Review of giant garter snake distribution data	2006	General analysis of distribution of this species CNDDB (July 2006) and consultation with CDFG.
Review of fish distribution data	2005 and 2006	Yoshiyama (1998), Micheny (1989) and Micheny and Deibel (1986), Moyle (2002) (2002), Vogel and Marine (1991), (70 FR 52488 (September 2, 2005)); general analysis of distribution using CNDDB (July 2006) and consultation with CDFG and NMFS.

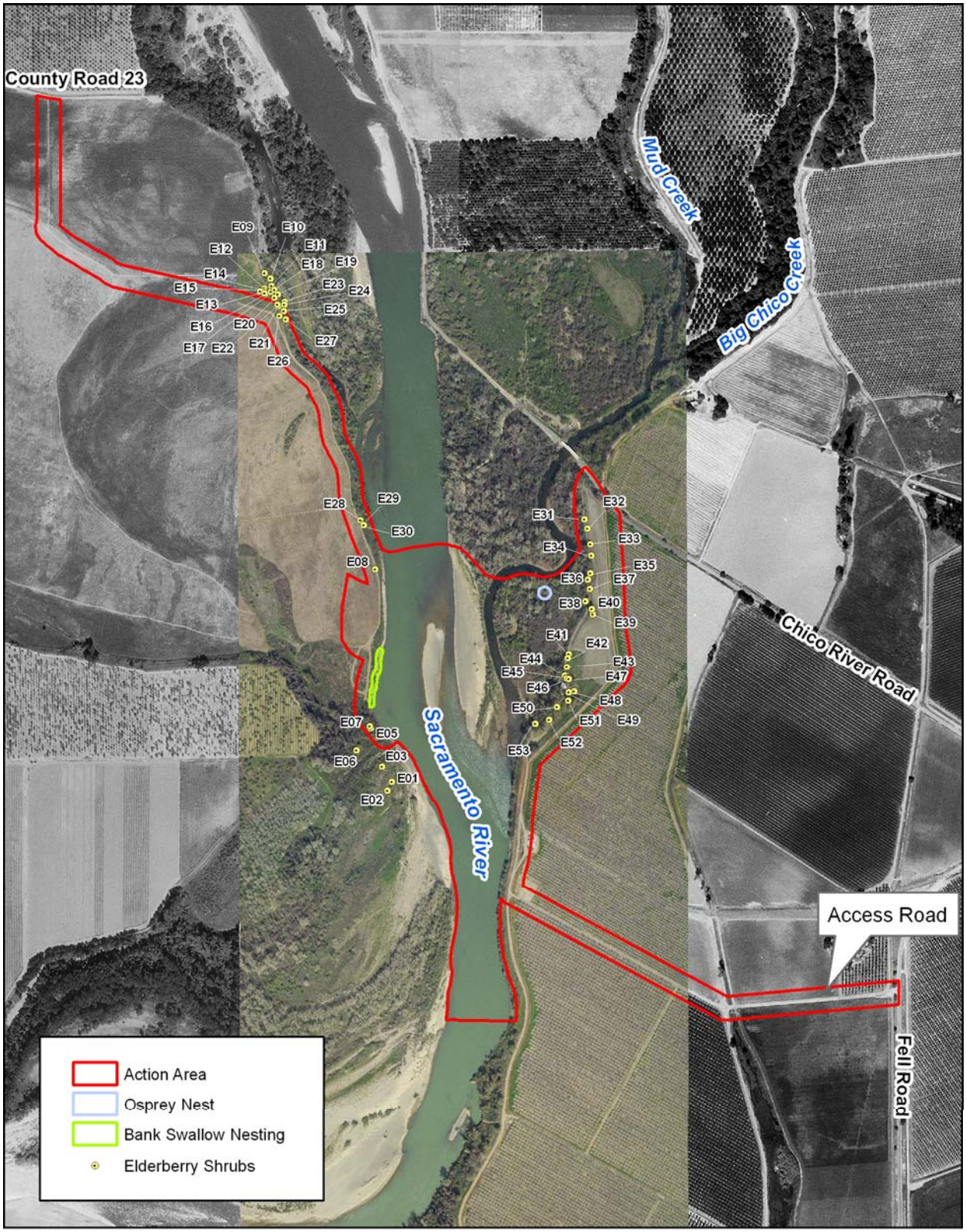

Figure 1-5 Special Status Species

1.8.3 Notable Species Not Included in the ASIP

A number of species that generally occur in Butte and Glenn counties, and/or within the U.S. Geological Service (USGS) quadrangles which were reviewed, are not addressed in this ASIP because: (1) they are not known to occur in the Proposed Action Area; (2) no suitable habitat occurs in the Proposed Action Area; and/or (3) no mechanisms exists by which they would be adversely affected by the project. These species are shown in **Table 1-3**.

Table 1-3. Species initially considered, but not included in the ASIP

Species	Legal Status	Rational for Exclusion from ASIP Analysis
Plants		
Ferris's milk-vetch *(Astragalus tener ferrisiae)*	CNPS List 1B	No known occurrence; not found during surveys.
Fox sedge *(Carex vulpinoidea)*	CNPS List 2	No known occurrence; not found during surveys.
Columbian watermeal *(Wolffia brasiliensis)*	CNPS List 2	No known occurrence; not found during surveys.
Four-angled spikerush *(Eleocharis quadrangulata)*	CNPS List 2	No known occurrence; not found during surveys.
Rose mallow *(Hibiscus lasiocarpus)*	CNPS List 2	No known occurrence; not found during surveys.
Mammals		
California myotis *(Myotis californicus)*	--/--	Known to occur in region; no mechanism for take as construction would not occur during brooding and impacts to riparian vegetation would be minimal.
Small-footed myotis *(Myotis ciliolabrum)*	--/--	Known to occur in region; no mechanism for take as construction would not occur during brooding season, species is primarily a cave dweller and impacts to riparian vegetation would be minimal.
Long-legged myotis *(Myotis volans)*	--/--	No known occurrence within Proposed Action Area; impacts to riparian vegetation would be minimal.
Yuma myotis *(Myotis yumanensis)*	--/--	Known to occur in region, no maternity colony sites within the Proposed Action Area; no mechanism for take as construction would not occur during brooding and impacts to riparian vegetation would be minimal.
Fringed myotis *(Myotis thysanodes)*	--/--	Known to occur in region, no maternity colony sites within the Proposed Action Area; no mechanism for take as construction would not occur during brooding and impacts to riparian vegetation would be minimal. Species is a fall migrant.
Long-eared myotis *(Myotis evotis)*	--/--	Known to occur in region; no mechanism for take as construction would not occur during brooding and impacts to riparian vegetation would be minimal.
PaleTownsend's big-eared bat *(Corynorhinus townsendii)= (Plecotus townsendii pallescens)*	--/CSC	No known occurrence; potential roosting habitat would not be impacted by the Proposed Action.
Greater western mastiff bat *(Eumpos perotis)= (Eumpos perotis californicus)*	--/CSC	Known to occur in region; no mechanism for take as construction would not occur during brooding and impacts to riparian vegetation would be minimal.
Birds		
Northern harrier *(Circus cyaneus)*	--/CSC	No mechanism for take as construction would not occur during nesting and impacts to grassland habitat would be minimal.
Western burrowing owl *(Athene cunicularia hypugaea)*	--/CSC	No known occurrence; not found during surveys.
Tricolored blackbird *(Agelaius tricolor)*	--/CSC	No known occurrence; no suitable dense stands of cattails and tules, or large blocks of blackberries, nettles, or thistles in the Proposed Action Area, not found during surveys.

Species	Legal Status	Rational for Exclusion from ASIP Analysis
Oak titmouse *(Baeolophus inornatus)*	--/--	No mechanism for take as construction would not occur during nesting and impacts to riparian vegetation would be minimal.
Lawrence's goldfinch *(Carduelis lawrencei)*	--/--	No known occurrence; not found in surveys; no mechanism for take as construction would not occur during nesting and impacts to riparian vegetation would be minimal.
Cooper's hawk *(Accipiter cooperi)*	--/CSC	No known occurrence; not found in surveys; no mechanism for take as construction would not occur during nesting and impacts to suitable nesting habitat would be minimal.
Little willow flycatcher *(Empidonax traillii)*	--/CE	No known occurrence; not detected during surveys; no mechanism for take as construction would not occur during nesting and impacts to riparian vegetation would be minimal.
Prairie falcon *(Falco mexicanus)*	--/CSC	No known occurrence; not detected during survey; no mechanism for take as construction would not occur during nesting.
Sharp-shinned hawk *(Accipiter striatus)*	--/CSC	No known occurrence; not found in surveys; no mechanism for take as construction would not occur during nesting and impacts to suitable nesting habitat would be minimal.
Loggerhead shrike *(Lanius ludovicianus)*	--/CSC	No known occurrence; not detected during surveys; no mechanism for take as construction would not occur during nesting.
Lewis's woodpecker *(Melanerpes lewis)*	--/CSC	No mechanism for take as construction would not occur during nesting; impacts to riparian vegetation would be minimal.
Yellow-breasted chat (nesting) *(Icteria virens)*	--/CSC	No mechanism for take as construction would not occur during nesting; impacts to riparian vegetation would be minimal.
Nuttall's woodpecker *(Picoides nuttallii)*	--/--	No mechanism for take as construction would not occur during nesting; impacts to riparian vegetation would be minimal.
California yellow warbler *(Dendroica petechia brewsteri)*	--/CSC	No mechanism for take as construction would not occur during nesting; impacts to riparian vegetation would be minimal.
Reptiles		
Giant garter snake *(Thamnophis gigas)*	FT/CT	No suitable habitat in the Proposed Action Area; no mechanism for take; not found during surveys; dense riparian forest and large predatory fish severely restrict habitat suitability.
Amphibians		
California red-legged frog *(Rana aurora draytonii)*	FT/CSC	No known occurrence in Central Valley; not found during surveys; Bullfrogs and predatory fish severely restrict habitat suitability.
Western spadefoot toad *(Spea hammondii)*	--/CSC	No known occurrence; not found during surveys.
Invertebrates		
Conservancy fairy shrimp *(Branchinecta lynchi)*	FE/--	No vernal pools in the Proposed Action Area; Proposed Action Area not hydrologically connected to vernal pools.
Vernal pool fairy shrimp *(Branchinecta lynchi)*	FT/--	No vernal pools in the Proposed Action Area; Proposed Action Area not hydrologically connected to vernal pools.
Vernal pool tadpool shrimp *(Lepidurus pachardi)*	FE/--	No vernal pools in the Proposed Action Area; Proposed Action Area not hydrologically connected to vernal pools.
Sacramento anthicid beetle *(Anthicus sacramento)*	--/--	No dune habitat in Proposed Action Area.
Antioch Dunes anthicid beetle *(Anthicus antiochensis)*	--/--	No dune habitat in the Proposed Action Area.

1.8.3.1 Giant Garter Snake

The giant garter snake is a federal and state listed threatened species. It inhabits agricultural wetlands and other waterways such as irrigation and drainage canals, sloughs, ponds, small lakes, low gradient streams, and adjacent uplands in the Central Valley. Because of the direct loss of natural habitat, the giant garter snake relies heavily on rice fields in the Sacramento and San Joaquin Valley, but also uses managed marsh areas in federal national wildlife refuges and state wildlife areas. Giant garter snakes are typically absent from larger rivers because of lack of

suitable habitat and emergent vegetative cover, and from wetlands with sand, gravel, or rock substrates. Riparian woodlands typically do not provide suitable habitat because of excessive shade, lack of basking sites, and absence of prey populations. However, some riparian woodlands do provide good habitat.

Primary habitat requirements consist of: (1) adequate water during the snake's active season (early-spring through mid-fall) to provide food and cover; (2) emergent, herbaceous wetland vegetation, such as cattails and bulrushes, for escape cover and foraging habitat during the active season; (3) grassy banks and openings in waterside vegetation for basking; and (4) higher elevation uplands for cover and refuge from floodwaters during the snake's dormant season in the winter.

Giant garter snakes feed primarily on small fish, tadpoles, and frogs. The giant garter snake inhabits small mammal burrows and other soil crevices above prevailing flood elevations throughout its winter dormancy period. Giant garter snakes typically select burrows with sunny exposure along south and west facing slopes. The breeding season extends through March and April, and females give birth to live young from late July through early September. Brood size is variable, ranging from 10 to 46 young, with a mean of 23 (Hansen and Hansen 1990). Young immediately scatter into dense cover and absorb their yolk sacs, after which they begin feeding on their own. Although growth rates are variable, young typically more than double in size within the first year; sexual maturity averages three years for males and five years for females (Hansen and Hansen 1990).

Habitat loss and fragmentation, flood control activities, changes in agricultural and land management practices, predation from introduced species, parasites, water pollution and continuing threats are the main causes for the decline of this species. However, when abundant cover is available, giant garter snake may be able to persist with numerous predators that share the same habitats (Hansen 1988).

Field surveys were conducted in the Proposed Action Area on June 15, 21 and 27, 2006 and concluded a lack of giant garter snake habitat in the area. Hence, the giant garter snake is not considered further in this ASIP for the following reasons: (1) the Proposed Action Area does not contain suitable habitat for giant garter snake; (2) giant garter snake are absent from larger rivers and other water bodies that support introduced populations of large, predatory fish. In addition, dense riparian forest, which dominates the Proposed Action Area, does not typically provide suitable habitat because of excessive shade and lack of basking sites.

1.8.4 Species Included in the ASIP

A comprehensive list of species with potential to be in the Proposed Action Area was developed. The ASIP provides a detailed assessment of potential project effects on MSCS-evaluated species that are covered under the programmatic biological opinions and NCCP Determination and that could be present in the Proposed Action Area. **Table 1-4** presents the species included in the ASIP.

Table 1-4. Species included in the ASIP.

Species	Scientific Name*	Legal Status	Habitat Requirements	Presence in Proposed Action Area
FISH				
Winter-run Chinook salmon	*Oncorhynchus tshawytscha*	Federal and State endangered	Spawning in Sacramento River reaches upstream of the Proposed Action Area. Riverine migration corridor	Juveniles and adults present in the Proposed Action Area.
Winter-run Chinook salmon Critical Habitat	NA	Federally designated Critical habitat	NA	Proposed Action Area is within designated critical habitat.
Spring-run Chinook salmon	*Oncorhynchus tshawytscha*	Federal and State threatened	Spawning in Sacramento River reaches upstream of the Proposed Action Area. Riverine migration corridor	Juveniles and adults present in the Proposed Action Area.
Spring-run Chinook salmon Critical Habitat	NA	Federally designated Critical habitat	NA	Proposed Action Area is within designated critical habitat.
Central Valley Steelhead	*Oncorhynchus mykiss*	Federally threatened	Spawning in Sacramento River reaches upstream of the Proposed Action Area. Riverine migration corridor	Juveniles and adults present in the Proposed Action Area.
Central Valley Steelhead Critical Habitat	NA	Federally designated Critical Habitat	NA	Proposed Action Area is within designated Critical Habitat.
Fall/late fall-run Chinook salmon	*Oncorhynchus tshawytscha*	Federal species of concern (NMFS)	Spawning in Sacramento River reaches upstream of the Proposed Action Area. Riverine migration corridor	Juveniles and adults present in the Proposed Action Area.
Southern DPS Green sturgeon	*Acipenser medirostris*	Federally threatened and California species of special concern	Sacramento River to the Sacramento – San Joaquin Delta.	Juveniles and adults assumed present in the Proposed Action Area.
Hardhead	*Mylopharcodon concephalus*	California species of special concern	Sacramento–San Joaquin Drainage, riverine.	Juveniles and adults present in shallow areas of the Proposed Action Area.
Sacramento Splittail	*Pogonichthys macrolepidotu*)	California species of special concern	Sacramento River and large tributaries	Juveniles and adults present in shallow areas of the Proposed Action Area.
BIRDS				
Bald Eagle	*Haliaeetus leucocephalus*	Federally threatened and State endangered	Requires large bodies of water, or free flowing rivers with abundant fish, and adjacent snags or other perches, typically in conifer-dominated habitats. Winter migrants may use lower elevation river systems with abundant prey and thermally protected roosting sites.	Not detected during surveys and no CNDDB (2006) documented occurrences reported within 10 miles of the Proposed Action Area. Suitable habitat present.
Western Yellow-billed Cuckoo	*Coccyzus americanus occidentalis*	Federal candidate and State threatened	Breed in large (> 25 acres, wider than 300-foot) blocks of riparian habitats, particularly woodlands with cottonwoods and willows. Dense understory foliage appears to be an important factor in nest site selection. Cottonwood trees appear to be important for foraging.	Not detected during surveys and no CNDDB (2006) documented occurrences reported within 10 miles of the Proposed Action Area.
Bank Swallow	*Riparia riparia*	State threatened	Nests in nearly vertical bank/cliff faces comprised of soft soils such as fine sandy loam, loam, and silt loam in species remaining range including coastal river mouths, and along the banks the Feather and Sacramento Rivers. Soil type, height and slope seem to be the primary selection criteria.	Active nest colony detected in proposed revetment construction footprint by USFWS personnel in 2005. Not detected during 2006. Three colonies identified using the site on May 1, 2007. CDFG unpublished data indicate that the colony size ranged from 50 to 340 nesting pairs from 1999 through 2005.
Swainson's hawk	*Buteo swainsoni*	State threatened	Nests in valley oaks, cottonwoods, and large willows usually in, or near, riparian habitats; forages in undisturbed grasslands, irrigated pastures, and agricultural fields of alfalfa, small grains,	14 active nests pre-2001 are documented within 10 miles of the Proposed Action Area including one nest within 0.25 miles of

Species	Scientific Name*	Legal Status	Habitat Requirements	Presence in Proposed Action Area
			and some row crops.	the dredging in the Proposed Action Area. Not detected during surveys.
White-tailed kite	*Elanus caeuleus*	Fully Protected by CDFG	Low-elevation grasslands, wetlands dominated by grasses, oak woodlands, and agricultural and riparian areas. Nests are built in trees that occur in isolation or in riparian areas. Lightly grazed or ungrazed grasslands/pastures and cultivated areas are used for foraging.	Not detected during surveys and no CNDDB (2006) documented occurrences reported within 10 miles of Proposed Action Area.
Osprey	*Pandion haliaetus*	California species of special concern	Nests in large trees, snags, and dead-topped trees in open riparian habitats for cover and nesting. Require large, clear, fish-bearing waters for foraging	An active osprey nest was detected within the dredging of the Proposed Action Area and has reportedly historically used the Proposed Action Area.
REPTILES				
Northwestern pond turtle	*Clemmys marmorata marmorata*	California species of special concern	Occurs in both permanent and intermittent aquatic habitats, including ponds, marshes, lakes, streams, and irrigation ditches; exposed rocks, logs, or other basking sites are required.	Not detected during surveys and no CNDDB (2006) documented occurrences reported within 10 miles of the Proposed Action Area. Dredging in the proposed area creates a depressions and/or an open gravel pit. However, other essential habitat features (water present in active season, basking sites) are not necessarily present.
INVERTEBRATES				
Valley elderberry longhorn beetle	*Desmocerus californicus dimorphus*	Federally threatened	Inhabits riparian and oak savanna habitats with elderberry shrubs, it's only known host plant.	There are 34 elderberry shrubs in the Proposed Action Area, including several with VELB exit holes.

1.9 NCCP HABITAT TYPES TO BE ASSESSED IN THE ACTION SPECIFIC IMPLEMENTATION PLAN

The Proposed Action Area contains four different MSCS habitat-types including the Valley Riverine Aquatic, Valley/Foothill Riparian, Grassland and Upland Cropland (**Figure 1-6**). Sensitive natural communities are land cover types that are especially diverse, regionally uncommon, or of special concern to local, state, and Federal agencies. Please refer to *Chapter 3: Environmental Baseline* for additional information.

1.9.1 Valley Riverine Aquatic Habitat

The Valley Riverine Aquatic habitat exists in structural classes 1:24:0-B. Open water (1) is defined as greater than 2 meters in depth and/or beyond the depth of floating rooted plants, and does not involve substrate. The submerged zone (2) is between open water and shore. The shore (4) is seldom flooded (except for wave wash or fluctuations in flow) and is less than 10 percent canopy cover. The open water zones of large rivers provide resting, food, and escape cover for many species of waterfowl. Near-shore waters also provide food for waterfowl. Many species of

insectivorous birds hawk their prey over water. A vast array of mammals depend on riverine habitats and associated sub-communities for various life cycles.

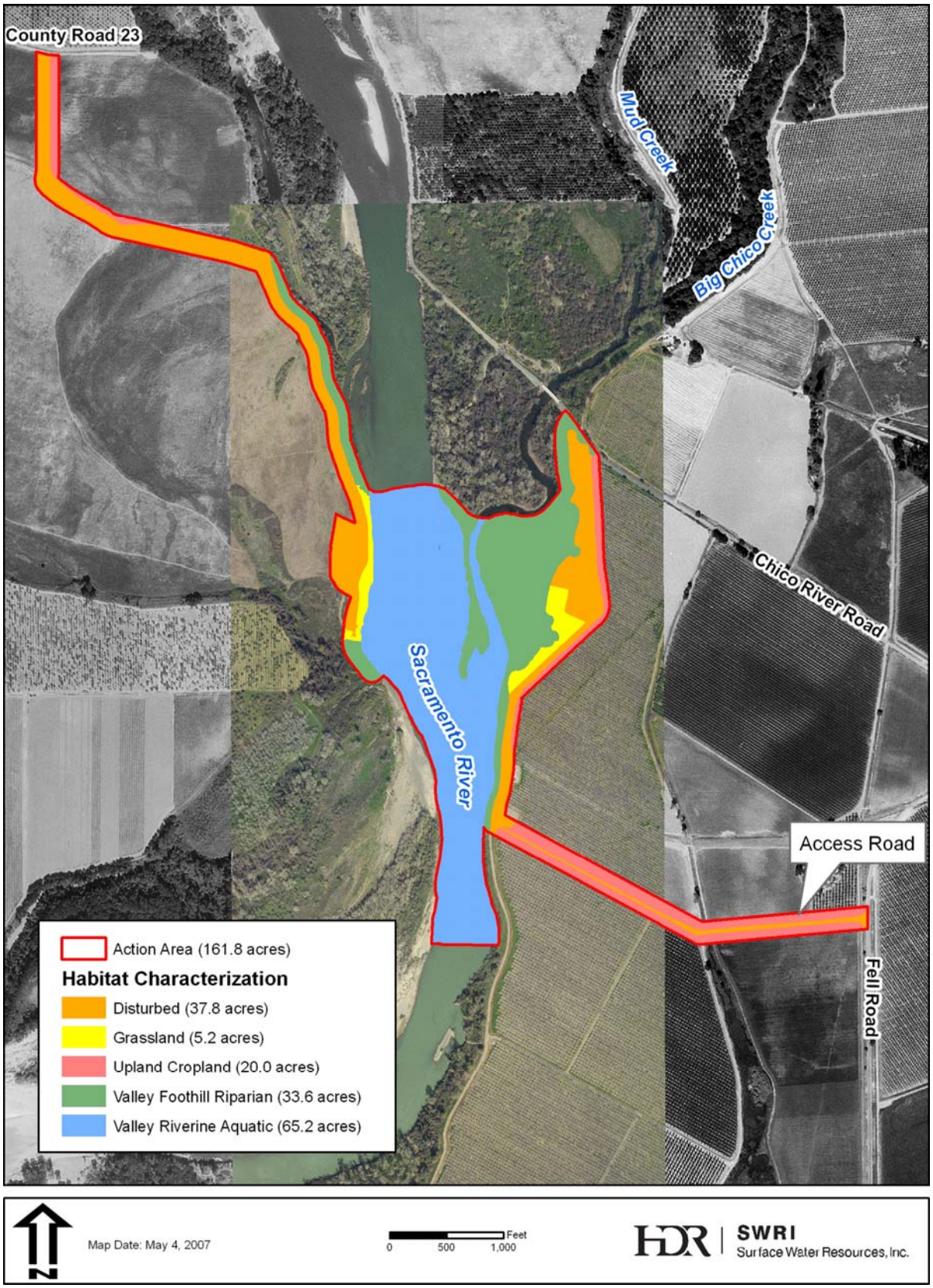

Figure 1-6. Habitat Characterization

1.9.2 Valley Foothill Riparian Forest

Valley/Foothill Riparian Forest consists of a canopy cover of 20 to 80 percent which height is approximately 30 meters (98 ft). There is a sub-canopy tree layer and an understory shrub layer that frequently is 30 to 50 percent wild grape. Herbaceous vegetation constitutes about one percent of the cover, except in openings where tall forbs and shade-tolerant grasses occur (Conard *et al.* 1977). Valley-foothill riparian habitats provide food, water, migration and dispersal corridors, and escape, nesting, and thermal cover for an abundance of wildlife. At least 50 amphibians and reptiles occur in lowland riparian systems. Many are permanent residents, others are transient or temporal visitors (Brode and Bury 1984). In one study conducted on the Sacramento River, 147 bird species were recorded as nesters or winter visitants (Laymon 1984). Additionally, 55 species of mammals are known to use California's Central Valley riparian communities (Trapp *et al.* 1984).

1.9.3 Upland Cropland

Upland Cropland habitat includes a variety of sizes, shapes, and growing patterns of vegetation. Most croplands support annuals, planted in spring and harvested during summer or fall. Cropland vegetation is grown as a monoculture, using tillage or herbicides to eliminate unwanted vegetation. Cropland habitats do not conform to normal habitat stages. Instead, cropland is regulated by the crop cycle in California. These habitats can either be annual or perennial, vary according to location in the state, and germinate at various times of the year. Most cropland types in California are annuals and are managed in a crop rotation system. Generally, the crop rotation system employs a combination of annual and perennial crops on a five to seven year rotation. Croplands are established on the State's most fertile soils, which historically supported an abundance of wildlife unequalled in other sites. Croplands have greatly reduced the wildlife richness and diversity of California. Many species of rodents and birds have adapted to croplands and are controlled by fencing, trapping, and poisoning to prevent excessive crop losses (California Department of Food and Agriculture 1975).

1.9.4 Perennial Grassland

Perennial Grassland habitats occur in two forms in California: (1) coastal prairie, found in areas of northern California under maritime influence; and (2) relics in habitats now dominated by annual grasses and forbs (Cooper and Heady 1964)). Annual grassland habitats are open grasslands composed primarily of annual plant species. Many of these species also occur as understory plants in Valley Oak Woodland (VOW) and other habitats. Structure in Annual Grassland depends largely on weather patterns and livestock grazing. Dramatic differences in physiognomy, both between seasons and between years, are characteristic of this habitat. Fall rains cause germination of annual plant seeds. Plants grow slowly during the cool winter months, remaining low in stature until spring, when temperatures increase and stimulate more rapid growth (Garrison *et al.* 1977). Both perennial and annual grasses provide optimum habitat for many species survival.

1.10 CRITICAL HABITAT IN THE PROPOSED ACTION AREA

Detailed primary constituent elements of critical habitat are freshwater rearing habitat and freshwater migration corridors. Freshwater rearing sites are those with water quantity and floodplain connectivity to form and maintain physical habitat conditions and support juvenile growth and mobility; water quality and forage supporting juvenile development; and natural cover such as shade, submerged and overhanging large wood, log jams and beaver dams, aquatic vegetation, large rocks and boulders, side channels, and undercut banks. Both spawning areas and migratory corridors comprise rearing habitat for juveniles, which feed and grow before and during their outmigration. Non-natal, intermittent tributaries also may be used for juvenile rearing. Rearing habitat conditions are strongly affected by habitat complexity, food supply, and presence of predators of juvenile salmonids. Freshwater rearing habitat has a high conservation value as the juvenile life stage of salmonids is dependant on the function of this habitat for successful survival and recruitment.

Freshwater migration corridors should be free of obstruction with good water quantity and quality conditions and contain natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, side channels, and undercut banks supporting juvenile and adult mobility, survival and food supply. Migratory corridors are downstream of the spawning area and include the lower Sacramento River and the Delta. These corridors allow the upstream passage of adults, and the downstream emigration of outmigrant juveniles. Migratory habitat conditions are strongly affected by the presence of barriers, which can include dams, unscreened or poorly- screened diversions, and degraded water quality. For successful survival and recruitment of salmonids, freshwater migration corridors must function sufficiently to provide adequate passage. For this reason, freshwater migration corridors are considered to have a high conservation value.

The discussions provided below focus on critical habitat for Sacramento River winter-run Chinook salmon, Central Valley spring-run Chinook salmon and Central Valley steelhead. Pursuant to ESA requirements, this ASIP also analyzes potential effects of the Proposed Action on designated critical habitats in the Proposed Action Area.

1.10.1 Sacramento River Winter-Run Chinook Salmon

NMFS designated critical habitat for Sacramento River winter-run Chinook salmon on June 16, 1993. Critical habitat for Sacramento winter-run Chinook salmon is defined to occur in the Sacramento River from Keswick Dam (river mile [RM] 302) to Chipps Island (RM 0) in the Delta; all waters from Chipps Island westward to Carquinez Bridge, including Honker Bay, Grizzly Bay, and Carquinez Strait; all waters from San Pablo Bay westward to the Carquinez Bridge; and all waters of San Francisco Bay (north of the San Francisco/Oakland Bay Bridge) from San Pablo Bay to the Golden Gate Bridge. In addition, the critical habitat designation recognizes those physical and biological features of the habitat that are essential to the conservation of the species and that may require special management consideration or protection (58 FR 33212 (June 16, 1993)).

1.10.2 Central Valley Spring-Run Chinook Salmon

NMFS designated critical habitat for the Central Valley spring-run Chinook salmon on September 2, 2005. The critical habitat designation includes the Proposed Action Area, which is part of the Tehama Hydrologic Unit (HU) 5504. The Tehama Hydrologic Unit includes the upstream reach of the Sacramento River to Antelope Creek (70 FR 52488 (September 2, 2005)).

1.10.3 Central Valley Steelhead

NMFS designated critical habitat for the Central Valley steelhead on September 2, 2005. The critical habitat designation includes the Proposed Action Area, which is part of the Tehama Hydrologic Unit (HU) 5504. The Tehama Hydrologic Unit includes the upstream reach of the Sacramento River to Antelope Creek (70 FR 52488 (September 2, 2005)).

1.10.4 Southern Distinct Population Segment of Green Sturgeon

Critical habitat has not been designated for green sturgeon. However, NMFS is compiling information to prepare a critical habitat proposal for the southern DPS (70 FR 17386 (April 6, 2005)), and has solicited information from the public to assist the agency with final determination of critical habitat. It is currently unclear when a final rule outlining critical habitat for the southern DPS of green sturgeon will be issued.

1.11 ESSENTIAL FISH HABITAT

One species within the Proposed Action Area requires consultation under Section 305 of the MSFCMA. This species is Chinook salmon (*Oncorhynchus tshawytscha*). The three runs of Chinook salmon listed below would be subject to consultation.

- Sacramento River winter-run Chinook salmon;
- Central Valley spring-run Chinook salmon; and
- Central Valley fall/late fall-run Chinook salmon.

1.12 BASELINE LEVEL OF FISHERY PROTECTION

This section presents the existing environmental regulation and biological opinions currently being implemented to protect at-risk native fish species in the Sacramento River and Delta. These items all represent the "*baseline level of fishery protection*" that the Proposed Action builds upon in addressing the goal of providing protection to the fish of the Sacramento River through: (1) Removal of sediment that would potentially render the existing facility inconsistent with NMFS and the CDFG fish screen criteria; and (2) Installation of a 1,520-foot of rock toe and tree revetment on the west side of the river to provide bank stabilization.

1.12.1 1995 Recovery Plan for the Sacramento/San Joaquin Delta Native Fishes (USFWS)

The Delta Native Fishes Recovery Plan for the Sacramento/San Joaquin Delta Native Fishes outlines a strategy for the conservation and restoration of the Sacramento-San Joaquin Delta that

currently supports or has the potential to support Delta native fishes. The principal objective of the Delta Native Fishes Recovery Plan is to establish self-sustaining populations of the species of concern that will persist indefinitely. Species addressed in this plan include delta smelt, longfin smelt, Sacramento splittail, green sturgeon, spring-run Chinook salmon and Sacramento perch.

1.12.2 2000 CALFED Programmatic EIS/EIR

The CALFED PEIS/EIR document describes, in a broad sense, the environmental consequences of the preferred program alternative and alternatives and enabled decisions to be made regarding program direction and content. Information from this document will be incorporated by reference into this ASIP, where applicable.

The CALFED PEIS/EIR and ROD and CEQA findings represent the culmination of the NEPA and CEQA processes. The ROD identifies the final selection of a long-term plan (Preferred Program Alternative), which includes specific actions to restore natural biological function of the Bay-Delta, describes a strategy for implementing the plan, and identifies complementary actions the CALFED agencies also will pursue.

1.12.3 2000 Multi-Species Conservation Strategy

The MSCS is an appendix of the CALFED Bay-Delta Program Final Programmatic EIS/EIR that explains how the CALFED agencies will meet the requirements of ESA, CESA, and NCCPA. The MSCS draws on key elements of the CALFED Preferred Program Alternative, such as the ERP to outline a comprehensive strategy for the conservation of numerous species of fish, wildlife, and plants, and their habitats. The MSCS presents a program-level environmental analysis of the Preferred Program Alternative that expands upon the PEIS/EIR analysis to address the conservation strategy and certain other issues pertinent to ESA and NCCPA compliance. The MSCS served as the program-level biological assessment of the Preferred Program Alternative for purposes of initiating consultations with USFWS and NMFS under Section 7 of ESA. The MSCS also served as the program-level NCCP for CDFG approval for NCCPA compliance.

1.12.4 2000 Programmatic Biological Opinion on the CALFED Bay-Delta Program (USFWS)

The USFWS Programmatic Biological Opinion covers 90 ESA-listed, proposed, and candidate species that were evaluated in the MSCS. The USFWS Programmatic Biological Opinion identifies ERP high-priority actions such as reducing direct mortality to fishes (year 1-7) by screening of existing unscreened or poorly screened diversions in the Delta, on the Sacramento River, San Joaquin River, and tributary streams based on a systematic priority approach and removing physical barriers to fish passage (Page 23). The USFWS Biological Opinion further states (Page 35) "…To compliment ERP efforts to improve fish passage, identify obstructions, such as small dams, and consider modification or removal in order to restore anadromous fish access to critical upstream spawning and rearing habitat."

1.12.5 2000 Programmatic Biological Opinion on the CALFED Bay-Delta Program (NMFS)

The NMFS Programmatic Biological Opinion covers four ESA-listed species that were evaluated in the MSCS. Page 66 of the NMFS CALFED Programmatic Biological Opinion provides a list of conservation recommendations for the CALFED Bay-Delta Program. Among the recommendations provided, it is stated that actions to restore and create waterfowl habitat along Central Valley waterways should be designed in a manner to avoid the creation of predatory fish holding habitat and prevent the entrapment of juvenile and adult salmonids.

1.12.6 2000 Natural Community Conservation Planning Act Approval of the CALFED Bay-Delta Program Multi-Species Conservation Strategy

Please refer to Section 1.6.4 for a description of the NCCPA Approval of the CALFED Bay-Delta Program MSCS.

1.12.7 2000 Ecosystem Restoration Program

The CALFED Agencies will implement a comprehensive ERP throughout the Bay-Delta's watershed, consistent with the Strategic Plan for Ecosystem Restoration. The goal of the ERP is to improve aquatic and terrestrial habitats and natural processes to support stable, self-sustaining populations of diverse and valuable plant and animal species through an adaptive management process. Implementation of the ERP includes recovery of species listed under the CESA and ESA (CALFED 1999). The information provided below is taken directly from the CALFED Bay-Delta ROD (CALFED 2000d).

To achieve its objectives, the ERP identifies over 600 programmatic actions in all the regions of the Bay-Delta watershed. CALFED's ERP will undertake a series of actions using a science-based adaptive management framework, consistent with the ERP Strategic Plan and ongoing scientific review. These actions are designed to result in CALFED-wide raising of species baseline. Additional information on the ERP Science Program can be found in the ERP Strategic Plan. The list of actions is provided in Volumes I and II of the ERP and in the ERP Strategic Plan. The Proposed Action will further the goal of the ERP by being consistent with the following programmatic action: *"Modifying or eliminating fish passage barriers, including the removal of some dams, construction of fish ladders, and construction of fish screens that use the best available technology."*

1.12.8 2004 Sacramento Winter-Run Chinook Salmon, Central Valley Spring-Run Chinook Salmon, Central Valley Steelhead, Southern Oregon/Northern California Coast Coho Salmon, and Central California Coast Steelhead Biological Opinion (NMFS)

On October 22, 2004, NMFS issued a Biological Opinion[1] on the effects of the long-term operations, criteria and plan (OCAP) for the CVP and SWP on federally listed endangered Sacramento River winter-run Chinook salmon, threatened Central Valley spring-run Chinook salmon, threatened Central Valley steelhead, threatened Southern Oregon/Northern California Coast Coho salmon, and threatened Central California Coast steelhead and their designated habitat. The Biological Opinion established non-discretionary terms and conditions that are intended to minimize take of winter-run and spring-run Chinook salmon and Central Valley steelhead. These terms and conditions pertain to ramping criteria, water temperature requirements, coldwater supply, fish passage, fish screen operations, gate operations, and incidental take/fish salvage of the species.

Due to numerous changed circumstances since the 2004/2005 OCAP consultation, Reclamation has requested re-initiation of Section 7 ESA consultation with NMFS. In a letter to NMFS dated April 2006, and clarified in May 2006, Reclamation requested initiation of early and formal consultation on the effects of long-term CVP and SWP operations on all federally-listed species and critical habitats that may be affected by those operations, and to include the newly designated critical habitat for Central Valley steelhead, Central Coast steelhead, and Central Valley spring-run Chinook salmon. Reclamation also requested initiation of formal consultation on the effects of the OCAP on the federally-threatened southern DPS of North American green sturgeon. At this time, the date for the completion of these new consultations is unknown.

[1] Due to numerous changed circumstances since the 2004/2005 OCAP consultation, Reclamation has requested re-initiation of Section 7 ESA consultation with NMFS. In a letter to NMFS dated April 2006, and clarified in May 2006, Reclamation requested initiation of early and formal consultation on the effects of long-term CVP and SWP operations on all federally-listed species and critical habitats that may be affected by those operations, and to include the newly designated critical habitat for Central Valley steelhead, Central Coast steelhead, and Central Valley spring-run Chinook salmon. Reclamation also requested initiation of formal consultation on the effects of the OCAP on the federally-threatened southern DPS of North American green sturgeon. It is assumed that the existing Biological Opinion from NMFS for OCAP operations will remain in force during the re-consultation process. At this time, the date for the completion of these new consultations is unknown.

2.0 DESCRIPTION OF THE PROPOSED ACTION AND CONSERVATION MEASURES

2.1 INTRODUCTION

This chapter describes the regulatory authority for undertaking the Proposed Action (*Section 2.2*); the ASIP Proposed Action Area (*Section 2.3*); the existing facilities operated by the Action Proponent (*Section 2.4*); the Proposed Action (*Section 2.5*); the construction schedule (*Section 2.6*); the access and staging (*Section 2.7*); the project commitments (*Section 2.8*); equipment and materials (*Section 2.9*); personnel (*Section 2.10*); Multi-Species Conservation Strategy and Conservation Measures (*Section 2.11*); and alternatives considered that would not result in take of listed species (*Section 2.12*).

2.1.1 Federal Endangered Species Act

Each federal agency has an obligation to ensure that any discretionary action it authorizes, funds, or carries out is not likely to jeopardize the continued existence of any endangered or threatened species or destroy or adversely modify its critical habitat unless that activity is exempt pursuant to the federal ESA (16 U.S.C § 1536(a)(2); 50 CFR § 402.03). It is under this authority that USFWS has prepared this ASIP, which fulfills the requirements of a Biological Assessment.

The ESA prohibits the take (harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect or attempt to engage in any such conduct) of any listed species.

Under Section 7(a)(2), a discretionary agency action jeopardizes the continued existence of species if it "reasonably would be expected, directly or indirectly, to reduce appreciably the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of the species" (50 CFR § 402.02). If a discretionary agency action is jeopardizing a species, the agency must stop the action or adapt it through reasonable and prudent alternatives, which must be within the scope of the agency's legal authority (50 CFR § 402.02).

Through this consultation, USFWS will comply with it obligations under the ESA, namely, to: (1) avoid any discretionary action that is likely to jeopardize the continued existence of listed species, (2) take listed species only as permitted by the USFWS, NMFS, and CDFG; and (3) and use USFWS authorities to conserve listed species.

2.1.2 State Endangered Species Act and the Natural Community Conservation Planning Act

The California Endangered Species Act (CESA) (Fish and Game Code Sections 2050 to 2097) is similar to the federal ESA. The California's Fish and Game Commission is responsible for maintaining lists of threatened and endangered species under the CESA. CESA prohibits the "*take*" of listed and candidate (petitioned to be listed) species. "*Take*" under California law means to "*hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch capture, or kill*" (California Fish and Game Code, section 86). CESA provides CDFG with administrative responsibilities over the plant and wildlife species listed as threatened or endangered. CESA also provides CDFG with the authority to permit the take of State-listed species under certain circumstances. Refer to California Fish and Game Code 2050-2116 for additional information.

The NCCPA authorizes the preparation of Natural Community Conservation Plans (NCCPs). NCCPs provide the means for regional or area-wide protection and perpetuation of natural wildlife diversity, while allowing compatible and appropriate development and growth. NCCPs must be approved by CDFG. CDFG may authorize incidental take of identified species, including endangered and threatened species, whose conservation and management is provided for in an approved NCCP. Because NCCPA allows CDFG to authorize incidental take of endangered and threatened species, an NCCP may be used to comply with CESA.

2.2 PROPOSED ACTION AREA

The Proposed Action Area is located in both Glenn and Butte counties, just west of the confluence of Big Chico Creek on the Sacramento River (**Figure 2-1**). For purposes of analysis, the Proposed Action Area was defined as the area in which direct or indirect environmental consequences would likely occur. The Proposed Action Area is functionally defined as the area 100-feet from the construction footprint, including access roads and a portion of the Sacramento River about 1000 feet downstream from the construction site.

The Proposed Action Area is within the Sacramento River Conservation Area (SRCA) also called the SB1086 Program. The SRCA is currently administered by the Sacramento River Conservation Area Forum (SRCAF). The Proposed Action Area is at the upstream end of Reach 3 – Chico Landing to Colusa, and is within the inner zone or active meander of the reach. Based on evaluations of aerial photographs taken since 1935, the river has migrated away from the pumps at a rate of 20 to 60 feet per year. If the current rate of river migration continues, the functionality of the existing pumping facility would be compromised.

The SRCAF recognizes there are places along the Sacramento River where bank stabilization would be necessary to limit meander in the inner river zone. This limitation takes into consideration the need to protect existing land uses including agriculture and structures such as buildings, bridges, pumping plants, and flood management structures from bank erosion.

The Proposed Action Area is rural and surrounded by agricultural lands, a national wildlife refuge, a California state park and undeveloped land. A portion of the Proposed Action Area is on the Capay Unit of the Sacramento River National Wildlife Refuge owned by USFWS and California State Parks, the proposed gravel bar removal site is within the banks of the Sacramento River, and the spoils deposit area is located just inside the east flood levee. The Proposed Action Area generally is located on the USGS Ord Ferry Quadrangle, Section 2 of T21N R1W, and is displayed on Figures 1-1, 1-2, and 1-3.

2.3 EXISTING FACILITIES

The M&T Chico Ranch/Llano Seco Rancho pumping facility provides a reliable water supply to about 15,000 acres of farmland, refuge land, and wildlife management areas including over 4,000 acres of wetlands owned or managed by the USFWS and CDFG providing key wetland habitat for waterfowl and other wetland species. The M&T Chico Ranch/Llano Seco Rancho pumping facility is located immediately downstream of the confluence of Big Chico Creek and the Sacramento River, on the east bank of the Sacramento River just south of the Bidwell-Sacramento River State Park at RM 193. The pumping facilities are located approximately six

miles southwest of the City of Chico. Approximately 300 feet downstream from the M&T Chico Ranch/Llano Seco Rancho pumping facility is the City of Chico Waste Water Treatment Plant (WWTP) outfall, which discharges into the Sacramento River.

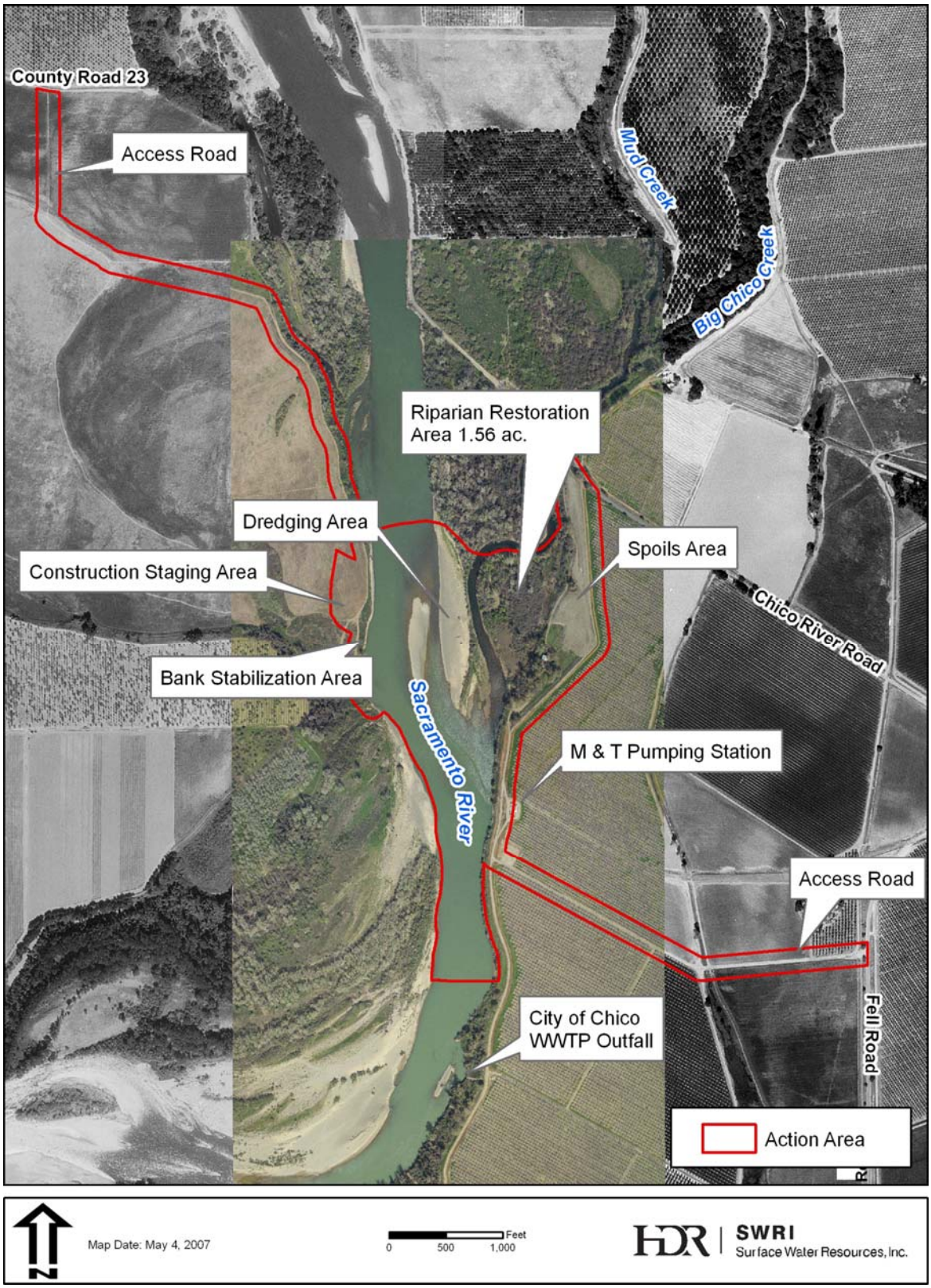

Figure 2-1 Site Access and Proposed Action Area

2.4 PROPOSED ACTION

2.4.1 Longitudinal Stone Toe and Tree Revetment plus Dredging

The Proposed Action would place 1,520 feet of rock toe and tree revetment on the west side of the river and remove gravel on the east side of the river. The location of the proposed longitudinal stone toe and tree revetment is shown on **Figure 2-2**. The length of the revetment was based on a review of banklines from 1935 through October 2006 (**Figure 2-3**) and was agreed upon by the Proposed Action Steering Committee. All of the banklines indicated on Figure 2-3 are for the west bank only and are presented for illustrative purposes only because some of the banklines were surveyed while others were digitized in a Geographic Information System (GIS) from historic aerial photographs. Since 1996, the apex of the bend on the west bank of the river has retreated approximately 320 feet, with an average annual rate of retreat of approximately 32 feet, varying from 20 to 60 feet annually. The upstream extent of the revetment is located at the point where there has been little retreat of the bank over the nine years. The downstream end of the revetment is located at the interface between the eroding bank and the lower elevation point bar surface, which provides a total length of protection of 1,520 feet.

Analysis of sediment transport and deposition at the bar upstream of the M&T pumping facility (Ducks Unlimited 2004) indicated that the average annual rate of deposition was likely to be approximately 43,000 tons. Therefore, material removal of approximately 156,000 tons (115,000 cubic yards) would be expected to occur approximately every four years, or once within the five-year project implementation period. If a series of dry years were to occur, such as those that occurred between 1976 and 1977, and 1987 through 1992, bar growth would be limited and there would be no need for additional material removal in the five-year project implementation period. Conversely, a series of wet years could occur, which could potentially require up to five material removal events during the five-year project implementation period. Stabilization of the bank would not prevent the need for additional material removal.

2.4.1.1 Design Considerations

Typically, longitudinal stone toe designs specify a weight or volume of stone to be placed per unit length of stream bank, rather than specifying a finished elevation and cross section dimensions, which results in a triangular-shaped section of stone placed along the toe of the stream bank. Backfilling behind the stone toe often is performed to thicken the toe, and to provide a medium for revegetation. A relatively smooth alignment that fits the site conditions is preferred because it tends to reduce the erosive energy along the toe (USACE 1997). Generally, a typical cross section is be specified providing for ease of construction and supervision of construction activities. Construction generally is conducted from the landward side. When bank materials erode easily, stone dikes are placed at intervals as tiebacks to prevent erosion behind the structure. Spacing of the tiebacks is based on the bank heights with typical spacings being 10 to 15 times the height of the bank. Tiebacks also generally are constructed on the upstream and downstream ends of revetments tiebacks to prevent flanking and unraveling, respectively. The hydraulic characteristics of the stream reach to be revetted generally dictate the size of stone used to form the longitudinal stone toe revetment. The stone should be well graded, and large enough to resist transportation downstream. Sufficient stone must be incorporated to account for toe scour. Brush incorporation into the revetment requires anchoring with cables and large boulders to prevent loss during overtopping flows (**Figure 2-4**).

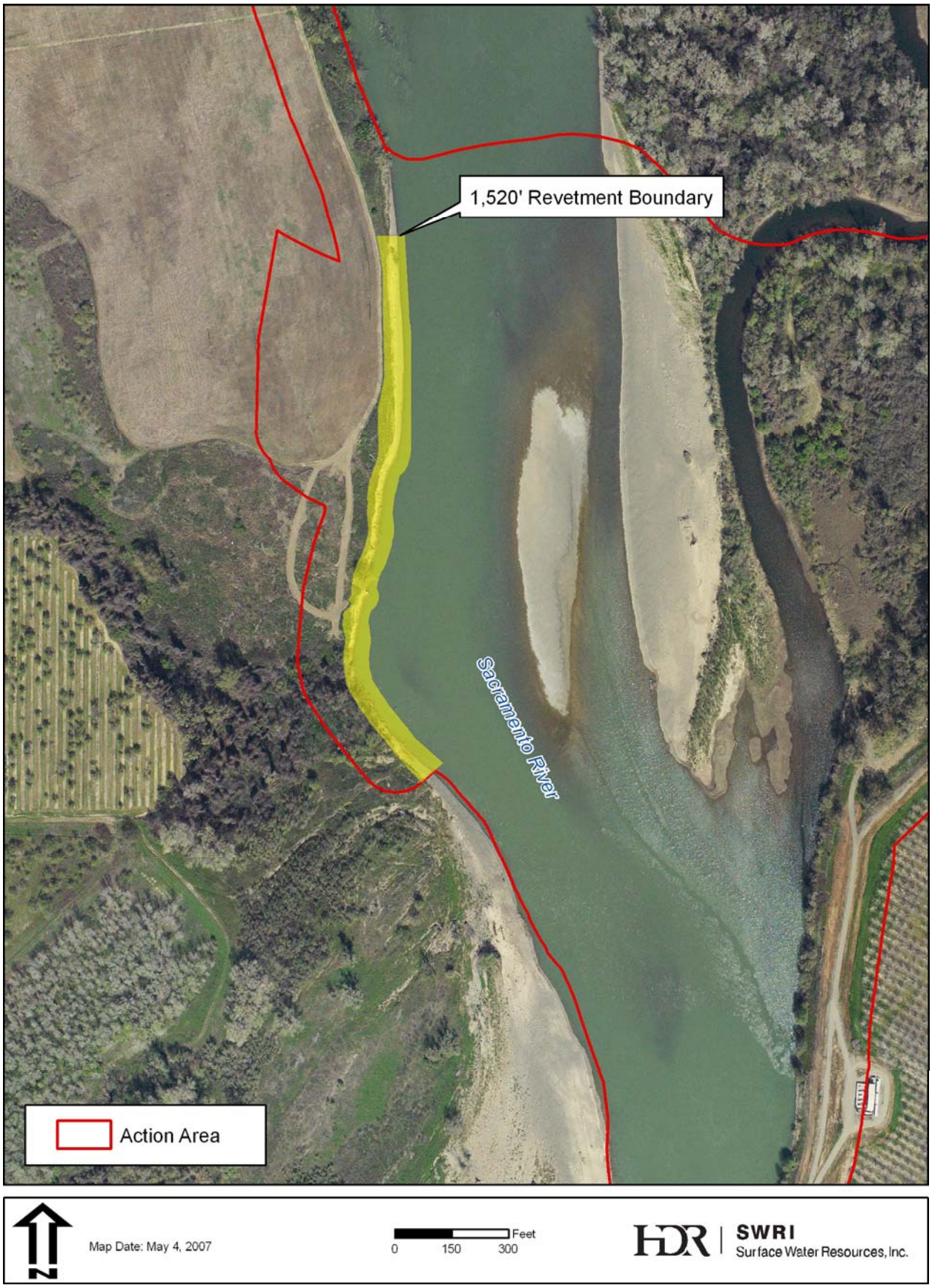

Figure 2-2 Stone Toe and Tree Revetment Plan View

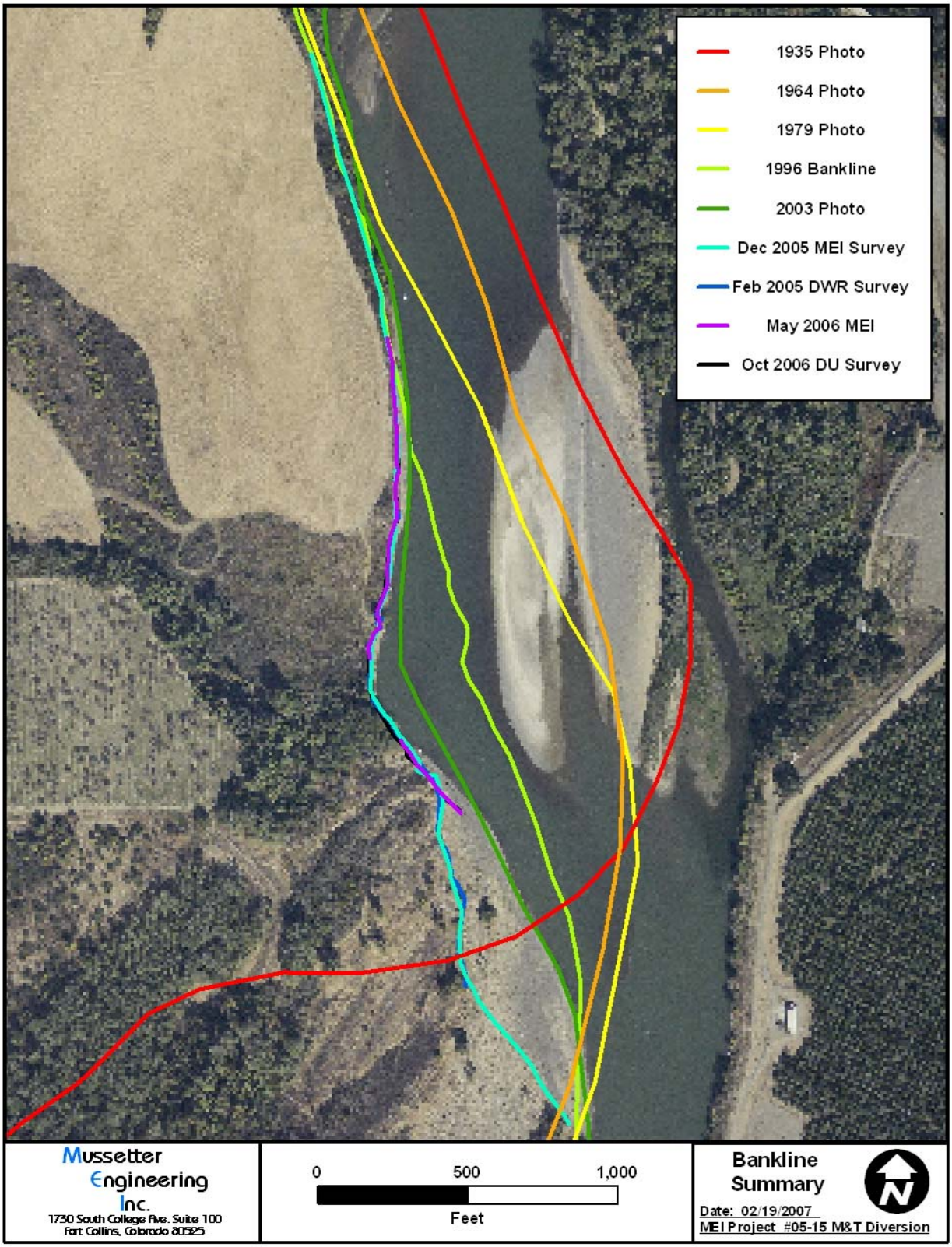

Figure 2-3. Movement of the West Bank of the Sacramento River between 1935 and October 2006

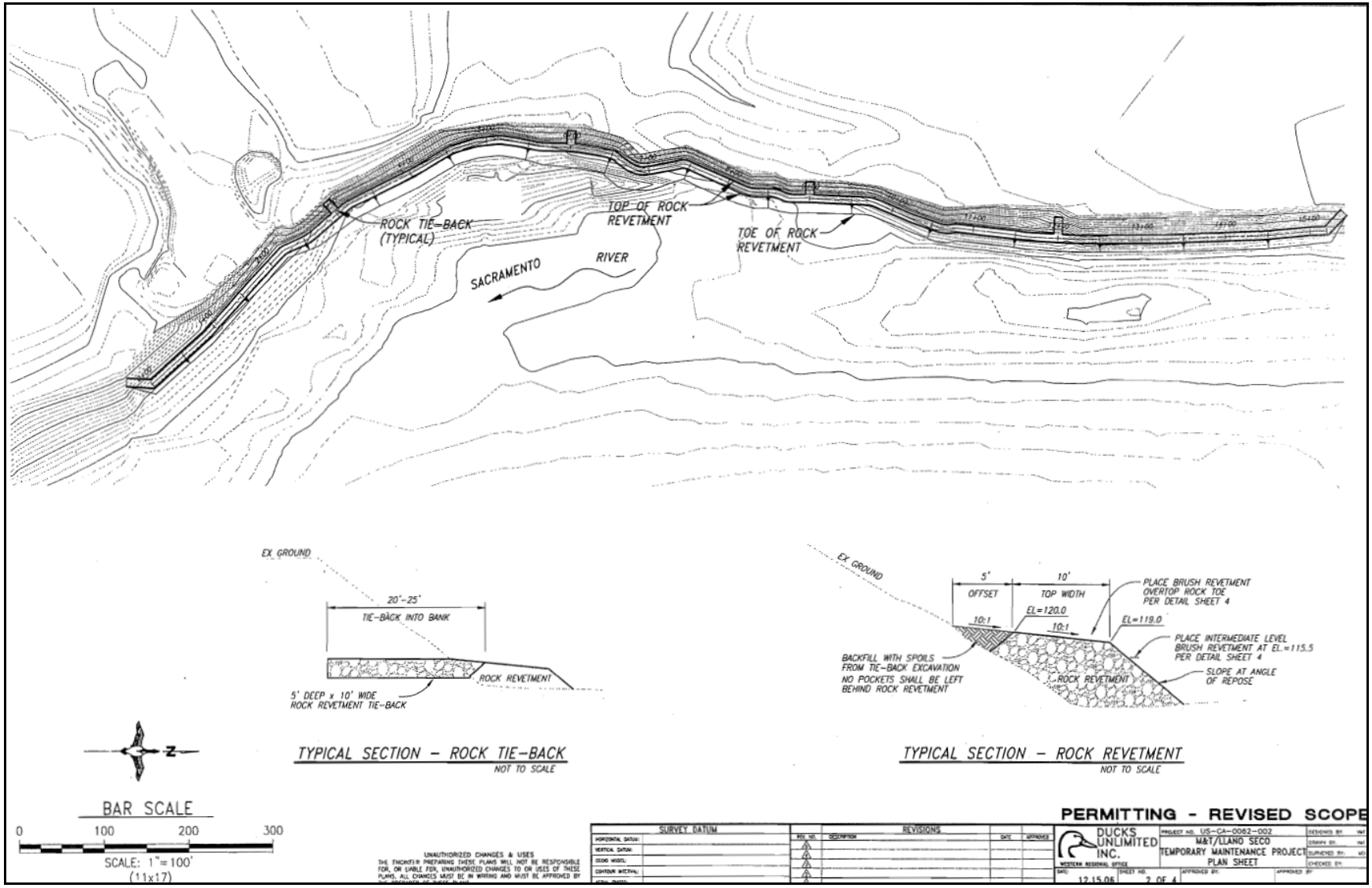

Figure 2-4. Engineering Detail of 1,520 Feet of Rock Toe Revetment on the West Bank of the Sacramento River. – From 2/9 Meeting Materials

2.4.1.2 Design of Longitudinal Stone Toe and Brush Revetment for RM 192.5R

The primary objective of placing a longitudinal stone toe with tree revetment at RM 192.5R on the Sacramento River is to stabilize the site to protect the M&T Chico Ranch/ Llano Seco Rancho pumping facility's ability to pump water until such time as a long-term solution is implemented. Addition of woody material to the top and within the rock revetment provides an element of self-mitigation for loss of EFH and SRA habitat.

No bank grading is anticipated at the site. Rock will be imported to the site by truck, dumped on a 20-foot wide working area along the top of the nearly vertical 15-foot high bank, and placed in the water at the base of the bank by either a dragline or a long-reach excavator with a 33- to 40-foot reach. Excavation for the rock tiebacks would be conducted with a long-reach excavator. The rate of rock importation and the amount of stockpiled rock on the site would be determined by the contractor and Refuge Manager, based on rate of rock toe placement, to minimize stockpiling.

The volume of rock required to provide toe protection and the size of individual rocks were determined from the USACE design procedure for riprap armor (USACE 1997). Hydraulic information used in selection of the rock size (D50 = 0.75 feet) and the depth of toe scour (4.1 feet) was derived from Mussetter Engineering, Inc's (MEI) two-dimensional hydrodynamic model of the reach (Ducks Unlimited 2005). Rock volumes were increased by a factor of 1.75 to account for the use of quarry rock. Application of the design procedure resulted in a requirement of six tons of rock per linear foot of bank, for a total of 9,120 tons, including four intermediate tiebacks and the up- and downstream tie-ins (Figure 2-4). The rock will extend up approximately half the bank to an elevation of approximately 120 feet above msl and the base of the revetment would be approximately 30 feet wide. The top of the bench would be an average of approximately 10 feet wide.

The brush portion of the revetment would consist of multiple, alternating clusters of trees spaced approximately 10 to 15 feet apart at two elevations. One layer would be installed on the top of the rock toe, and the second layer would be installed at an intermediate elevation to provide instream and object cover at a range of flows (**Figure 2-5**). Each tree cluster would consist of 10 to 16 trees, depending on the size of each tree, and would extend for approximately 40 to 50 feet in length. Trees forming clusters on the top of the rock toe would be oriented in varying directions and would be layered to create a dense mix of branches and roots, and would be anchored to partially sunken large boulders (minimum of 3 feet in diameter) using steel cable. Intermediate clusters of trees would be buried in the rock toe and oriented with either the root wad or branches extending toward the river from the rock toe. It is anticipated that approximately 390 almond trees would be obtained from the M&T Chico Ranch/Llano Seco Rancho for use in the brush revetment. **Error! Reference source not found.** shows an engineering detail drawing of the brush revetment.

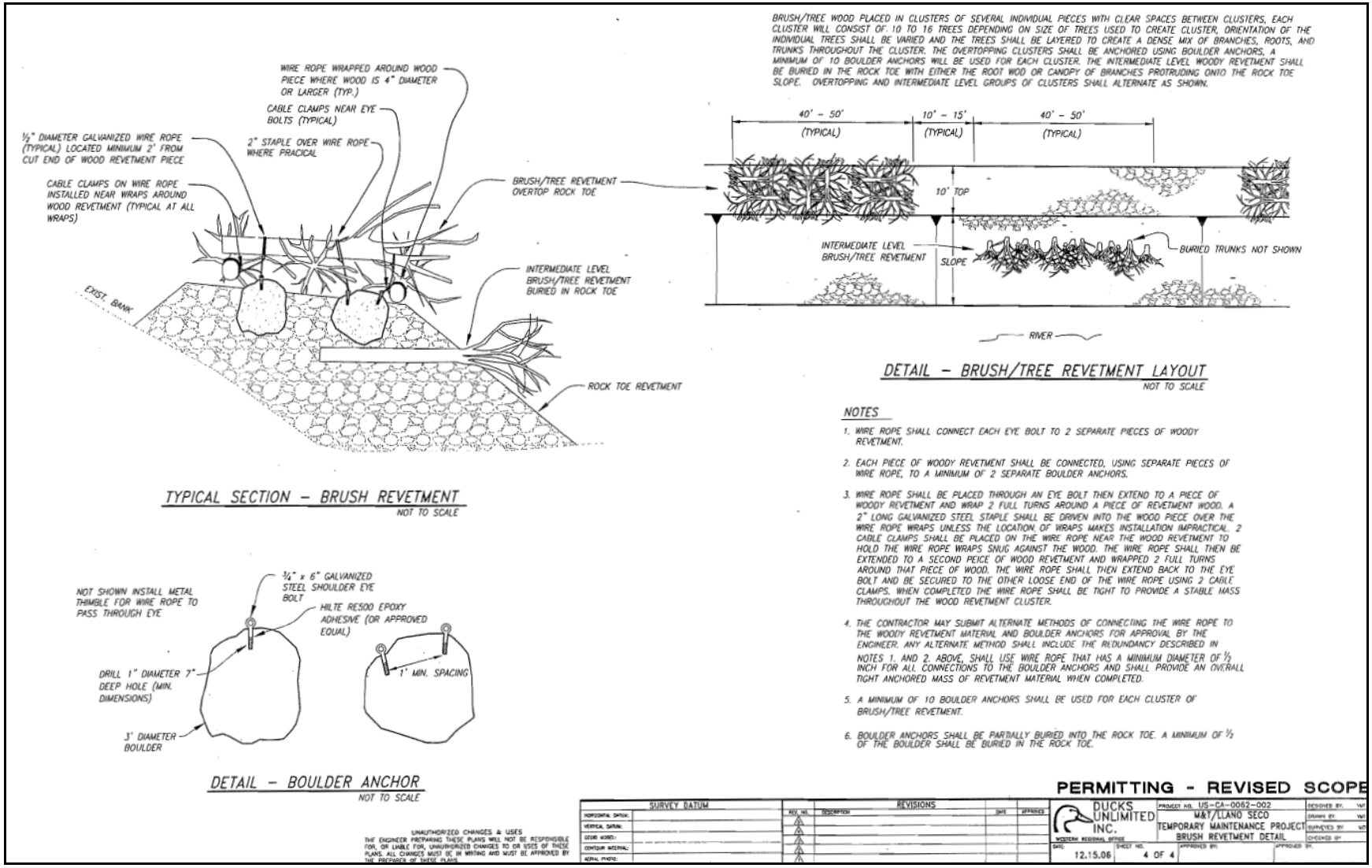

Figure 2-5. Instream Woody Material Tie Down Details (modified from Northwest Hydraulics Consultants Inc. 2005)-Updated in 2/9 Meeting Materials

Riparian habitat that provides terrestrial and aquatic habitat for special status species and species of primary management concern would be removed during construction and would be mitigated at a ratio of 2:1 (i.e., two acres restored for every acre removed). Therefore, live plantings, including willow, alder, and cottonwood trees would be planted between the bank and the top of the rock toe revetment for the length of the revetment. However, it is anticipated that the plantings would not fully mitigate for the removed riparian habitat. Therefore, much of the riparian habitat mitigation would occur at an additional site to be identified prior to the onset of construction. Removed grassland would be mitigated at a ratio of 1:1 (i.e., one acre restored for every acre removed) on the USFWS Sacramento River National Wildlife Refuge. Because the Proposed Action may be a temporary solution to the bank erosion and gravel deposition occurring in the Proposed Action Area, the rock toe and brush revetment could be removed in the future. Therefore, no additional live plantings would be placed on the rock toe revetment itself. Additionally, removal of the rock likely would occur from the top of the bank, and would be subject to acquisition of appropriate permits and independent environmental review under NEPA and CEQA.

The elevation of the top of the outboard portion of the rock berm will be approximately 119 feet. The winter period flow duration curve (Hamilton City gage – CDEC Station ID HMC), and the associated HEC-RAS water-surface elevations, indicate that 119 feet elevation will be inundated at the 42 percent exceedance flow (15,000 cfs) that has an average winter duration of 38 days. The entire structure, including the trees and brush, will be inundated at the 25 percent exceedance flow (24,840 cfs and an elevation of 123 feet msl) that has average winter duration of 23 days (pers. comm., Harvey 2006). A flow duration analysis was not conducted to identify the flow exceedance at which the intermediate clusters would be partially or fully inundated. However, it is expected that the highest branch or root tips of the intermediate clusters would be below the lowest branch or root tips of the tree clusters anchored to the revetment bench (i.e., the top of the revetment) (Figure 2-5). Therefore, it is expected that the intermediate tree clusters would be completely inundated greater than 42 percent of the time, and would be partially inundated substantially more frequently, thus providing velocity refuges and rearing habitat at flows that would occur during most anadromous salmonid outmigration periods.

The stone toe will have a 1:10 cross grade, which will place the outboard portion of the toe at a slightly lower elevation than the inboard elevation (**Figure 2-6**). The 1:10 grade will have the following advantages:

- It will permit construction of the upper-portion (inboard) of the structure completely out of the wetted channel.
- The outboard edges of the trees/brush revetment will "drape" over the rock at an elevation that is less than 119 feet, thereby creating SRA habitat.
- The outboard edges of the trees/brush will be inundated for longer than 38 days at 42 percent exceedence flow.
- The entire structure will be inundated for 23 days at 25 percent exceedance flow.
- It decreases the likelihood of stranding fish when high flows recede.

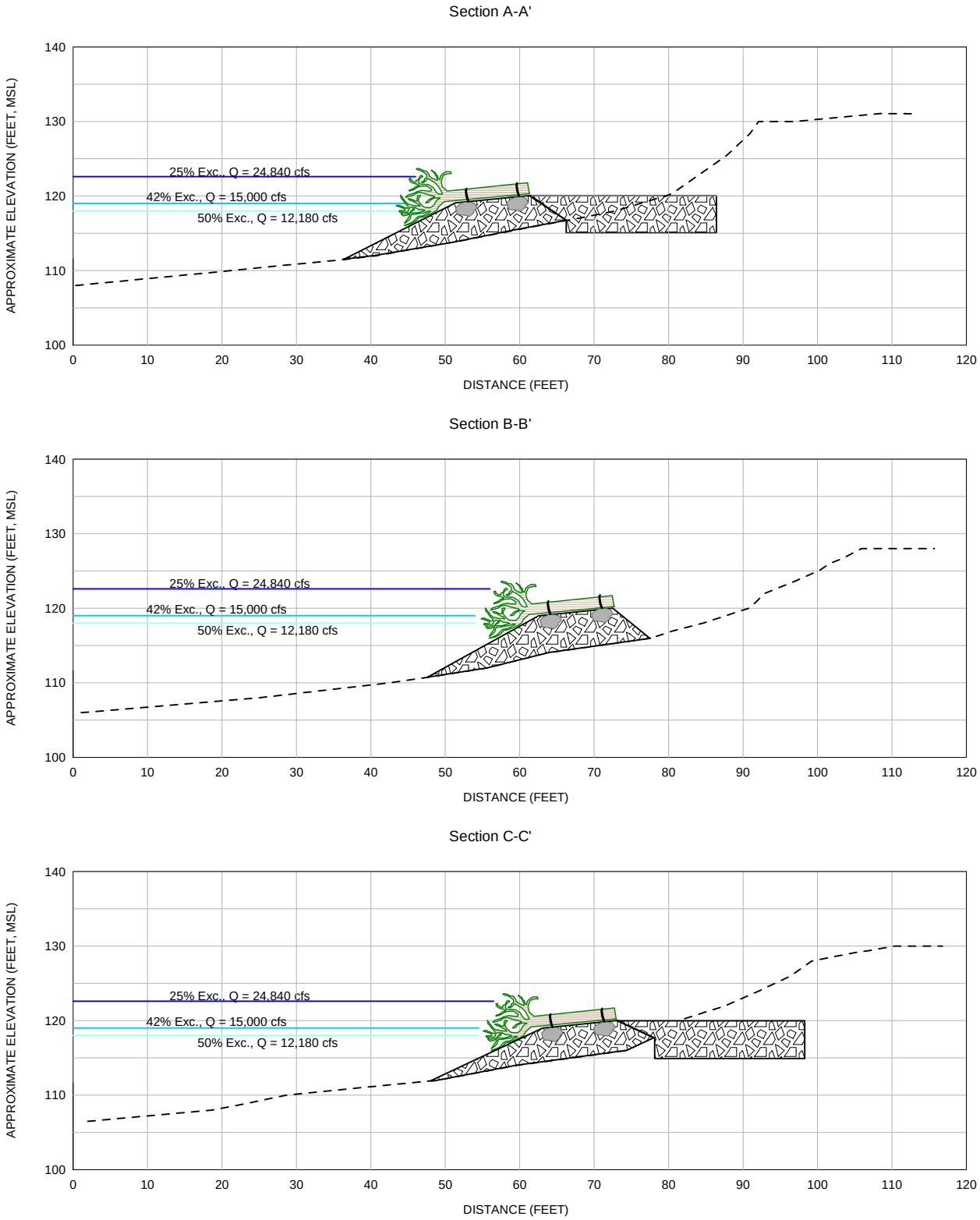

Figure 2-6 Typical Cross-Sections

* Cavity inboard of rock toe depicted in B-B' will be filled and planted with riparian vegetation.

2.4.1.3 Placement of Bank Protection Material

Rock for the toe protection would be placed in the channel with large construction equipment such as long-reach excavators and draglines or other appropriate machinery. Tree and brush would be placed in the revetment area utilizing a crane, or other appropriate machinery.

2.4.1.4 Gravel Removal

In addition to revetment of the west bank of the Sacramento River, the Proposed Action also would entail removing gravel bar material from the river to allow parallel sweeping flows at the pumping site in order to maintain the functionality of the pumping facility and fish screen criteria. The gravel bar removal would occur in three steps, which were used successfully at the site in 2001 (CDFG and City of Chico 2001). The three-step process is detailed below:

1. A temporary stream crossing over Big Chico Creek would be constructed to provide heavy equipment access to the site from the M&T Chico Ranch/Llano Seco Rancho. The crossing would extend from an existing access road on the M&T Chico Ranch/Llano Seco Rancho across Big Chico Creek to the gravel bar. This crossing would include one or more corrugated metal arch culverts covered with gravel fill (**Figure 2-7**), which could be obtained from the gravel bar itself. The crossing would be a 15 to 20-foot wide road bed at the top and would extend approximately 60 to 80 feet across the span of Big Chico Creek and would meet NMFS and CDFG stream crossing criteria by utilizing the Stream Simulation Design Method (CDFG 2002a; NMFS 2001b). The crossing would be removed after construction activities have been completed and the original shoreline contours restored. Some gravel would be left in the creek after removing the culverts. On the gravel bar the stream crossing would extend to the construction site in the center of the bar *via* a compacted gravel pathway. This pathway would require some brush and small tree removal for a short distance (about 50-feet) from the crossing to the open bar. Upon project completion this pathway would be restored to its original state including necessary grading and replanting within the pathway.

2. The excavation area inside the gravel bar would be excavated to about 5 feet below the fall low-flow (4,000 cfs Sacramento River Flow) water surface elevation. During excavation, a 5 to 10-foot berm would be left on the outer edge of the dry bar to separate the Sacramento River and Big Chico Creek from the construction activities. This technique would reduce or eliminate any turbidity caused by the re-suspension of sands and silts during construction. This buffer would isolate turbid seep water in the excavation area from the Sacramento River and Big Chico Creek during construction. Silt would settle in the excavation area and would be subject to re-suspension when high flows capture the area during the winter-spring period.

3. Winter flood flows would complete the reconfiguration of the bar by inundating the excavated area and scouring the outer berm. The gravel removed from the bar would be relocated to a spoils area located approximately 1,000 feet to the east on the M&T Ranch property. The spoils site is located within the floodplain of the river, at an existing gravel storage area. The storage site would not significantly alter floodplain capacity. Gravel and sands from the bar would be dispersed evenly over the storage area and sloped toward the water to alleviate any ponding and eliminate low areas that may pond after flooding and potentially strand juvenile salmonids, Sacramento splittail, and other fishes. The gravel and sand would be made available only for river and floodplain restoration activities at a future

date. If gravels are removed from the storage site, it would be in a progression from the downstream to the upstream end of the storage area, while maintaining the drainage gradient.

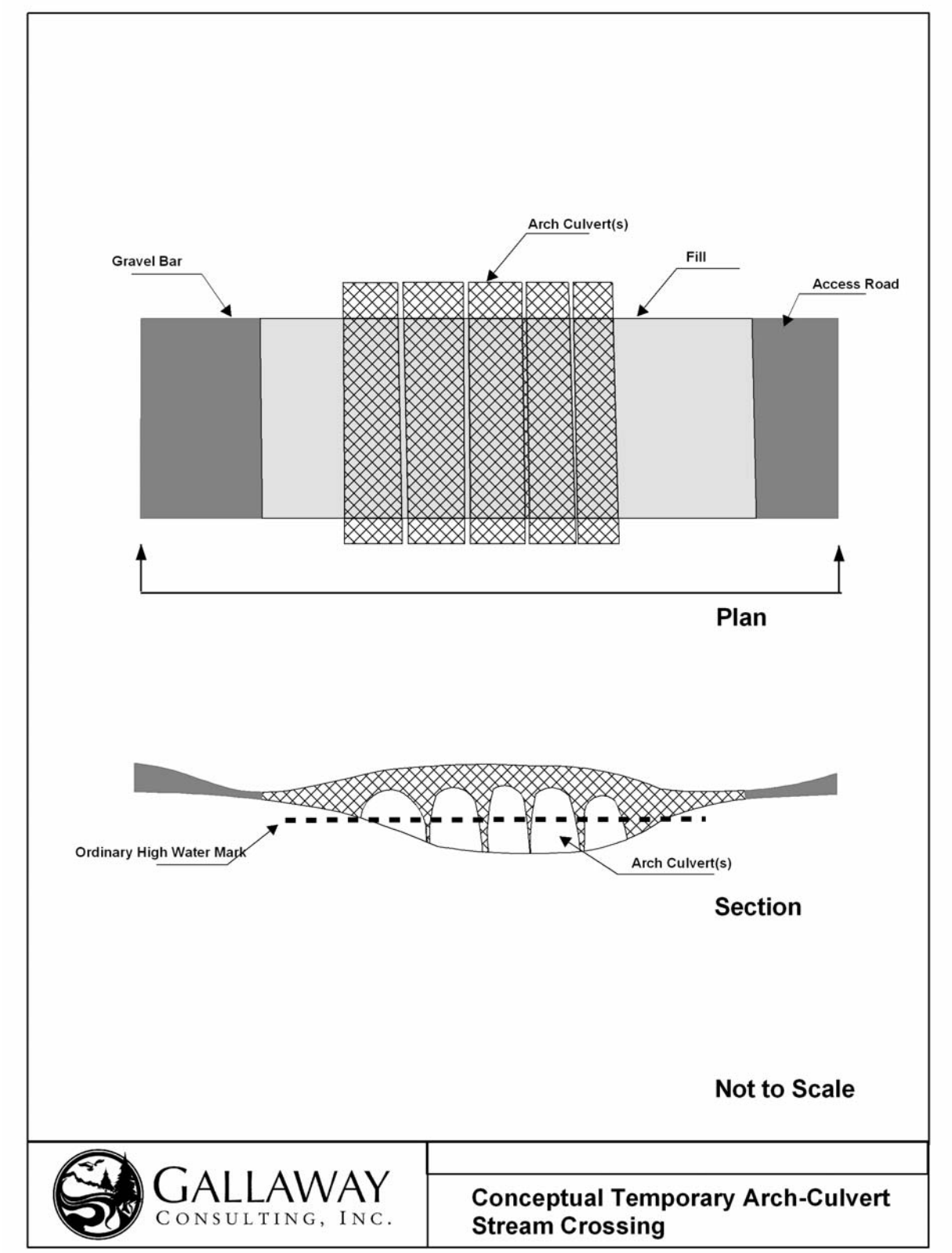

Figure 2-7 Big Chico Creek Culvert Crossing Concept

As mitigation for loss of riparian bar and aquatic backwater habitat, M&T Chico Ranch/Llano Seco Rancho would restore degraded habitat at or near the affected area. Proposed restoration activities would include the removal of non-native vegetation and re-vegetation with native riparian species to provide SRA and/or riparian habitat. As a component of SRA habitat, riparian tree species such as alders, cottonwoods and willows will be planted on the bench between the Instream Woody Material (IWM) and the riverbank.

Material removal of about 156,000-tons could be expected to occur about every four years, or once within the five-year project implementation period. For a conceptual plan of the dredging activities, please refer to **Figure 2-8**.

2.5 CONSTRUCTION SCHEDULE

Construction of the Proposed Action would be performed as soon as possible, during the appropriate work windows of October 1 through October 31, after required permits are issued and ESA consultation is completed. An estimated construction period for revetment and dredging activities, if weather and river conditions are appropriate, is estimated to take two weeks (weather dependent).

2.6 ACCESS AND STAGING

Access to the revetment site would occur *via* an unnamed road on USFWS property that begins at the terminus of County Road 23, south of Hamilton City in Glenn County, California. There would be a staging area west of the revetment site (Figure 2-1), which could potentially impact resources at a CALFED Project site that has already undergone NEPA/CEQA EA/EIR review. The environmental compliance document for the previous CALFED Project is known as the "Final EIR – Sacramento River- Chico Landing Sub-reach Habitat Restoration Planning". Roadway access to the dredging and spoils pile area would occur via River Road, near the River Road crossing over Big Chico Creek. Refer to Figure 2-1 for location of site access points.

2.7 PROJECT COMMITMENTS

The following actions would be implemented as part of the Proposed Action to avoid the potential for direct and indirect adverse impacts to environmental resources resulting from project construction and/or operations.

2.7.1 Biological Resources

- Pre-construction surveys for sensitive biological resources will be conducted by qualified biologists. Sensitive resources include species evaluated in Section 3.6.
- Potentially impacted elderberry shrubs will be removed under the USFWS Sacramento National Wildlife Refuge existing incidental take permit or transplanted to an approved area under supervision of a USFWS approved biologist.
- Elderberry shrubs within 100 feet of construction activities will be identified and fenced with high-visibility plastic fencing.

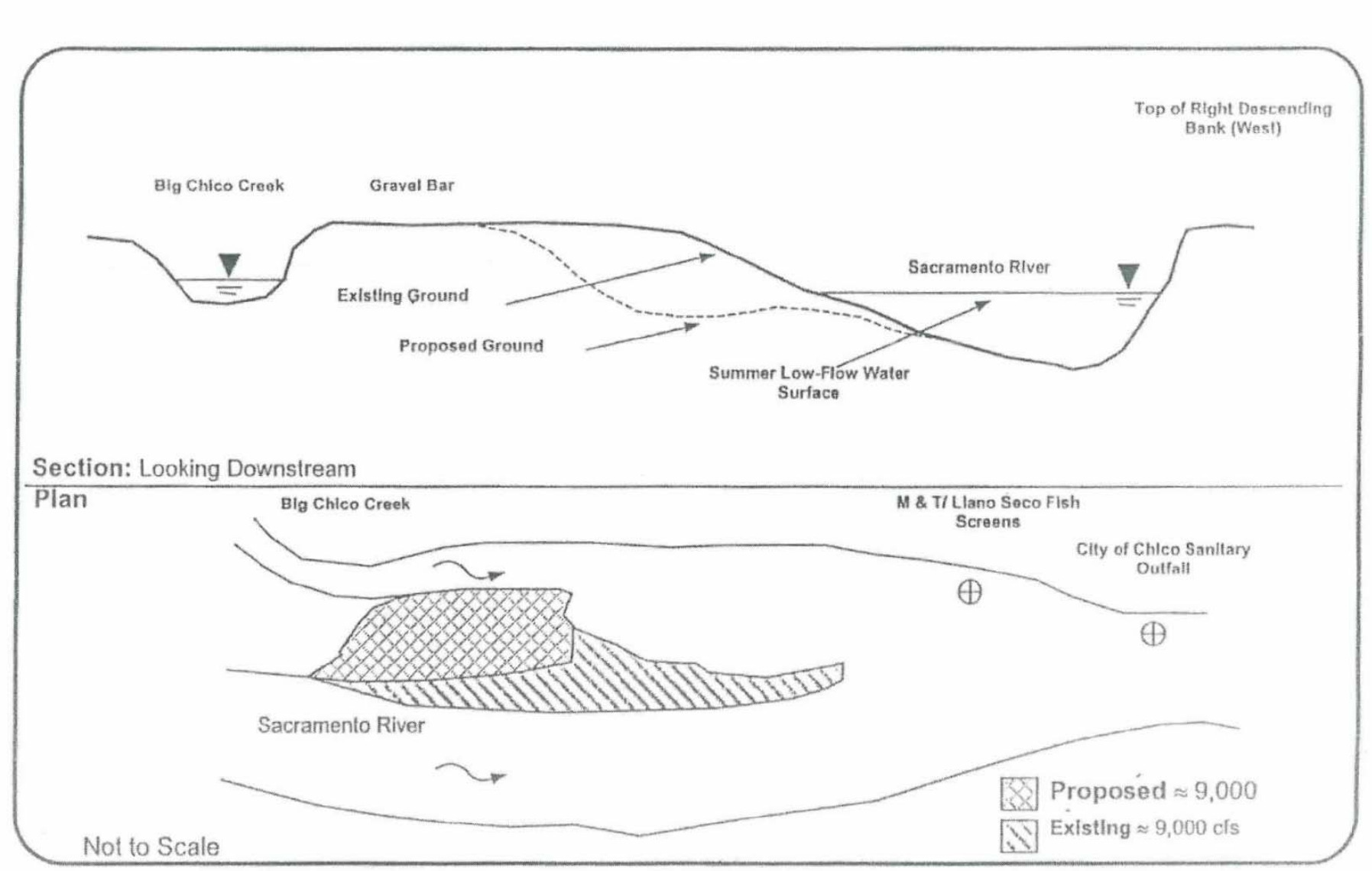

Figure 2-8 Concept Dredging Plan

- The project engineer will stake the limits of the construction footprint in the field. Temporary construction netting (high-visibility plastic fencing) will be placed around nearby vegetation by the contractor to provide protection from construction activities.
- Project personnel will participate in an environmental awareness training program provided by the project biologist. Construction workers will be informed about any sensitive biological resources associated with the project and that disturbance of sensitive habitat or special-status species is a violation of the federal ESA and Section 404 of the Clean Water Act.
- Workers will be informed of the nearshore presence of juvenile listed fish species, including anadromous salmonids and that actions causing injury or death to fish could result in civil or criminal penalties to the individuals who commit such actions.
- Workers will be informed of the need to carefully place rock in order to avoid impacts to juvenile fish.
- Removed riparian vegetation will be restored at a ratio of two (2) acres restored for every acre removed.
- Removed grassland vegetation will be restored at a ratio of one (1) acre restored for every acre removed.
- M&T Chico Ranch/Llano Seco Rancho will develop a plan to avoid, compensate for, and enhance natural vegetation, including riparian habitats and IWM prior to, during, and subsequent to construction activities.
- During construction of the rock toe revetment, a "veneer" of stone less than 8 inches in diameter or "pit run rock" consisting of various sizes of rock that lock together will fill interstitial spaces created by large quarry stone. These measures would reduce the presence of cavities that could be used as refuges for piscivorous fish species.
- Removed bank swallow habitat will be mitigated at a ratio of two (2) linear feet for every linear foot of habitat removed.
- A qualified biological monitor would be present on site during construction.

2.7.2 Cultural Resources

- If buried cultural materials are unearthed during construction, the contractor will halt construction work within 100 feet of any find of buried cultural resources until a qualified archaeologist can assess its significance.
- If human remains are unearthed during construction, the contractor will contact the County Coroner to make the necessary findings of origin and disposition in accordance with Public Resources Code 5097.98.

In both cases, the contractor also would contact the lead agencies immediately.

2.7.2.1 Air Quality

- The contractor will ensure that a water truck is present in the project area and surrounding non-paved roads to water the roadways in order to minimize dust and other particulate matter

- The contractor will incorporate as many standard mitigations and best management practices as feasible, as detailed in the Butte County Air Quality Management Districts *Indirect Source Review Guidelines.*

2.7.2.2 Drainage and Water Quality

- M&T Chico Ranch/Llano Seco Rancho will apply for certification from the Central Valley Regional Water Quality Control Board (RWQCB) under section 401 of the Clean Water Act, and implement an Erosion Control Plan and Post Construction Stormwater Management Plan (PCSWMP).
- A Storm Water Pollution Prevention Plan (SWPPP), provided by the contractor prior to the onset of construction activities will be implemented as required by the conditions of a National Pollution Discharge Elimination System (NPDES) permit.
- Hazardous materials, which could be present during project construction, will be limited to petroleum products. M&T Chico Ranch/Llano Seco Rancho will develop a Hazardous Materials Control, Spill Prevention, and Response Plan (HMCSPRP) to reduce the potential effects of hazardous materials use and spills.

2.7.2.3 Hazards and Hazardous Materials

- The possibility exists that fuels, lubricants, and other construction materials could enter the human environment during construction. The HMCSPRP and SWPPP will include provisions to ensure that potential effects associated with hydrocarbon use would be minimized.

2.7.2.4 Best Management Practices

Best Management Practices provided by the contractor will be implemented and will include:

- Preventing any substances that could be hazardous to aquatic life from contaminating the soil or entering watercourses, including ditches and canals.
- Establishing a HMCSPRP before project construction that includes strict on-site handling rules to keep construction and maintenance materials out of drainage and waterways.
- Training all construction personnel in the proper use and cleanup of potentially hazardous materials.
- Cleaning up all spills immediately according to the HMCSPRP, and notify CDFG and the Central Valley RWQCB immediately of spills and cleanup procedures.
- Providing staging and storage areas for equipment, materials, fuels, lubricants, solvents, and other possible contaminants away from watercourses and their watersheds

2.8 EQUIPMENT AND MATERIALS

Heavy equipment to be used during construction on both components of the Proposed Action will include:

- Bucket Loader
- Dump Truck
- Excavator
- Dragline
- Water Truck
- Grader

2.9 PERSONNEL

A base project crew of three persons will be required throughout most of the construction period. Crew size will peak at about five personnel.

2.10 MULTI-SPECIES CONSERVATION STRATEGY AND CONSERVATION MEASURES

2.10.1 Multi-Species Conservation Strategy

The Multi-Species Conservation Strategy (MSCS) developed two types of conservation measures for achieving NCCP community and evaluated species goals (CALFED 2000c):

- Measures to avoid, minimize, and compensate for CALFED's adverse effects on evaluated species and NCCP communities; and
- Measures to enhance evaluated species and NCCP communities that are not directly linked to CALFED's adverse impacts.

The first type of measure is designated to offset CALFED's adverse effects, including potential effects associated with the Proposed Action. Measures to avoid, minimize, and compensate for the Proposed Action will be undertaken by the CALFED agencies involved. The second type of conservation measures generally represents refinements to portions of the ERP, and other elements of CALFED, including the Proposed Action, that will benefit NCCP communities and evaluated species. These enhancement measures also will be undertaken by the CALFED agencies involved. The discussion below describes both types of conservation measures associated with the Proposed Action for NCCP communities and evaluated species.

2.10.1.1 Evaluated Species - Conservation Measures to Avoid, Minimize, and Compensate

These conservation measures represent a menu of options to avoid, minimize, and compensate for CALFED adverse effects on evaluated species (CALFED 2000c). These conservation measures apply to all species with which the "Recovery," "Contribute to recovery" and "Maintain" goals are associated.

"Recovery" goals are goals assigned to evaluated species whose recovery is dependent on restoration of the Delta and Suisun Bay/Marsh ecosystems and for which CALFED could reasonably be expected to undertake all or most of the actions necessary to recover the species. The term "Recovery" means that the decline of a species is arrested or reversed and threats to the species are neutralized and that the species' long-term survival in nature is therefore assured.

Fish species evaluated in this ASIP that have an assigned "Recovery" goal include Sacramento River winter-run Chinook salmon, Central Valley spring-run Chinook salmon, Central Valley steelhead, green sturgeon and Sacramento Splittail. The VELB is the only terrestrial species that has been assigned a "Recovery" goal that is evaluated in this ASIP.

"*Contribute to recovery"* goals are goals assigned to evaluated species where CALFED actions affect only a limited portion of the species range and/or CALFED actions have limited effects on the species. The goal of contributing to a species' recovery means that CALFED will undertake the actions under its control and within its MSCS Problem area that is necessary to recover the species (CALFED 2000c). No fish species evaluated in this ASIP have been assigned a "*contribution to recovery*" goal. Terrestrial species evaluated in this ASIP that have an assigned "*contribution to recovery*" goal include western yellow-billed cuckoo, bank swallow, and Swainson's hawk.

"*Maintain*" goals are goals assigned to species expected to be minimally affected by CALFED actions. The MSCS requires that CALFED's actions adverse effects on species in this category be avoided, minimized, or compensated for. The avoidance, minimization, and compensation measures for these species may not contribute to their recovery, but would ensure that CALFED actions do not degrade the status of the species or contribute to the need to list the species. CALFED also is expected, where practicable, to take advantage of opportunities to improve conditions for these species. Hardhead is the only species evaluated in this ASIP that has an assigned "Maintain" goal. Terrestrial species evaluated in this ASIP that have an assigned "Maintain" goal include bald eagle, white-tailed kite, osprey, and northwestern pond turtle.

Appropriate conservation measures to avoid, minimize, and compensate potential adverse effects have been incorporated into this ASIP as part of the Proposed Action. Conservation measures are described below and in *Chapter 4: Effects of the Proposed Action and Development of Conservation Measures.*

2.10.1.2 Evaluated Species - Conservation Measures to Enhance

These enhancement conservation measures represent the range of actions that may be required to ensure that prescriptions (species habitat or population targets that, if met, achieve species goals) are achieved for species with a "Recovery" or "contribute to recovery" goal. Appropriate conservation measures to enhance evaluated species have been incorporated into this ASIP as part of the Proposed Action.

Specific measures to enhance as part of the Proposed Action that are consistent with the CALFED Program include the following:

- Restoration of riparian habitat, SRA cover along the Sacramento River and its tributaries; and reduction of populations of invasive non-native riparian plants
- Reduction in the adverse effects of diversions on fish

2.10.1.3 Natural Community Conservation Planning Communities - Conservation Measures to Avoid, Minimize, and Compensate

Conservation measures for NCCP communities are primarily directed at conserving the quality and quantity of natural habitats. Where a CALFED action, including the Proposed Action, would result in the permanent loss of natural NCCP habitats, restoration, enhancement, or protection of in-kind habitat would typically be required to compensate for the loss. Therefore, if the Proposed Action were to result in the loss of habitat, the CALFED agencies involved would have to incorporate an adequate array of compensatory conservation measures into this ASIP, and clearly identify the compensatory habitat. The Proposed Action would result in the permanent loss of valley foothill riparian habitat, a natural NCCP habitat. However, compensatory measures are included in **Table 2-1**.

2.10.1.4 Natural Community Conservation Planning Communities - Conservation Measures to Enhance

The MSCS incorporates conservation measures to enhance the condition of those NCCP communities with which the "Recovery" and "contribute to recovery" species are associated. The Proposed Action was refined to further enhance its benefits to these evaluated species by including the conservation measures presented in *Chapter 4 - Effects of the Proposed Action and Development of Conservation Measures*. These refinements, or enhancement conservation measures, also enhance the condition of the NCCP communities for which each of the "Recovery" and "contribution to recovery" evaluated species are associated.

2.10.2 Conservation Measures

Based on results of biological surveys conducted in the Proposed Action Area and an evaluation of the potential adverse effects that may directly or indirectly affect protected species and/or habitats, a series of conservation measures were identified and have been incorporated as part of the Proposed Action description. Conservation measures have been included for anadromous salmonid species, non-salmonid species, valley elderberry longhorn beetle, bald eagle, western yellow-billed cuckoo, bank swallow, Swainson's hawk, white-tailed kite, osprey, northwestern pond turtle, and critical habitat, and EFH for winter-run Chinook salmon, spring-run Chinook salmon and fall/late fall-run Chinook salmon. Conservation measures are briefly discussed and summarized in Table 2-1.

The following section outlines the types of conservation measures that have been incorporated into the Proposed Action to avoid, minimize, and compensate for adverse effects on listed species. The details of the various conservation measures are discussed in *Chapter 4, Effects of the Proposed Action and Development of Conservation Measures*.

Table 2-1. Summary of conservation measures incorporated into the project description

Purpose	Conservation measure	
	Monitoring	**Management Action**
Fish and EFH Conservation Measures		
Turbidity control to reduce effects on aquatic species.	Turbidity monitoring twice daily during periods when construction may create turbid conditions.	Placement of sediment curtains around affected area.
Control of petroleum product discharges.	On-going construction monitoring to ensure compliance with RWQCB regulations.	Comply with RWQCB permit conditions, including provisions for control of petroleum discharges and erosion control during construction.
		Placing staging and maintenance areas outside of drainage to watercourses
		Replanting erodable areas immediately following completion of construction.
Valley Elderberry Longhorn Beetle Conservation Measures		
Avoid impacts to VELB on the east side of the river.	Monitor as necessary following the USFWS guidelines.	Transplant E04, E05, and E07 as permitted by USFWS under their authority granted within the programmatic Section 7 consultation #1-1-98-F-13 and implement the USFWS guidelines for mitigating project effects on the VELB to compensate for Proposed Action effects on the species.
Bald Eagle Conservation Measures		
Avoid and minimize effects of construction activity on species		Avoid or minimize construction-related disturbances that could be associated with the Proposed Action within 0.5 mile of active nest sites (February – July) and winter roosting sites (November–February)
Avoid actions that could result in the loss of traditional nesting trees or degradation of natural habitat within 0.5 mile of traditional nest trees.		Avoid or minimize disturbance to existing habitat.
Western Yellow-billed Cuckoo		
Avoid and minimize effects of construction activity on species.		Conduct pre-construction surveys in suitable habitat to determine the presence and distribution of the species.
		Avoid and minimize actions that could degrade or result in the loss of suitable nesting habitat within the species current and historical range. Habitat will be restored as part of the Valley/Foothill Riparian habitat restoration efforts.
		Avoid Proposed Action activities near active nest sites that could result in disturbance during the breeding period (May – August).
Bank Swallow Conservation Measures		
Avoid or minimize actions that could adversely affect known colonies or unoccupied river reaches with eroding banks composed of soils that would provide suitable nesting substrate.		Mitigate for lost bank swallow habitat by restoring, enhancing, or conserving in perpetuity 2 linear feet of habitat for every linear foot of affected habitat as close as reasonably possible to where impacts are incurred. A detailed mitigation plan for bank swallow will be prepared by the Project Proponent and approved by CDFG prior to the onset of construction activities.
		Pre-construction surveys of Proposed Action Area no more than 15 days prior to construction during the nesting season (March 1 – July 31).
		Avoid actions near active nesting colonies from March 1 – July 31.
		Avoid creating suitable, but temporary nesting habitat that could create population sinks.
		Coordinate protection and restoration of channel meander belts and existing bank swallow colonies with other Federal and State programs in the affected reach.
Swainson's Hawk Conservation Measures		
Avoid and minimize effects of construction activity on nesting hawks.	Monitoring per CDFG requirements if nest disturbance avoidance measures are required during construction.	Conduct CDFG-recommended protocol-level nesting surveys March-June within 0.5 mile of the Proposed Action Area;
		Consultation with CDFG to determine effects and develop minimization plan, including possible changes in construction activity.
		Compliance with CDFG-approved impact minimization plan
White-tailed Kite Conservation Measures		
Avoid and minimize effects of		Avoid or minimize construction-related disturbances that could be

Purpose	Conservation measure	
	Monitoring	**Management Action**
construction activity on species.		associated with the Proposed Action within 0.25 mile of active nest sites during the nesting period (February – August).
		Conduct surveys in suitable nesting habitat within 0.25 mile of construction to locate active nest sites prior to construction.
Minimize temporary or permanent loss of degradation of existing habitat where construction and maintenance activities result in removal of riparian vegetation.		Avoid or minimize disturbance to existing habitat.
Osprey Conservation Measures		
Avoid and minimize effects of construction activity on species		Conduct pre-construction surveys in suitable habitat to determine the presence and distribution of the species.
		Avoid or minimize construction-related disturbances that could be associated with Proposed Action within 0.25 miles of active nest sites during the nesting period (March – August)
Minimize temporary or permanent loss of degradation of existing habitat where construction and maintenance activities result in removal of riparian vegetation		Avoid or minimize disturbance to existing habitat.
Northwestern Pond Turtle Conservation Measures		
Avoid and minimize effects of construction activity on species.		Where the Proposed Action would adversely affect occupied habitat, enhance or restore 1 acre of suitable habitat near affected areas for every acre of occupied habitat affected. For this project 0.21 acres of suitable backwater habitat (Valley Riverine Aquatic) will be affected and 0.21 acres of suitable habitat will be enhanced or restored in the vicinity of the affected area within 1 year of project initiation. This habitat will be compensated for with Instream Woody Material /SRA as part of the mitigation for loss of SRA
		To the extent practicable, capture individuals from habitat that would be affected by the Proposed Action, and relocate them to nearby suitable existing, restored, or enhanced habitat.
Valley/Foothill Riparian		
Minimize temporary or permanent loss or degradation of existing habitat where construction and maintenance activities result in removal of riparian vegetation.		Avoid or minimize disturbance to existing riparian vegetation.
Minimize loss or degradation of existing SRA overhead cover along channels if construction activities result in removal of riparian adjacent to channels.		Restore or enhance 2 acres of additional in-kind habitat for every acre of affected habitat near where impacts are incurred. For this project 3.46 acres of habitat will be restored or enhanced between the bank and the rock toe revetment, and at an off-site area to be determined prior to the onset of construction activities.
Valley Riverine Aquatic		
Minimize temporary or permanent loss or degradation of existing habitat during construction and maintenance activities.		Avoid or minimize disturbance to existing SRA overhead.
		Restore or enhance 2 acres of SRA for every acre of affected habitat near where impacts are incurred. Native riparian plant species will be planted between the bank and the rock toe revetment. Additionally, the incorporation of tree clusters in the rock revetment will mitigate for removed SRA.

2.11 ALTERNATIVES CONSIDERED BUT NOT EVALUATED THAT WOULD NOT RESULT IN TAKE OF LISTED SPECIES

All of the alternatives, including the No-Action/No-Project Alternative, could result in the "take" of listed species. Terrestrial listed species include the federally threatened VELB, and the state threatened bank swallow and Swainson's hawk. Listed aquatic fish species include the federally and state endangered winter-run Chinook salmon, the federally and state threatened spring-run

Chinook salmon, the federally threatened steelhead, the federally threatened southern DPS of green sturgeon. A summary of the reasoning is provided below.

2.11.1 No-Action/No-Project Alternative

The No Action/Project Alternative was developed to meet the requirements of NEPA and CEQA and to serve as a baseline for assessing the impacts of proposed actions. The No Action/Project Alternative includes the actions, practices, and land uses that would be assumed to occur at the project site without Federal funding authorized by the CALFED Program. Under the No Action/Project Alternative alternate sources of funding would be acquired before M&T Chico Ranch/Llano Seco Rancho could implement the removal of accumulated gravel upstream of their diversion facilities.

Under the No Action/Project alternative, if M&T Chico Ranch/Llano Seco Rancho is unable to pump water from the Sacramento River, the ranches could divert water from Butte Creek in accordance with the 1991 agreement for the relocation of pumping plant to the Sacramento River. If the M&T Chico Ranch/Llano Seco Rancho divert water from Butte Creek, the loss of up to 40 cfs would have a detrimental effect on spring-run Chinook salmon in Butte Creek. The No-Action/Project alternative would result in continued erosion of the right (west) bank, and growth of the in-channel gravel bar upstream of the diversion. In addition, maintenance of the existing pumping facility would be restricted to normal maintenance of existing facilities such as debris removal.

The No Action/Project Alternative would adversely affect the ability of the pumping facility to deliver adequate water supplies to the ranches, the state and federal wildlife refuges, and other downstream wildlife management areas that depend on the pumps for their water supply while meeting existing fish screening criteria. In accordance with the agreement to provide flows for fisheries and wildlife purposes associated with the relocation of the M&T/Parrott Pumping Plant (1991 Agreement) (M&T Chico Ranch *et al.* 1991), if M&T Chico Ranch/Llano Seco Rancho's ability to pump water from the Sacramento River is lost, flows in Butte Creek dedicated under the 1991 Agreement likely would be reduced. The water retained at the M&T Chico Ranch/Llano Seco Rancho would be sufficient to irrigate 1,000 acres of farmland or managed wetlands and would be critical to the economic viability of the ranch. Additionally, continued gravel bar migration downstream on the east (left) bank of the river, could compromise the operation of the City of Chico's WWTP outfall. Based on observed erosion rates at the site between 1996 and 2006 (annual erosion rates have ranged from about 20 to 60-ft/year, with up to 100-feet per year during wet winters), erosion could be between 100 and 500-feet over the five-year period. Analysis of sediment transport and deposition at the bar upstream of the M&T Chico Ranch/Llano Seco Rancho pumping facility (Ducks Unlimited 2004) indicated that the average annual rate of deposition was likely to be about 43,000 tons.

2.11.1.1 Fish Species

The No Action/No Project Alternative would result in continued deposition and expansion of the in-channel gravel bar located upstream of the M&T Chico Ranch/Llano Seco Rancho diversion in the Sacramento River. In addition, the continued downstream migration of the gravel bar could compromise the operation of the City of Chico's WWTP outfall. Between 1996 and 2006, annual erosion rates have ranged from about 20 to 60-ft/year, with up to 100-feet per year during

years characterized by high, winter flows. As previously discussed, erosion could be between 100 to 500 feet over the 5-year analytical period. Analysis of sediment transport and deposition at the bar upstream of the M&T Chico Ranch/Llano Seco Rancho pumping facility and City of Chico WWTP outfall indicated that the average annual rate of deposition was likely to be about 43,000 tons. Based on the assumptions included in the river modeling of the site, the gravel bar would continue to extend downstream toward the pumping facility, compromising the ranch's ability to divert water for their water supply commitments while meeting existing fish screen criteria.

The No Action/Project Alternative also would result in continued erosion of the right (west) bank would occur as a result of flood flows, wave wash, and human use of the site. The western bank would continue to meander. Short-term turbidity (and subsequent downstream sedimentation) would be associated with bank erosion events, although turbidity (and sedimentation) would be masked if erosion occurs during high-flow events when the river is already extremely turbid. The continued erosion of the bank would result in the continued natural meander of the river, which would result in the creation of some habitat element, and the loss of others, including: (1) the creation of instream scour pools; (2) recruitment of IWM, (3) the continued exposure of loose sand substrates; (4) the predominance of relatively high bank slope; and (5) a continued loss of SRA. The combination of these factors results in a relatively high predation risk to sensitive species. In addition, continued erosion of the west bank of the Sacramento River would be expected to result in some recruitment of IWM at the 250-foot bankline area of the Valley/Foothill Riparian habitat near the downstream end of the Proposed Action Area. However, as flows continue to undercut and erode this existing stand of vegetation, erosional forces will facilitate the loss of existing SRA cover.

The combination of the above factors would adversely impact the performance of the M&T Chico Ranch/Llano Seco Rancho pumping facility. Specifically, it is anticipated that NMFS/CDFG anadromous salmonid sweeping velocity criteria would no longer be able to be met, resulting in potential increased impingement of juvenile anadromous salmonids at the screen, and increased predation risk associated with lower water velocities proximate to the artificial structure in the river; thereby resulting in potential take of Sacramento River winter-run Chinook salmon, Central Valley steelhead and Central Valley spring-run Chinook salmon. Although specific screening criteria have not been developed for green sturgeon, reduced sweeping velocities have potential for increased impingement, entrainment, and predation potential of green sturgeon, potentially resulting in take.

In addition, the combination of the above factors would adversely impact the ability of the M&T Chico Ranch/Llano Seco Rancho pumping facility to deliver adequate supplies of water to both of the ranches, and the State and Federal wildlife refuges and wildlife management areas that depend upon the pumps for their water supply. In accordance with the agreement for relocation of M&T/Parrott Pumping Plant (M&T Chico Ranch *et al.* 1991) providing for bypass flows in Butte Creek, if M&T Chico Ranch/Llano Seco Rancho cannot pump water from the Sacramento River, flows in Butte Creek dedicated under the Agreement will be reduced. Reduction of flows in Butte Creek could reasonably be expected to degrade aquatic resources habitat values, suitability and utilization, resulting in potential take of Central Valley spring-run Chinook salmon and Central Valley steelhead.

2.11.1.2 Terrestrial Species

The No Action/Project Alternative could result in continued erosion of the west bank of the Sacramento River. Specifically, continued erosion could threaten known elderberry shrubs that currently are set back from the bank, potentially resulting in loss of VELB habitat. Loss of VELB habitat may result in "harm" (a form of "take") to the VELB.

No "take" of state-listed species, including bank swallow or Swainson's hawk would occur as a result of habitat loss because the definition of "take" under the California ESA applies only to individual members of a listed species. For example, continued erosion of the west bank of the river could potentially cause loss of mature Swainson's hawk nesting trees. However, because erosion would not result in loss of individual hawks, no "take" under CESA would occur.

2.11.2 Alternative B – Dredging/ Material Removal

2.11.2.1 Fish Species

The dredging/material removal only alternative could result in "take" of specific species in the Sacramento River. First, a temporary loss of SRA at Big Chico Creek associated with construction of the access road to the gravel bar potentially could represent "take". Second, continued deposition and expansion of the gravel bar subsequent to the initial dredging, at a rate equal to or exceeding rates observed over the past 5 years would result in reduced Sacramento River intake structure screen performance. Reduced screen performance would result from reduced sweeping velocities and the associated increased potential for impingement and entrainment, and the increased predation risk associated with reduced velocities at an artificial structure. Therefore, the dredging/material removal alternative would represent "take" of Sacramento River winter-run Chinook salmon, Central Valley spring-run Chinook salmon, and Central Valley DPS of steelhead. Although Section 4(d) take prohibitions of green sturgeon have yet to be issued, decreased screen performance and increased predation risk represent potential direct mortality to the southern-distinct DPS of green sturgeon.

2.11.2.2 Terrestrial Species

Alternative B, which includes only dredging of the gravel bar on the east bank and does not include revetment of the west bank, could result in continued erosion of the west bank of the Sacramento River. As previously discussed, continued erosion could threaten known elderberry shrubs that currently are set back from the bank, potentially resulting in loss of VELB habitat. Loss of VELB habitat may result in "harm" (a form of "take") to the VELB. No "take" of state-listed species would occur.

3.0 ENVIRONMENTAL BASELINE

In this ASIP, the environmental baseline defines the status of the species, habitats, and associated environmental parameters against which the effects of the Proposed Action are measured. The environmental baseline includes: (1) past and present impacts of all federal, state, or private actions and other human activities in the Proposed Action Area; (2) anticipated impacts of all proposed Federal projects in the Proposed Action Area that have completed early or formal consultation and received "no jeopardy" biological opinions or "jeopardy" biological opinions with RPAs; and (3) impacts of State or private actions that are contemporaneous with the consultation in progress.

3.1 INTRODUCTION TO SPECIES ACCOUNTS

Chapter 3 presents detailed species accounts for the special-status species addressed in this ASIP. The species addressed are based on a combination of factors including the following:

- Species listed as threatened or endangered under the federal ESA
- Species proposed for listing under ESA
- Species considered candidates for listing under ESA
- Federal species of concern
- Species that have been identified as having EFH by NMFS
- Species listed as threatened or endangered under the CESA
- Species considered candidates for listing under CESA
- Fully protected species under the California Fish and Game Code
- California species of special concern
- Other native species of concern to the CALFED Program that are included in the MSCS
- Presence in the Proposed Action Area

Species accounts for anadromous salmonids are provided in Section 3.2; species accounts for non anadromous salmonid fish are provided in Section 3.3; species accounts for terrestrial wildlife are provided in Section 3.4; and a description of NCCP communities that fall within the Proposed Action Area are provided in Section 3.5. The species accounts are organized by federal then state designation. No special-status plants occur within the Proposed Action Area; therefore, no species accounts are provided for plants.

3.2 SPECIES ACCOUNTS FOR ANADROMOUS SALMONIDS

Described below are species' accounts for Sacramento River winter-run Chinook salmon, Central Valley spring-run Chinook salmon, Central Valley fall-run/late fall-run Chinook salmon and Central Valley steelhead.

3.2.1 Chinook Salmon

Adult Chinook salmon migrate from the Pacific Ocean upstream within the Sacramento River to spawning areas. The river reach adjacent to the M&T Ranch Pumping Plant site serves as a migratory corridor for adult upstream migration. The timing of adult upstream migration for each of the four runs typically occurs during the winter, spring, fall, and late-fall (the seasonal

timing of adult upstream migration corresponds with the designation for each of the four runs of Chinook salmon).

The general seasonal timing of migration and spawning by each of the runs is shown in **Table 3-1**. Spawning by adult Chinook salmon has not been observed or documented in the Proposed Action Area. Adult salmon migrate upstream past the Proposed Action Area, with subsequent migration past the M&T Ranch Pumping Plant diversion by juvenile salmon during their emigration from the Sacramento River to the Pacific Ocean.

Special-status salmonid species use the main channel adjacent to the M&T Ranch during spawning migration upriver, and when emigrating downriver as juveniles to the delta and Pacific Ocean. Adult salmonids also could use the deeper parts of this channel adjacent to the Proposed Action Area, while holding, until gonads mature in prelude to spawning. Although fall-run and late fall-run Chinook salmon inhabit a number of watersheds within the Central Valley for spawning and juvenile rearing, the largest populations occur within the mainstem Sacramento River, Feather River, Yuba River, American River, Mokelumne River, Merced River, Tuolumne River, and Stanislaus River. Fall-run Chinook salmon, in addition to spawning in these river systems, also are produced in fish hatcheries located on the Sacramento River, Feather River, American River, Mokelumne River, and Merced River. Hatchery operations are intended to mitigate for the loss of access to upstream spawning and juvenile rearing habitat resulting from construction of dams and reservoirs within the Central Valley in addition to producing fall-run Chinook salmon as part of the ocean salmon enhancement program to support commercial and recreational ocean salmon fisheries. Fall/late-fall run Chinook salmon also support an inland recreational fishery.

Table 3-1. Generalized Life History Timing of Central Valley Chinook Salmon Runs

Run	Adult Migration Period	Peak Migration Period	Spawning Period [a]	Peak Spawning Period	Fry Emergence Period	Juvenile Stream Residency	Juvenile Emigration Period
Late fall	Oct – Apr	Dec	Early Jan - Mar	Feb - Mar	Apr - Jun	7-13 months	Apr - Dec
Winter	Dec - Jul	Mar	Late Apr - Oct	May - Jun	Jul - Oct	5-10 months	Jul - Apr
Spring	Mid-Feb -Jul	Apr - May	Late Aug – Mid Nov	Mid-Sep	Nov - Mar	3-15 months	Oct - May
Fall	Jul - Dec	Sep - Oct	Late Sep - Mar	Oct - Nov	Dec - Mar	1-7 months	Dec - Jun

Sources: (Moyle 2002; CDFG 1998; NMFS 2004; Vogel and Marine 1991)
[a] The time periods identified for spawning include the time required for incubation and initial rearing, before emergence of fry from spawning gravels.

3.2.1.1 Sacramento River Winter-Run Chinook Salmon

Legal Status

Legal Status: Federal and State Endangered
MSCS Goal: 'R' = Recovery

The Sacramento River winter-run Chinook salmon Evolutionarily Significant Unit (ESU) currently is listed as endangered under both the federal ESA (58 FR 33212 (June 16, 1993)) and CESA (CDFG Website 2005). The Sacramento River winter-run Chinook salmon ESU includes populations in the Sacramento River and its tributaries in California (58 FR 33212 (June 16, 1993)).

NMFS has identified distinct populations of Pacific salmon as ESUs. For a fish population (or group of populations) to be considered an ESU, it must be: (1) reproductively isolated from other populations; and (2) contribute substantially to the ecological and genetic diversity of the species (Waples 1991).

Life History, Habitat Requirements and Distribution

Winter-run Chinook salmon are an anadromous species spending one to three years within the ocean before migrating upstream into the Sacramento River to spawn. The majority of adult winter-run Chinook salmon returning to spawn are three-year-olds; however, the adult population also includes two-year-old and four-year-old Chinook salmon. Adult winter-run salmon migrate upstream through San Francisco Bay and Delta during the winter and early spring months with peak migration occurring during March (Moyle 2002). Adult winter-run Chinook salmon migrate upstream within the Sacramento River with the majority of adults spawning in the reach upstream of Red Bluff. Winter-run Chinook salmon spawn within the mainstem of the Sacramento River in areas where gravel substrate, water temperatures, and water velocities are suitable. Spawning occurs during the spring and summer (mid-April through August) (Moyle 2002). Egg incubation continues through the fall months.

Juvenile winter-run Chinook salmon rear within the Sacramento River throughout the year, feeding primarily on aquatic insects. Juvenile winter-run salmon (smolts) migrate downstream through the lower reaches of the Sacramento River, Delta, and San Francisco Bay during the winter and early spring (December through May) as they migrate from the freshwater spawning and juvenile rearing areas into the coastal marine waters of the Pacific Ocean. The migration timing of juvenile winter-run Chinook salmon varies within and among years in response to a variety of factors including increases in river flow and turbidity resulting from winter storms.

Distribution in the Proposed Action Area

The Sacramento River mainstem in the vicinity of the Proposed Action is the primary upstream and downstream migration corridor for winter-run Chinook salmon. Within this reach of the river, winter-run Chinook salmon require relatively cool water throughout their juvenile residence, good water quality, and foraging/cover areas. Adult winter-run Chinook salmon generally migrate upstream through the Proposed Action Area from December through July. Juvenile winter-run Chinook salmon generally can migrate downstream in the Upper Sacramento River from July through April, although it is believed that most juvenile emigration occurs through the Proposed Action Area after October. Winter-run Chinook salmon do not spawn within the Sacramento River in the vicinity of the Proposed Action.

Reasons for Decline

With the construction of Shasta and Keswick dams, winter-run salmon no longer had access to historic spawning habitat within the upper watersheds. As a result of migration blockage, spawning and juvenile rearing habitat for winter-run Chinook is limited to the mainstem Sacramento River downstream of Keswick Dam. During the mid-1960s adult winter-run Chinook salmon returns to the Sacramento River were relatively high (about 80,000 returning

adults). However, the population declined substantially during the 1970s and 1980s. The population decline continued until 1991 when the adult winter-run Chinook salmon population returning to Sacramento River was estimated to be less than 200 fish. As a result of the substantial decline in abundance the species was listed as endangered under both the California and Federal ESAs. During the mid- and late 1990s the numbers of adult winter-run salmon returning to Sacramento River gradually increased and the trend of increasing abundance continues to present. About 5,500 adult winter-run salmon returned to the river to spawn in 2001.

Juvenile winter-run Chinook salmon are also vulnerable to entrainment at a large number of unscreened water diversions located along the Sacramento River and within the Delta in addition to entrainment and salvage mortality at the (State Water Plan) SWP and CVP (Central Valley Plan) export facilities. Changes in habitat quality and availability for spawning and juvenile rearing, exposure to contaminants and acid mine drainage, predation mortality by Sacramento pike minnow, striped bass, and other predators, and competition and interactions with hatchery-produced Chinook salmon have all been identified as factors affecting winter-run Chinook salmon abundance. In addition, sub adult and adult winter-run Chinook salmon are vulnerable to recreational and commercial fishing, ocean survival is affected by climatic and oceanographic conditions, and adults are vulnerable to predation mortality by marine mammals.

Designated Critical Habitat and/or Essential Fish Habitat

In 1993, critical habitat for winter-run Chinook was designated to include the Sacramento River from Keswick Dam (River Mile [RM] 302) to Chipps Island (RM 0) at the westward margin of the Delta (CALFED 2000b). Also included are waters west of the Carquinez Bridge, Suisun Bay, San Pablo Bay, and San Francisco Bay north of the Oakland Bay Bridge (58 FR 33212 (June 16, 1993)).

The Proposed Action Area is identified as EFH for winter-run Chinook salmon. The action reach of the mainstem Sacramento River contains three components of EFH:

- *Juvenile rearing*. Juvenile rearing is discussed primarily in terms of rearing in the natal stream area. As the FMP notes, juvenile rearing may be an incidental habitat function in the mainstem rivers, which serve primarily as migration corridors;
- *Juvenile migration corridors*. The FMP notes that "Smolts swim and drift through the streams and rivers and must reach the estuary or ocean where there are adequate prey and water quality conditions and must find adequate cover to escape predators as they migrate"; and
- *Adult migration corridors and adult holding habitat*. The FMP does not specifically identify habitat requirements for adult migration, but notes that passage blockage, water quality, flow modifications, channel modification, reduced frequency of holding pools, lack of cover, reduced depth of holding pools, reduced cold-water refugia, and increased predation resulting from habitat modifications are habitat concerns.

Given these designated characteristics, the primary components of EFH present at the Proposed Action Area are migration pathways. The existing condition of the habitat in the area is disturbed in terms of flow modifications, channel modification (channelization and riprap), lack

of vegetative cover, and the likely increased predation resulting from habitat modifications. Flow modifications are primarily the result of upstream impoundments, which have reduced flows in winter and spring, when natural precipitation and snow melt would otherwise result in higher flow, and increased flows in summer and fall, which are generally dry periods in California's Central Valley. Smolt migration pathways are affected by the existing water diversion, as well as by diversions upstream and downstream from the project site.

Conservation Efforts

As with other Chinook salmon stocks, NMFS is continuing to evaluate the status of the winter-run Chinook salmon population and the effectiveness of various management actions implemented within the Sacramento River, Delta, and ocean to provide improved protection and reduced mortality for winter-run salmon, in addition to providing enhanced habitat quality and availability for spawning and juvenile rearing.

In recent years a number of changes have been made to improve the survival and habitat conditions for winter-run Chinook salmon. Modifications have been made to reservoir operations for instream flow and temperature management, modifications been made to Red Bluff Diversion Dam gate operations, and several large previously unscreened water diversions have been equipped with positive barrier channel alignment maintenances. Changes to ocean salmon fishing regulations, and modifications to SWP and CVP export operations have also been made to improve the survival of both adult and juvenile winter-run Chinook salmon. These changes in management actions, in combination with favorable hydrologic and oceanographic conditions in recent years, are thought to have contributed to the trend of increasing abundance of adult winter-run Chinook salmon returning to the upper Sacramento River to spawn since the mid-1990s. In the immediate Proposed Action Area, recovery efforts have been focused on reductions in mortality for emigrating juveniles, through screening of large agricultural diversions.

Recovery Plan and Recovery Guidance

NMFS (1997) prepared a proposed recovery plan for winter-run Chinook salmon. The recovery goals include protecting and restoring spawning and rearing habitat; improving the survival of downstream migrants; improving adult upstream passage; reducing harvest; reducing impacts of management programs; and improving understanding of life history and habitat requirements. The delisting criteria are: (1) mean annual spawning abundance of 10,000 females over 13 consecutive years; (2) a cohort replacement rate (CRR) greater than 1.0; and (3) a standard error less 25 percent of the spawning population estimate (CALFED 2000b). Additional recovery guidance is presented in the Anadromous Fish Restoration Program (AFRP) (2001b). NMFS assembled a Central Valley Technical Recovery Team (TRT) in charge of assessing the status of all listed ESUs in the Central Valley, determining ESU needs and developing ESU recovery criteria. A new proposed recovery plan for winter-run Chinook salmon is expected to be developed by June 2007.

Research and Monitoring Gaps

Research into the behavior and use of juvenile winter-run Chinook in estuarine habitats would help ascertain key limiting factors for this species. For example, the effects of high water temperatures on growth and the cues for juvenile migration from the estuary are not well understood (NMFS 1997). In addition, the extent and duration of juvenile salmon rearing in the middle to lower Sacramento River is not clear. Studying genetic differentiation of different Central Valley salmon runs has provided insight into the genetic status of the winter-run Chinook salmon and development protocols for use in artificial propagation efforts (CDFG 2002c). Experimental captive rearing programs at Bodega Marine Laboratory and Livingston Stone National Fish Hatchery continue to rear winter-run Chinook salmon to maturity in captivity (CDFG 2002c).

3.2.1.2 Central Valley Spring-Run Chinook Salmon

Legal Status

Legal Status: Federal and State Threatened
MSCS Goal: 'R' = Recovery

The Central Valley spring-run Chinook salmon is listed as threatened under both the federal and State ESAs. The Central Valley spring-run Chinook salmon ESU includes populations in the Sacramento River and its tributaries in California (64 FR 50394 (September 16, 1999)).

Life History, Habitat Requirements and Distribution

Spring-run Chinook salmon are an anadromous species, spawning in freshwater and spending a portion of their life cycle within the Pacific Ocean. Adult spring-run Chinook salmon migrate upstream into the Sacramento River system during the spring months, but are sexually immature. Adult spring-run Chinook salmon hold in deep cold pools within the rivers and tributaries over the summer months prior to spawning. Spawning occurs during the late summer and early fall (late August through October) in areas characterized by suitable spawning gravels, water temperatures, and water velocities. Eggs incubate within the redds emerging as fry during the late fall and winter. A portion of the fry appear to migrate downstream soon after emerging where they rear within the lower river channels, and potentially within the Delta estuary, during winter and spring months. After emergence a portion of the spring-run Chinook salmon fry remain resident in the creeks and rear for a period of about one year. The juvenile spring-run Chinook salmon that remain in the creeks migrate downstream as yearlings primarily during the late fall, winter and early spring with a peak yearling migration occurring in November (CDFG 1999). The downstream migration of both spring-run Chinook salmon fry and yearlings during the late fall and winter typically coincides with increased flow and turbidity associated with winter stormwater runoff.

Spring-run spawning and juvenile rearing currently occurs on a consistent basis within only a small fraction of their previous geographic distribution, including populations inhabiting Deer, Mill, and Butte creeks, the mainstem Sacramento River, several other local tributaries on an intermittent basis, and the lower Feather River.

Distribution in the Proposed Action Area

Adult and juvenile spring-run Chinook salmon primarily utilize the Sacramento River in the Proposed Action Area as a migration corridor. Adult spring-run Chinook salmon are not known to spawn within the Sacramento River in the vicinity of the Proposed Action Area. Adult spring-run Chinook salmon generally migrate upstream through the Proposed Action Area from mid-February through July. It is believed that most juvenile emigration occurs through the Action/Project Area from October through May.

Reasons for Decline

A variety of environmental and biological factors have been identified that affect the abundance, mortality, and population dynamics of spring-run Chinook salmon. One of the primary factors that have affected population abundance of spring-run Chinook salmon has been the loss of access to historic spawning and juvenile rearing habitat within the upper reaches of the Sacramento River and its tributaries and San Joaquin River as a result of the migration barriers caused by construction of major dams and reservoirs. Operation of the Red Bluff Diversion Dam, which impedes adult upstream migration and vulnerability of juvenile spring-run Chinook salmon to predation mortality, has been identified as a factor affecting mortality within the river. Water temperatures within the rivers and creeks also have been identified as a factor affecting incubating eggs, holding adults, and growth and survival of juvenile spring-run Chinook salmon. Juvenile spring-run Chinook salmon also are vulnerable to entrainment at a large number of unscreened water diversions located along the Sacramento River and within the Delta in addition to entrainment and salvage mortality at the SWP and CVP export facilities.

Changes in habitat quality and availability for spawning and juvenile rearing, exposure to contaminants, predation mortality by Sacramento pikeminnow, striped bass, and other predators, and competition and interactions with hatchery-produced Chinook salmon have all been identified as factors affecting spring-run Chinook salmon abundance. In addition, subadult and adult spring-run Chinook salmon are vulnerable to recreational and commercial fishing, ocean survival is affected by climatic and oceanographic conditions, and adults are vulnerable to predation mortality by marine mammals.

Spring-run Chinook salmon were historically widely distributed and abundant within the Sacramento and San Joaquin river systems (Yoshiyama *et al*. 1998). Spring-run Chinook salmon historically migrated upstream into the upper reaches of the mainstem rivers and tributaries for spawning and juvenile rearing. Construction of major dams and reservoirs on these river systems eliminated access to the upper reaches for spawning and juvenile rearing and completely eliminated the spring-run salmon population from the San Joaquin River system. Spring-run Chinook salmon abundance has declined substantially and the geographic distribution of the species within the Central Valley also has declined substantially. Recent genetics studies have shown that spring-run like Chinook salmon returning to lower Feather River are genetically similar to fall-run Chinook salmon. Hybridization between spring-run and fall-run Chinook salmon, particularly on the Feather River where both stocks are produced within the Feather River hatchery, is a factor affecting the status of the spring-run salmon population.

Designated Critical Habitat and/or Essential Fish Habitat

NMFS designated critical habitat for the Central Valley spring-run Chinook salmon on September 2, 2005. The critical habitat designation includes the Proposed Action Area, which is part of the Tehama Hydrologic Unit (HU) 5504. The Tehama Hydrologic Unit includes the upstream reach of the Sacramento River to Antelope Creek (70 FR 52488 (September 2, 2005)).

EFH has been identified in the Pacific Coast Salmon Plan (PFMC Website 1997; PFMC 2000). The Proposed Action Area is identified as EFH for Central Valley spring-run Chinook salmon.

Conservation Efforts

In recent years, a number of changes have been made to improve the survival and habitat conditions for spring-run Chinook salmon. Several large previously unscreened water diversions have been equipped with positive barrier channel alignment maintenances. Changes to ocean salmon fishing regulations, and modifications to SWP and CVP export operations have also been made to improve the survival of both adult and juvenile spring-run Chinook salmon. Improvements in fish passage facilities have also been made to improve migration and access to Butte Creek. Additionally, an important measure to improve survival and habitat conditions for spring-run Chinook salmon was the acquisition of instream flow provided by the M&T Chico Ranch water exchange (i.e., diverting from the Sacramento River rather than Butte Creek). These changes and management actions, in combination with favorable hydrologic and oceanographic conditions in recent years, are thought to have contributed to the trend of increasing abundance of adult spring-run Chinook salmon returning to spawn in Butte Creek.

Recovery Plan and Recovery Guidance

NMFS is expected to develop a proposed recovery plan for spring-run Chinook salmon by June 2007. The MSCS goals for the species would be derived from this recovery plan.

Research and Monitoring Gaps

Current research for spring-run Chinook salmon is focusing on intensive studies of Butte Creek spring-run Chinook salmon and genetic clarification of Feather River Hatchery fish (NMFS 2003). Myers (1998) also point out that additional genetic information would help elucidate the status of remnant spring-run Chinook salmon populations in Butte, Deer, and Mill creeks, and their relationship to spring-run Chinook salmon from the mainstem Sacramento and Feather rivers. Studying emigration timing, migration pathways, and juvenile abundance will help to plan habitat restoration projects (CDFG 2000b). Additional areas for research include extent and effect of diseases, hatcheries as conservation, effects of mixed-stock fisheries, assessment of relative roles of different mortality factors, experimental assessment of the effects of river operations, efficacy of various habitat improvements, stock identification for management, and constant fractional marking (CDFG 1998; NMFS 2003).

3.2.1.3 Central Valley Fall/Late Fall-Run Chinook Salmon

Legal Status

Legal Status: Federal Species of Concern, California Species of Special Concern
MSCS Goal: 'R' = Recovery

The Central Valley fall-run/late fall-run Chinook salmon recently has been removed from the federal list of candidate species, but remains a species of concern under the federal Endangered Species Act (69 FR 19975 (April 15, 2004))[2] The Central Valley fall-run/late fall-run Chinook salmon is designated as a California species of special concern (CDFG Website 2005). The Central Valley fall-run/late fall-run Chinook salmon ESU includes all naturally spawned fall- and late fall-run populations of Chinook salmon in the Sacramento and San Joaquin basins and their tributaries, east of Carquinez Strait, California (64 FR 50394 (September 16, 1999)). In California, species of special concern is an informal designation used by CDFG to identify declining and vulnerable species in the state.

Life History, Habitat Requirements and Current Distribution

Fall-run Chinook salmon are the most abundant species of Pacific Salmon inhabiting the Sacramento and San Joaquin river systems. Fall-run/late-fall-run Chinook salmon are anadromous with spawning and juvenile rearing occurring within freshwater rivers and streams and juvenile and adult rearing occurring within coastal marine waters. Adult fall-run Chinook salmon migrate from the coastal marine waters upstream through San Francisco Bay and the Delta during late summer and early fall (about late July -- early December). Adult fall-run Chinook salmon migrate upstream to areas characterized by suitable spawning conditions, which include the availability of clean spawning gravels, cold water (considered be less than 56º F) and relatively high water velocities. Fall-run Chinook salmon spawning is similar to that described for other Chinook salmon with the creation of redds where eggs are deposited and incubate. Fall-run Chinook salmon spawning occurs between October and December with the greatest spawning activity occurring typically in November and early December. The success of fall-run Chinook salmon spawning is dependent, in part, on seasonal water temperatures.

After incubating and hatching, the young salmon emerge from the gravel redd as fry. A portion of the fry population migrate downstream soon after emergence, where they rear within the lower river channels, Delta, and estuary during the spring months. The remaining portion of juvenile salmon continue to rear in the upstream stream systems through the spring months, until they are physiologically adapted to migration into saltwater (smolting), which typically takes place between April and early June. A small proportion of the fall-run Chinook salmon juveniles may, in some systems, rear through the summer and fall months migrating downstream during the fall, winter, or early spring as yearlings. The juvenile and adult Chinook salmon rear within coastal marine waters, foraging on fish and macroinvertebrates (e.g., northern anchovy, Pacific

[2] On April 15, 2004, NMFS published a notice in the Federal Register acknowledging establishment of a species of concern list, addition of species to the species of concern list, description of factors for identifying species of concern, and revision of the candidate species list. In this notice, NMFS announced the Central Valley fall and late fall-run Chinook salmon ESU change in status from a candidate species to a species of concern. In 1999, the Central Valley ESU underwent a status review after NMFS received a petition for listing. Pursuant to that review, NMFS found that the species did not warrant listing as threatened or endangered under the ESA, but sufficient concerns remained to justify addition to the candidate species list. Therefore, according to NMFS' April 15, 2004 interpretation of the ESA provisions, the Central Valley ESU now qualifies as a species of concern, rather than a candidate species (69 FR 19975 (April 15, 2004)).

herring, squid, krill, etc.), until they reach maturation. Adult Chinook salmon, spawn at ages ranging from about two to five-years-old with the majority of adult fall-run Chinook salmon returning at age three. Chinook salmon die after spawning.

Distribution in the Proposed Action Area

Adult and juvenile fall-run/late-fall-run Chinook salmon primarily utilize the Sacramento River in the Proposed Action Area as a migration corridor. Adult fall-run/late-fall-run Chinook salmon are not known to spawn within the Sacramento River in the vicinity of the Proposed Action Area.

Adult fall-run Chinook salmon generally migrate upstream through the Proposed Action Area from July through December. It is believed that most juvenile emigration occurs through the Proposed Action Area from December through June.

Adult late fall-run Chinook salmon generally migrate upstream through the Proposed Action Area from October through April. It is believed that most juvenile emigration occurs through the Proposed Action Area from April through December.

Reasons for Decline

A variety of environmental and biological factors have been identified that affect reproductive success, mortality, and population dynamics of fall-run/ late fall-run Chinook salmon. The loss of access to historic spawning and juvenile rearing areas as a result of the construction of dams and reservoirs on many of the Central Valley river systems is a factor affecting population abundance. In addition, exposure to seasonal water temperatures during both the upstream migration of adults and downstream migration of juveniles, changes in instream flows resulting from reservoir operations, degradation of the quality and availability of suitable spawning habitat and juvenile rearing areas, and the effects of hatchery operations on Chinook salmon have been identified as important factors affecting abundance. Juvenile Chinook salmon also are susceptible to entrainment at unscreened water diversions, losses resulting from salvage and handling at the SWP and CVP export facilities, predation mortality by non-native fish species, interannual variability in hydrologic conditions within the streams and river systems, and variability in ocean rearing conditions also have been identified. Contaminant exposure, impediments and barriers to upstream and downstream migration, ocean commercial and recreational angler harvest, and inland recreational harvest have also been identified as factors affecting population abundance.

Fall-run and late fall-run Chinook salmon habitat quality and availability within the upper Sacramento River and tributaries has been affected by a variety of factors including construction and operation of water storage impoundments and water diversions, changes in the magnitude and seasonal timing of instream flows, hatchery operations, and barriers and impediments to adult and juvenile migration. Predation by pikeminnow and striped bass and other species, commercial and recreational angler harvest, changes in land use, channelization and stabilization using riprap of the mainstem river and tributaries, reductions in floodplain habitat and instream cover, and a variety of other factors have affected the species. Chinook salmon also are vulnerable to mortality as a direct and indirect result of SWP and CVP water diversion operations, operation of the Red Bluff Diversion Dam, operation of the Delta cross-channel, and

entrainment into unscreened diversions. Reduction in the availability and quality of spawning gravel downstream of dams has also been identified as a factor affecting the species.

Designated Critical Habitat or Essential Fish Habitat

Critical habitat has not been proposed or designated because Central Valley fall-run/late fall-run Chinook salmon are not protected under the federal ESA. Essential fish habitat has been identified in the Pacific Coast Salmon Plan (PFMC Website 1997; PFMC 2000). The Proposed Action Area is identified as EFH for Central Valley fall-run/late fall-run Chinook salmon.

Conservation Efforts

Management changes have occurred to regulate commercial and recreational angler harvest, improve instream flow conditions, improve water temperature management downstream of reservoirs, improve quality and availability of spawning and juvenile rearing habitat, and improve fish passage facilities at a number of existing migration impediments and barriers.

Management changes have also occurred to address concerns regarding contaminant exposure, the success of fish handling and salvage at the SWP and CVP export facilities, and a number of water diversions located on both the Sacramento and San Joaquin river systems have been equipped with positive barrier channel alignment maintenances designed to reduce or eliminate juvenile salmon entrainment mortality. These management changes, in combination with favorable hydrology and ocean rearing conditions in recent years, have contributed to an increasing trend in adult fall-run Chinook salmon abundance within the ocean and Central Valley river systems.

Recovery Plan and Recovery Guidance

Measures for recovery of the Sacramento late fall-run and San Joaquin fall-run Chinook salmon populations are presented in the AFRP (2001b), and the *Recovery Plan for Sacramento-San Joaquin Delta Native Fishes* (USFWS 1996). Because the MSCS "R" goal for these runs is for resource agencies to cooperatively develop restoration goals for "Viable Salmonid Populations," CALFED and CDFG are working together to identify restoration goals following the VSP framework (McElhany *et al.* 2000), which aims to ensure the long-term viability of Sacramento-San Joaquin fall-run and Sacramento late fall-run Chinook salmon (CALFED 2000c).

Research and Monitoring Gaps

The specific habitat requirements and causes of population declines of the fall-run and late fall-run Chinook salmon are not well understood (CDFG Website 2006a). Research is needed to characterize the genetic make-up of Central Valley fall-run Chinook salmon to compare populations in the San Joaquin River to other watersheds (Myers *et al.* 1998). In addition, the amount of spatial and seasonal overlap and genetic introgression between all runs in the Sacramento River is an important topic for study (CDFG Website 2006a).

3.2.1.4 Central Valley Steelhead

Legal Status

Legal Status: Federal Threatened Species, California Species of Special Concern
MSCS Goal: 'R' = Recovery

The Central Valley steelhead DPS was listed as a federally threatened species on March 19, 1998 (63 FR 11482 (March 9, 1998)). The Central Valley steelhead DPS includes all naturally spawned populations of steelhead in the Sacramento and San Joaquin rivers and their tributaries. Excluded are steelhead from San Francisco and San Pablo bays and their tributaries. Two artificial propagation programs are considered to be part of the DPS: (1) the Coleman National Fish Hatchery; and (2) the Feather River Hatchery steelhead hatchery programs (71 FR 834 (January 5, 2006)).

NMFS has identified discrete populations of steelhead as DPS. For a group of vertebrates to be considered a DPS, it must be: (1) discrete from other populations; and (2) it must be significant to its taxon. NMFS considers a group of organisms as discrete if the group is markedly separated from other populations of the same taxon as a consequence of physical, physiological, ecological and behavioral factors. Significance is measured with respect to the taxon as opposed to the full species (71 FR 834 (January 5, 2006)).

Life History, Habitat Requirements and Current Distribution

Central Valley steelhead are anadromous. Adult steelhead spawn in freshwater and the juveniles migrate to the Pacific Ocean where they reside for a period of years before returning to the river system to spawn. Steelhead that do not migrate to the ocean, but spend their entire life in freshwater, are known as resident rainbow trout.

The steelhead life cycle is characterized by a high degree of plasticity in the duration of both their freshwater and marine rearing phases. The steelhead life cycle is adapted to respond to environmental variability in stream hydrology and other environmental conditions. Adult steelhead migrate upstream during the fall and winter (September through about February) with steelhead migration into the upper Sacramento River typically occurring during the fall and adults migrating into lower tributaries typically during the late fall and winter. Steelhead spawn in areas characterized by clean spawning gravels, cold-water temperatures, and moderately high velocity. Spawning typically occurs during the winter and spring (December -- April) with the majority of spawning activity occurring between January and March. Unlike Chinook salmon that die after spawning, adult steelhead may migrate downstream after spawning and return to spawn in subsequent years.

Steelhead spawn by creating a depression in the spawning gravels where eggs are deposited and fertilized. The eggs incubate within the redd for a variable period of time, which is dependent upon the water temperature. After hatching, the young steelhead emerge from the gravel redd as fry. The young steelhead rear within the stream system, foraging on insects, for one to two or more years before migrating to the ocean. After rearing within the stream the juvenile steelhead undergo a physiological transformation (smolting) that allows the juvenile steelhead to migrate from the freshwater rearing areas downstream to coastal marine waters. Downstream migration of steelhead smolts typically occurs during the late winter and early spring (January through

May). The seasonal timing of downstream migration of steelhead smolts may vary in response to a variety of environmental and physiological factors, including changes in water temperature and flow and increased turbidity. The juvenile steelhead rear within the coastal marine waters for about two to three years before returning to their natal stream as spawning adults.

Although quantitative estimates of the number of adult steelhead returning to Central Valley streams to spawn and are not available, anecdotal information and observations indicate that population abundance is low. Steelhead distribution is currently restricted to the mainstem Sacramento River downstream of Keswick Dam, the Feather River downstream of Oroville Dam, the American River downstream of Nimbus Dam, the Mokelumne River downstream of Comanche Dam, and a number of smaller tributaries to the Sacramento River system, Delta, and San Francisco Bay. The Central Valley steelhead population is composed of both naturally spawning steelhead and steelhead produced in hatcheries.

Distribution in the Proposed Action Area

Adult and juvenile steelhead primarily utilize the Sacramento River in the Proposed Action Area as a migration corridor. Adult steelhead are not known to spawn within the Sacramento River in the vicinity of the Proposed Action Area. Adult steelhead generally migrate upstream through the Proposed Action Area from August through March, with peak immigration occurring during January and February. The primary period of steelhead smolt emigration occurs from January through June.

Reasons for Decline

Central Valley steelhead historically migrated upstream into the high gradient upper reaches of Central Valley streams and rivers for spawning and juvenile rearing. Construction of dams and impoundments on the majority of Central Valley rivers has created impassable barriers to upstream migration and substantially reduced the geographic distribution of steelhead. Changes in habitat quality for juvenile rearing, exposure to contaminants, predation mortality, passage barriers and impediments to migration, changes in land use practices, and competition and interactions with hatchery-produced steelhead have all been identified as factors affecting steelhead abundance.

Factors affecting steelhead abundance are similar to those described for winter-run and spring-run Chinook salmon. One of the primary factors that have affected population abundance of steelhead has been the loss of access to historic spawning and juvenile rearing habitat within the upper reaches of the Sacramento River and its tributaries and San Joaquin River as a result of the migration barriers caused by construction of major dams and reservoirs. Water temperatures within the rivers and creeks, particularly during summer and early fall months, also have been identified as a factor affecting growth and survival of juvenile steelhead.

Designated Critical Habitat

NMFS designated critical habitat for the Central Valley steelhead on September 2, 2005. The proposed critical habitat designation includes the Proposed Action Area, which is part of the

Tehama HU 5504. The Tehama HU includes the upstream reach of the Sacramento River to Antelope Creek (70 FR 52488 (September 2, 2005)).

EFH designations are not applicable for Central Valley steelhead.

Conservation Efforts

In recent years a number of changes have been made in the local area to improve the survival and habitat conditions for steelhead. Several nearby large previously unscreened water diversions have been equipped with positive barrier channel alignment maintenances. Improvements to fish passage facilities have also been made to improve migration and access to spawning and juvenile rearing habitat.

Recovery Plan and Recovery Guidance

NMFS has assembled a Central Valley Recovery Team to examine steelhead population status, population requirements, and population recovery criteria. NMFS is expected to develop a proposed recovery plan for Central Valley steelhead by June 2007.

MSCS Central Valley steelhead ESU "R" goal is to "Achieve recovery objectives under development for the Central Valley steelhead ESU."

Research and Monitoring Gaps

NMFS noted that there are no ongoing population assessments for this species (68 FR 55926 (September 29, 2003)). The effect of catch-and-release mortality on wild populations and effect of trout fisheries on juvenile steelhead should be investigated (68 FR 55926 (September 29, 2003)). In addition, ecological conditions in the Sacramento and San Joaquin rivers differ and there is a potential for genetic differences to exist among the different populations of these large river basins (NMFS 1997). Also, there is considerable uncertainty about the relationship between anadromous and non-anadromous *Oncorhynchus mykiss* forms, including the relationship with multiple subspecies of resident trout. It is likely that the abundant man-made barriers have greatly altered historical patterns of migration and anadromy (68 FR 55926 (September 29, 2003)). A comprehensive analysis of ecological and genetic information may help elucidate these complex issues (NMFS 1997). Steelhead also have been described spawning and rearing in seasonal habitats such as intermittent streams and streams that do not contain suitable habitat year around (McEwan 2001). McEwan (2001) suggests that further research effort should be made to reveal the extent to which steelhead use season habitats.

3.2.2 Species Accounts for Non-Salmonid Fish Species

The non-salmonid fish species addressed in this ASIP are green sturgeon, hardhead, Sacramento splittail, and river lamprey. These fish migrate through and rear in the mainstem Sacramento River system. They may spend a portion of their life history in the mainstem river reach from the Delta to Redding potentially including the Proposed Action Area. One characteristic of these non-salmonid species is a relatively long juvenile, or permanent residence in the river system. These species are well-adapted to variation in flow, temperature, and turbidity. They evolved to

fill their own respective niches in the historic river/floodplain/marsh habitat of the Central Valley, characterized by repeated flood-drought cycles, highly variable flows (uncontrolled by dams), and thus cooler temperatures during snowmelt and potentially much warmer temperatures during the summer when river flows were not supplemented by reservoir releases. High flooding periods were accompanied by large plumes of turbidity from erosion in the mid-to-lower watershed areas. Current flow, water temperature and turbidity regimes in the mainstem river are therefore probably more moderate (less variable) for these species than they were prior to 1850.

This suite of species also evolved under conditions representative of most large river floodplains: (a) a meandering mainstem river with sand bars, natural levees, and large wetlands and marshes accessible from the mainstem river during periods of high flow, (b) high nutrient loads, and (c) few predators. Currently, the levee system that isolates the river from natural floodplain has altered these conditions, and there is less variety of habitat in the river system that there was historically. There are river meander corridor restoration projects underway and being planned under the CALFED program. These programs may help expand the habitat for the suite of non-salmonid species. In the Proposed Action Area, it is likely that conditions in the river channel will become characterized by:

- A relatively steep sided bank with a deep cut out and scoured channel.
- Minimal side-channel Instream Woody Material recruitment and SRA habitat.
- The presence of a suite of non-native predatory fish (smallmouth bass, largemouth bass, striped bass, and others)

These existing conditions represent a high level of disturbance when compared to ideal conditions for these species, and the density of these species in this mainstem river habitat is likely to be relatively low, when compared to historical densities.

Given these conditions, the environmental baseline of the Proposed Action Area can be characterized as: (1) generally lacking spawning habitat for all salmonid and non-salmonid species addressed; and (2) generally suitable for incidental rearing of salmon and non-salmonid species where there is flow refuge and/or Instream Woody Material recruited from the overhead riparian area.

Although these fish may have different life-history strategies, adults, juveniles, and larvae utilize the mainstem river in the Proposed Action Area for rearing and foraging, as outlined below.

3.2.2.1 Southern DPS of Northern American Green Sturgeon

Legal Status

Legal Status: Federal Threatened
MSCS Goal: 'R' = Recovery

After first determining that green sturgeon is a candidate species that did not warrant listing (68 FR 4433 (2003)), on April 5, 2005, NMFS announced the completion of an updated ESA status review for the North American green sturgeon, and the resultant proposal to list the southern DPS of North American green sturgeon as a threatened species under the federal ESA. The proposed listing is based on: (1) new information showing that the majority of spawning adults

are concentrated into one spawning river (the Sacramento River), thus increasing the risk of extirpation due to catastrophic events; (2) severe remaining threats that have not been adequately addressed by conservation measures currently in place; (3) fishery-independent data exhibiting a negative trend in juvenile green sturgeon abundance; and (4) new information showing evidence of lost spawning habitat in the upper Sacramento and Feather rivers (70 FR 17386 (April 6, 2005)). After considering public comments on the Proposed Rule, NMFS subsequently issued a Final Rule on April 6, 2006, which finalized the listing of the Southern DPS as a threatened species. NMFS is currently considering issuance of protective regulations that may be necessary and advisable to provide for the conservation of the species (70 FR 17386 (April 6, 2005)).

Life History, Habitat Requirements and Distribution

Green sturgeon is an anadromous species. Green sturgeon migrate upstream between late February and late July (CDFG Website 2006b). In the Klamath River, the water temperature tolerance of immigrating adult green sturgeon reportedly probably ranges from 44.4°F to 60.8°F (6.9°C to 16°C); green sturgeon were not found in areas of the river outside this surface water temperature range (USFWS 1995a). Mature males range from 139 to 199 centimeters (cm) fork length (FL) and 15 to 30 years of age (Van Eenennaam *et al.* 2001). Mature females range from 157 to 223 cm FL and 17 to 40 years of age (Moyle 2002). Maximum ages of adult green sturgeon are likely to range from 60 to 70 years (Moyle 2002).

Adult green sturgeon are thought to spawn every three to five years (pers. comm., Tracy 1990) but new information suggests that spawning could occur as frequently as every two years. Spawning occurs from March through July, with peak activity from April through June (Moyle *et al.* 1995). The southern DPS of green sturgeon appear to spawn within 200 miles (322 km) of the ocean. Spawning occurs in deep turbulent river mainstems. Specific spawning habitat preferences are unclear, but eggs likely are broadcast over large cobble where they settle into the cracks (Moyle *et al.* 1995). Green sturgeon reportedly prefer to spawn in water temperatures ranging from 46.4°F to 57.2°F (8°C to 14°C) (Moyle 2002; Environmental Protection Information Center *et al.* 2001; USFWS 1995a). Water temperatures above 68°F (20°C) are reportedly lethal to green sturgeon embryos (Cech *et al.* 2000). Green sturgeon females produce 60,000 - 140,000 eggs (Moyle *et al.* 1992), and they are the largest eggs (diameter 4.34 mm) of any sturgeon species (Cech *et al.* 2000).

Green sturgeon larvae probably hatch at around 200 hours (at 54.9°F) after spawning, and are dissimilar to other sturgeon species in that they lack a distinct swim-up or post-hatching stage (Moyle 2002). Optimal growth rates for green sturgeon juveniles reportedly occur at water temperatures of 59°F (Cech *et al.* 2000). Green sturgeon larvae first feed at 10 days post hatch and grow quickly reaching a length of 66 mm and a weight of 1.8 g in three weeks of exogenous feeding. Metamorphosis to the juvenile stage is complete at 45 days. Juveniles continue to grow rapidly, reaching 300 mm in one year. Juveniles spend from one to four years in fresh and estuarine waters and disperse into salt water at lengths of 300 to 750 mm.

Green sturgeon is the most marine oriented of the Pacific Coast sturgeon species (68 FR 4433 (January 29, 2003)). They apparently remain near the estuaries at first, but then migrate considerable distances in the ocean as they grow. Based on recoveries of green sturgeon tagged in the San Francisco Bay estuary, most green sturgeon migrate northward, in some cases as far as British Columbia (Moyle 2002). Tagged green sturgeon from the Sacramento and Columbia

rivers are primarily captured to the north in coastal and estuarine waters, with some fish tagged in the Columbia River being recaptured as far north as British Columbia (WDFW 2002). While there is some bias associated with recovery of tagged fish through commercial fishing, the pattern of a northern migration is supported by the large concentration of green sturgeon in the Columbia River estuary, Willapa Bay, and Grays Harbor, which peaks in August. These fish tend to be immature; however, mature fish and at least one ripe fish have been found in the lower Columbia River (WDFW 2002). Genetic evidence suggests that Columbia River green sturgeon are a mixture of fish from at least the Sacramento, Klamath, and Rogue rivers (Israel *et al.* 2002).

Some general information is available for green sturgeon feeding habits. Adult green sturgeon scour the Sacramento-San Joaquin Delta benthos for invertebrates including shrimp, mollusks, amphipods, isopods, and small, disabled or dead fish (Environmental Protection Information Center *et al.* 2001). The primary diet for juvenile green sturgeon reportedly consists of small crustaceans, such as amphipods and opossum shrimp (CDFG Website 2001). As juvenile green sturgeon develop, they reportedly eat a wider variety of benthic invertebrates, including clams, crabs, and shrimp (CDFG Website 2001).

The green sturgeon is the most widely distributed member of the sturgeon family Acipenseridae (68 FR 4433 (January 29, 2003)). In North America, green sturgeon are found in rivers from British Columbia south to the Sacramento River, California, though their ocean range is from the Bering Sea to Ensenada, Mexico (Moyle 2002). In California, historical spawning populations existed only in the Sacramento, Eel, and Klamath-Trinity river systems. A number of presumed spawning populations (Eel River, South Fork Trinity River, San Joaquin River) have been lost, and the only known spawning in California occurs in the Sacramento and Klamath rivers (Moyle 2002). Green sturgeon are reported to spawn in the Feather River, though this claim is not substantiated (NMFS 2002a). There is no documentation to suggest that green sturgeon presently spawn in the San Joaquin River; however, spawning may have occurred prior to large-scale hydropower and irrigation development. Young green sturgeon have been taken in the Santa Clara Shoal area in the Delta but these fish likely originated from elsewhere, most likely the Sacramento River (68 FR 4433 (January 29, 2003)).

Recent habitat evaluations conducted in the upper Sacramento River for salmonid recovery planning suggest that significant potential green sturgeon spawning habitat was made inaccessible or altered by dams (historical habitat characteristics, water temperature, and geology summarized in Lindley (2004)). This spawning habitat may have extended up into the three major branches of the Sacramento River: the Little Sacramento River, the Pitt River system, and the McCloud River (NMFS 2005).

In assessing North American green sturgeon status, NMFS determined that two DPSs exist. The northern DPS contains a single stock green sturgeon spawning population in the Rogue, Klamath, and Eel rivers (NMFS 2005); the southern DPS presently contains only a single spawning population in the Sacramento River (NMFS 2005). The remaining information presented will focus on the southern DPS of green sturgeon. NMFS concludes that green sturgeon in the southern DPS were likely to become endangered in the foreseeable future throughout all of its range (NMFS 2005). Population estimates for adult green sturgeon in the San Pablo Bay area have ranged from a several hundred to 2000, with high of over 8,000 in 2001 (NMFS 2002a). These estimates are based on incidental green sturgeon catch during CDFG's white sturgeon monitoring. However, the validity of the assumptions necessary for this estimation is questionable (Moyle 2002; NMFS 2002a).

Larval and post larval green sturgeon are caught each year in a rotary screw trap at the Red Bluff Diversion Dam (USFWS 1997; USFWS 2001a). A total of 2,608 juvenile sturgeon were captured from 1994-2000. All were assumed to be green sturgeon since 124 of these fish were grown by the University of California, Davis' researchers to an identifiable size and all were green sturgeon. Young sturgeon appear in catches from early May through August. Most range in size from 1 to 3 inches. Catch rates were greatest in 1995 and 1996 and were lowest in 1999 and 2000 (State Water Contractors 2004).

No green sturgeon have been reported by salmonid monitoring programs in Clear, Battle, Butte, Deer, Mill creeks (pers. comm., Brown 2004). Sampling on these tributaries includes ladder counts (Battle Creek), snorkel surveys (Deer, Butte, Clear and Battle creeks), and rotary screw trapping (Deer, Mill, Clear and Butte creeks). Ladder counts have occurred annually between March and July 1995-2004 on Battle Creek. Snorkel surveys have been conducted to estimate spring-run and/or winter-run Chinook salmon escapement in each of the creeks except Mill Creek. Snorkel surveys have been conducted in August 1992-present in Deer Creek; June to August in 1994-present in Butte Creek; and May to October 1995-2004 in Battle Creek. Rotary screw trap sampling is conducted annually during periods from October to May 1995-2004 on Deer and Mill Creeks (spring-run), September to June 1996-present on Butte Creek, and since 1998 on Battle Creek (State Water Contractors 2004).

No green sturgeon have been reported by salmonid monitoring programs in the American River (pers. comm., Hannon 2004; pers. comm., Healy 2004; pers. comm., Kennedy 2004). Fish sampling methods included snorkeling, rotary screw traps, and seines. Snorkel surveys have been conducted to determine salmonid distribution from February 1993 to January 1994 and February 2004 to present. Rotary screw trap sampling is conducted annually from December to July 1993-2004. Seining surveys to capture steelhead for PIT tagging have recently been conducted on the American River beginning in mid-June and ending in September or late-October (State Water Contractors 2004).

Green and white sturgeon adults have been observed periodically in small numbers in the Feather River (State Water Contractors 2004). There are at least two confirmed records of adult green sturgeon. There are no records of larval or juvenile sturgeon of either species, even prior to the 1960's when Oroville Dam was built. There are reports that green sturgeon may reproduce in the Feather River during high flow years, but these are not specific and are unconfirmed (State Water Contractors 2004).

Distribution in the Proposed Action Area

Green sturgeon potentially may spawn in suitable habitat both upstream and downstream of the Proposed Action Area in the Sacramento River. Thus, because juveniles rear year-round it is possible that green sturgeon larvae or juveniles could be in the Proposed Action Area throughout the year.

Reasons for Decline

The principal factor for decline for the southern DPS of green sturgeon reportedly comes from the reduction of green sturgeon spawning area to a limited area of the Sacramento River (NMFS

2005). Keswick Dam provides an impassible barrier blocking green sturgeon access to what were likely historic spawning grounds upstream (NMFS 2005). In addition, a substantial amount of potential habitat in the Feather River above Oroville Dam may have been lost (NMFS 2005). However, there is a lack of historical information on presence or absence of green sturgeon spawning in the Feather River, and it remains unclear whether suitable spawning habitat is available or has ever been available in the Feather River, and if development and water use in the Feather River may have made conditions unsuitable for spawning during most years, or if conditions were always marginal for green sturgeon (State Water Contractors 2004).

Potential adult migration barriers to green sturgeon include RBDD, Sacramento Deep Water Ship Channel locks, Fremont Weir, Sutter Bypass, and the Delta Cross Channel Gates on the Sacramento River, and Shanghai Bench and Sunset Pumps on the Feather River (NMFS 2005). The threat of screened and unscreened agricultural, municipal, and industrial water diversions in the Sacramento River and Delta to green sturgeon are largely unknown as juvenile sturgeon are often not identified, and the current CDFG and NMFS' screen criteria do not address sturgeon. Based on the temporal occurrence of juvenile green sturgeon and the high density of water diversion structures along rearing and migration routes, the potential threat of these diversions are found to be serious and in need of study (NMFS 2005).

CDFG (1992) and USFWS (1995) found a strong correlation between mean daily freshwater outflow (April to July) and white sturgeon year class strength in the Sacramento-San Joaquin Estuary, suggesting that insufficient flow rates are likely to pose a significant threat to green sturgeon. It is postulated that low flow rates could dampen survival by hampering the dispersal of larvae to areas of greater food availability, hampering the dispersal of larvae to all available habitat, delaying the transportation of larvae downstream of water diversions in the Delta, or decreasing nutrient supply to the nursery, thus stifling productivity (CDFG 1992b). The subject studies primarily involve the more abundant white sturgeon; however, the threats to green sturgeon are thought to be similar (NMFS 2005). It is important to note, however, that white sturgeon spend more time in a riverine environment than green sturgeon, and the aforementioned correlation may not be applicable. The relationship between flow and green sturgeon year class strength is unknown.

High water temperatures no longer seem to be the problem that they once were with the installation of the Shasta Dam temperature control device in 1997, although Shasta Dam has a limited storage capacity and coldwater reserves could be depleted in long droughts. Water temperatures at RBDD have not been higher than 16ºC since 1995 (CDEC) and are within the green sturgeon egg and larvae optimum for growth and survival of 15 to 19ºC (Mayfield and Cech 2004). CDFG has indicated that water temperatures may be inadequate for spawning and egg incubation in the Feather River during many years as the result of releases of warmed water from Thermalito Afterbay. It is likely that high water temperatures (greater than 17.2ºC) may deleteriously affect sturgeon egg and larval development, especially for late-spawning fish in drier water years (USFWS 1995a).

Non-native species are an ongoing problem in the Sacramento-San Joaquin River and Delta systems. One risk for green sturgeon associated with the introduction of non-native species involves the replacement of relatively uncontaminated food items with those that may be contaminated. For example, the non-native overbite clam, *Potamocorbula amurensis*, introduced in 1988, has become the most common food of white sturgeon and was found in the only green sturgeon examined thus far (CDFG 2002b). The overbite clam is known to bioaccumulate

selenium, a toxic metal (CDFG 2002b). It is currently unknown, however, the significance of this threat to the southern DPS of green sturgeon.

Green sturgeon also may experience predation by introduced species including striped bass, but predation has yet to be estimated (NMFS 2005).

Contamination of the Sacramento River increased substantially in the mid-1970s when application of rice pesticides increased (USFWS 1995b). Estimated toxic concentrations for the Sacramento River during 1970-1988 may have deleteriously affected striped bass larvae (Bailey *et al.* 1994). White sturgeon also may accumulate PCBs and selenium (CDFG 1989b). While green sturgeon spend more time in the marine environment than white sturgeon and, therefore, may have less exposure, the Biological Review Team for green sturgeon concluded that some degree or risk from contaminants also occur for green sturgeon. However, this risk has not been quantified or estimated.

Designated Critical Habitat

Critical habitat has not been designated for green sturgeon. However, NMFS is compiling information to prepare a critical habitat proposal for the southern DPS (70 FR 17386 (April 6, 2005)), and has solicited information from the public to assist the agency with final determination of critical habitat. It is currently unclear when a final rule outlining critical habitat for the southern DPS of green sturgeon will be issued.

Conservation Efforts

Existing efforts are being carried to protect the southern DPS of green sturgeon. As a result of the CVPIA enacted in 1992, the USFWS and Reclamation have led an effort to implement a significant number of activities across the Central Valley including projects such as: (1) river restoration; (2) land purchases; (3) fish screen projects; (4) water acquisitions for the environment; and (5) special studies and investigations.

Many notable beneficial actions have originated and been funded by the CALFED program including such projects as floodplain and instream restoration, riparian habitat protection, fish screening and passage projects, research regarding non-native invasive species and contaminants, restoration methods, and watershed stewardship and education and outreach programs (NMFS 2005). NMFS received information from CALFED regarding potential projects that could be regarded as conservation measures for green sturgeon. This information indicated a total of 118 projects of various types and levels of progress funded between 1995 and 2004. Projects primarily consisted of fish screen evaluation and construction projects, restoration evaluation and enhancement activities, contaminations studies, and dissolved oxygen investigations related to the San Joaquin River Deep Water Ship Channel. Two evaluation projects specifically addressed green sturgeon while the remaining projects primarily address anadromous fish in general, particularly listed salmonids. .

Recovery Plan and Recovery Guidance

The AFRP (2001b) under authority of CVPIA states that the target production level for green sturgeon in Central Valley rivers is 2,000 fish. CALFED's (2000c) goal is to achieve recovery objectives identified for green sturgeon in the *Recovery Plan for the Sacramento/San Joaquin Delta Native Fishes* (USFWS 1996). Green sturgeon will be considered restored when in the Sacramento-San Joaquin Delta once the median population of mature sturgeon (>1.0 meter [m]) has reached 1,000 individuals (USFWS 1996).

Research and Monitoring Gaps

NMFS (2002b) states there is a critical need to monitor population trends and identify potential risks to green sturgeon. The AFRP (2001b) identifies locating green sturgeon spawning sites and evaluating the availability, adequacy and use by adult green sturgeon as a high priority.

3.2.2.2 Sacramento Splittail

Legal Status

Legal Status: California Species of Special Concern
MSCS Goal: 'R' = Recovery

The Sacramento splittail is designated as a California species of special concern (CDFG Website 2006a). In 1999, the USFWS listed the Sacramento splittail as threatened under the federal ESA. On August 17, 2001, and again on March 21, 2002, USFWS announced re-opening of the comment period for the final rule on the Sacramento splittail to "*....invite comments and to obtain peer-review on the statistic analysis completed by the Service to re-analyze the available splittail abundance data.*" USFWS also invited additional comments on the status of the species (66 FR 23181 (May 8, 2001)). The public comment period ended December 2, 2002. In response to the public comment period, and after reviewing the available scientific and commercial information, USFWS determined that the Sacramento splittail listing as a threatened or endangered species under the ESA was not warranted. As a result, the USFWS removed the Sacramento splittail from the list of threatened species on September 22, 2003. Therefore, the applicability of the recovery objectives identified for Sacramento splittail in the Recovery Plan for the Sacramento/San Joaquin Delta Native Fishes (USFWS 1996) will need to be revisited.

Life History, Habitat Requirements and Distribution

Splittail are native to California's Central Valley. Historically, splittail were found as far north as Redding on the Sacramento River (Reclamation 1908). Splittail also were found in the tributaries of the Sacramento River as far as the current Oroville Dam site on the Feather River and Folsom Dam site on the American River (Reclamation 1908). Along the San Joaquin River, historic distribution is unclear. Girard (1854) reported two *Pogonichthys* species in the San Joaquin River. These reports do not make a distinction between which of the two species was found at particular locations on the San Joaquin River. In the southern Central Valley, Tulare Lake was likely to have supported many native fish species, including splittail (Moyle 1976) but has since been drained and reclaimed. Splittail were present within Buena Vista and Kern Lakes (Moyle 2002), both of which are reclaimed. Some researchers (Sommer *et al.* 1997) indicate that

splittail still occur, at least during optimal conditions, through as much as 78 percent of their former range in terms of river reaches. However, others (Moyle and Yoshiyama 1992) believe the species appears to be restricted to a small portion of its former range, with dams and diversions preventing access to upstream habitat in large rivers and streams beyond the valley floor (Moyle and Yoshiyama 1992). The State of California indicates that splittail still occur in a large portion of its range (80 percent in the Sacramento, and 70 percent in the San Joaquin). There appears to be consensus that at least 20 percent and possibly more of the species range has been reduced. Baxter (2001) found that the range of the Sacramento splittail extends away from the Delta, though detections on the periphery of its range appear to be part of a single, mobile, Sacramento and San Joaquin River/Bay-Delta population that includes fish from the Napa and Petaluma River systems. Their distribution in the Estuary suggests that brackish water may characterize optimal rearing habitat for fish greater than 75 millimeters (mm) (3.0 inches (in)) standard length (SL) (Moyle *et al.* 2001). Suisun Marsh includes the largest aerial extent of shallow water habitat available to the splittail and likely has the greatest concentrations of the species.

Sacramento splittail is a large cyprinid (length more than 12 inches) unique to the Sacramento/San Joaquin basin. The species is relatively long-lived (5 to 7 years), highly fertile (100,000 eggs), and matures at the end of the first year (males) or third year (females). As is typical of a fish evolved in a highly variable riverine system, populations fluctuate annually, depending on spawning success. They are found mostly in slow moving sections of mainstem rivers and sloughs, and have been abundant in Suisun Bay and Marsh. Adults migrate upstream to spawn in conjunction with high flows that inundate their side-channel and off-channel spawning habitat – vegetation temporarily submerged by flooding of riparian and upland habitats. Eggs attach to vegetation. Larvae remain in shallow weedy areas near shore and move to deeper water habitats as they mature.

Distribution in the Proposed Action Area

Historically, Sacramento splittail were found as far up the Sacramento River as Redding, yet today are largely absent from the upper parts of their distribution range (Moyle 2002). However, in wet years Sacramento splittail may migrate up the Sacramento River as far as the Red Bluff Diversion Dam at river mile 243 in Tehama County (Moyle 2002). It is unlikely that splittail spawn in the vicinity of the Proposed Action Area. Therefore, in the Proposed Action Area, Sacramento splittail habitat utilization may be restricted to infrequent upstream migration episodes, and incidental rearing during the downstream movement portion of their early life history, which most likely may occur between late February and July.

Reasons for Decline

The human-caused factor that has had the greatest effect on the abundance of Sacramento splittail is loss and degradation of floodplain and marsh habitat (CDFG 1992a). Land reclamation, flood control practices, and agricultural development have eliminated and drastically altered much of the ephemeral and perennial shallow-water habitats in the lowland areas available to spawning adults, larvae, and juveniles. An estimated 96 percent of historical wetland habitats are either unavailable to Sacramento splittail or have been eliminated (64 FR 5963 (February 8, 1999)). Splittail abundance is positively associated with high Delta outflows during primary spawning months (March through May) (CDFG 1992a; Sommer *et al*. 1997).

High Delta outflows during late winter and spring correlate with increased total surface area of shallow-water habitats containing submerged vegetation (used by spawning adults), both within and upstream of the Delta. During years of low-river flow, such as the 1986-1992 drought, spawning success may be greatly reduced, contributing to reduced adult abundance.

Designated Critical Habitat

Critical habitat designation is not applicable for Sacramento splittail.

Conservation Efforts

The Sacramento splittail will benefit from efforts by agencies implementing the CVPIA and CALFED actions to restore ecological health and improve water quality (64 FR 5963 (February 8, 1999)).

Recovery Plan and Recovery Guidance

USFWS (1996) developed a Recovery Plan for the Sacramento/San Joaquin Delta Native Fishes to manage the estuary for improved native fish habitat and reduce the decline of native fish populations, including the Sacramento splittail. The objective of the plan is to: (1) create meander belts along the Sacramento River by setting levees back; (2) create and reconnect wetlands to the floodplain in the lower San Joaquin, Tuolumne, and Stanislaus rivers; (3) restore marsh habitat in the Delta and Suisun Marsh; (4) manage bypasses for fish; and (5) remove upstream barriers to migration. Specific criteria are stated in USFWS (1996), and include meeting two out of three possible restoration criteria regarding Sacramento splittail abundance over a 15-year period.

Research or Monitoring Gaps

Despite the use of several monitoring techniques for estimating Sacramento splittail populations, the USFWS (2006a) acknowledges significant methodological weaknesses for each method. The abundance status of the Sacramento splittail could be estimated more accurately with a rigorous survey designed specifically for this species. In addition, research into the mechanisms driving Sacramento splittail population declines during low outflow-high diversion years would help ascertain key limiting factors for this species.

3.2.2.3 Hardhead

Legal Status

Legal Status: California Species of Special Concern
MSCS Goal: ‘m’ = Maintain

The hardhead is designated as a California species of special concern.

Life History, Habitat Requirements and Distribution

Most streams in which hardhead occur have water temperatures in excess of 68ºF, and reported optimal water temperatures for hardhead (as determined by laboratory choice experiments) appear to be 75.2ºF to 82.4ºF (Moyle 2002). At higher water temperatures, hardhead generally selected low oxygen levels, a factor that may limit their distribution to well-oxygenated streams and to surface water of reservoirs. They prefer clear, deep pools and runs with sand-gravel-boulder substrates and slow velocities. In streams, adults often remain in the lower half of the water column. Hardhead tend to be absent where introduced species, especially centrarchids, predominate. Their relatively poor swimming ability at low water temperatures may keep them from moving up streams with natural or artificial velocity barriers that permit the passage of salmonids (Moyle 2002).

Hardheads are most active in early morning and evening when feeding. They are omnivores that forage for benthic invertebrates and aquatic plant material on the bottom but also eat drifting insects and algae. In the American River, they can reach 30 cm (11.8 inches) standard length [SL] in four years. Hardhead mature in their third year and spawn mainly in April and May. Juvenile recruitment patterns suggest that spawning may extend into August in some foothill streams. Spawning behavior has not been documented, but large aggregations of fish found during the spawning season suggest that fertilized eggs are deposited on beds of gravel in riffles, runs, or the heads of pools. Females, depending on size, can produce 7,000 to 24,000 eggs per year (Moyle 2002).

The early life history of hardhead is poorly understood. After hatching, the larval and post-larval fish presumably remain along stream edges in dense cover of flooded vegetation or fallen tree branches. As they grow, they move into deeper habitats.

Historically, hardhead have been regarded as widespread and abundant in central California. They are still widely distributed in foothill streams, but their populations are increasingly isolated from one another, making them vulnerable to localized extinctions. As a consequence, they are much less abundant than they once were, especially in the southern half of their range. They are apparently still fairly common in the mainstem Sacramento River, lower reaches of the American and Feather rivers, smaller tributary streams, and some river reaches above the foothills.

Hardhead are widely distributed in low- to mid-elevation streams in the main Sacramento–San Joaquin drainage. They also are present in the Russian River. Their range extends from the Kern River, Kern County, in the south to the Pit River. In the San Joaquin drainage, hardhead are scattered in tributary streams and absent from the valley reaches of the San Joaquin River. In the Sacramento drainage, hardhead are present in larger tributary streams as well as in the Sacramento River (Moyle 2002).

Distribution in the Proposed Action Area

In the Proposed Action Area, juvenile rearing and adult foraging has the potential to occur, specifically in the backwater area of the Big Chico Creek—Sacramento River confluence.

Reasons for Decline

The causes of hardhead decline appear to be habitat loss and predation by nonnative fishes. Hardhead require large- to medium-size, cool- to warmwater streams with deep pools for their long-term survival. Increased water diversions have eliminated habitat, isolating upstream areas, and creating water temperature and flow regimes unsuitable for hardhead. A particular problem seems to be predation by smallmouth bass and other centrarchid species.

Designated Critical Habitat

Designation of critical habitat is not applicable for hardhead.

Conservation Efforts

According to CDFG (2006a), it would be prudent to stabilize hardhead populations while they still are at moderate levels. CDFG (2006a) stated that the best way to protect hardhead is to have a number of Aquatic Diversity Management Areas established in mid-elevation canyon areas in which normal flow regimes and high water quality are maintained (Baltz and Moyle 1993; Moyle and Yoshiyama 1992). Because hardhead are good indicator species of relatively undisturbed conditions, a system of such preserves would protect not only the species, but also their entire biotic community.

Recovery Plan and Recovery Guidance

Recovery plans or recovery guidelines have not been established for hardhead in the Proposed Action Area.

Research and Monitoring Gaps

According to CDFG (CDFG Website 2006a) hardhead populations should be monitored to ascertain species' status.

3.2.2.4 River Lamprey

Legal Status

Legal Status: Federal Species of Concern and California Species of Special Concern

The river lamprey is designated as a federal species of concern and a California species of special concern.

Life History, Habitat Requirements and Distribution

The biology of river lamprey has not been studied in California; therefore, information currently available is based on studies in British Columbia, where the timing of life history events may not be the same because of colder water or other factors (Moyle 2002).

Ammocoetes begin transformation into adults at about 12 cm (4.7 inches) TL, during summer. The process of metamorphosis takes 9 to 10 months, the longest known for lampreys. River lamprey in final stages congregate immediately upriver from saltwater and enter the ocean in late spring. Apparently, adults spend only three to four months in the ocean, where they grow rapidly to 25 to 31 cm (9.8 to 12.2 inches) TL (Moyle 2002).

River lamprey feed mostly on herring and salmon. They typically attach to the back of the host fish, above the lateral line, where they feed on muscle tissue. Feeding continues even after the death of their prey. The effect of river lamprey predation on prey can be significant; in Canada, it is considered to be a major source of salmon mortality (Moyle 2002).

Adults migrate back into fresh water in autumn. The extent and timing of migration in California are poorly understood. They spawn from February through May. No information concerning incubation and development time exists. While maturing, river lamprey shrink about 20 percent in length. They dig saucer-shaped depressions in gravelly riffles for spawning. Fecundity estimates range from 11,400 to 37,300 eggs. Adults die after spawning. Ammocoetes remain in silty backwaters and eddies to feed on algae and microorganisms. The length of the ammocoete stage is not known, but is probably three to five years, thus, total lifespan is likely to be six to seven years (Moyle 2002).

The anadromous river lamprey is found in coastal streams from San Francisco Bay to the Taku River and Lynn Canal, Alaska (Vladykov and Follett 1958). In California, most records are for the lower Sacramento-San Joaquin River system, but efforts to find them in other streams have been minimum (Moyle 2002). They are present in the Napa River, Sonoma and Alameda creeks, tributaries to San Francisco Bay, and in the lower Sacramento and San Joaquin rivers, especially the Stanislaus and Tuolumne rivers.

Distribution in the Proposed Action Area

It is unknown to what extent, if any, river lamprey potentially utilize habitat in the vicinity of the Proposed Action Area. However, in California most records are for the lower Sacramento-San Joaquin River systems (Moyle 2002).

Reasons for Decline

Trends in the populations of river lamprey are unknown in California, but it is likely that populations are declining because the Sacramento, San Joaquin, and Russian rivers and their tributaries have been severely altered by dams, diversions, pollution, and other factors.

Designated Critical Habitat

Designation of critical habitat is not applicable for river lamprey.

Conservation Efforts

Conservation efforts have not been developed specifically for the river lamprey. According to CDFG, management for river lamprey cannot be effectively conducted until more information is known about this species.

Recovery Plan and Recovery Guidance

According to USFWS (1996), it is expected that the joint Recovery Plan for the *Sacramento/San Joaquin Delta Native Fishes* will improve conditions in the Delta for fish in general, including the river lamprey.

Research and Monitoring Gaps

No accurate assessment of the fish population exists. River lamprey distribution, abundance, life history, and habitat requirements in California need to be investigated (CDFG Website 2006a).

3.2.3 Species Accounts for Wildlife

Species accounts for VELB, bald eagle, western yellow-billed cuckoo, bank swallow, Swainson's hawk, white-tailed kite, osprey and northwestern pond turtle are provided below.

3.2.3.1 Valley Elderberry Longhorn Beetle

Legal Status

Legal Status: Federal Threatened
MSCS Goal: 'R' = Recovery

VELB is federally listed as threatened; it has no state status.

Life History, Habitat Requirements and Distribution

In the Sacramento Valley, VELB is closely associated with blue elderberry (*Sambucus mexicana*), which is an obligate host for beetle larvae. Kellner (1986) reported that they appear to be attracted to "stressed" or unhealthy elderberry trees, which have more yellow in the leaves and have leaves that fall earlier in the year than healthy trees. However, Talley (2005) and Collinge (2001) examined VELB habitat quality in context of habitat in context of fragmentation and identify other features of habitat quality as influences on VELB abundance and distribution. Our observations at the Refuge are that healthy elderberry bushes have show more VELB activity.

Besides exhibiting a preference for "stressed" elderberry, VELB prefers trees with stems of a certain size class. Exit holes have been found more frequently in trunks or branches that are 5 to 20 cm (2-8 in) in diameter (Kellner 1986), or at least 1.0 inch or greater at ground height (USFWS 1999) and less than one meter off the ground (Collinge *et al*. 2001). Research also shows that exit holes more consistently occur in clumps or stands than in isolated bushes (Collinge *et al*. 2001). In two different studies, occurrence frequencies in elderberry by VELB

ranged from 20-50 percent along the American River (USFWS 1984), to usually less than 20 percent along the Sacramento River (Jones and Stokes 1985).

Since the spatial distribution of VELB is often minimal (USFWS 1984), the beetle has been assumed to be a poor disperser (Collinge *et al*. 2001). Due to low dispersing ability and naturally low population densities (USFWS 1984), the beetles are thought to be more vulnerable to impacts from habitat fragmentation (USFWS 1999a). Thus, non-fragmented stands of elderberry are essential for dispersal corridors for the species and may be necessary to maintain long-term gene flow over large areas.

Distribution in the Proposed Action Area

There are 34 elderberry shrubs in the Proposed Action Area, including several with VELB exit holes (Figure 1-5). Three (3) elderberry shrubs including E05, E07, and E08 may be directly affected by the project. However, a recent visit to the Proposed Action Area by Kelley Moroney (USFWS Assistant Refuge Manager) indicated that shrubs EO5 and E07 may have eroded into the river or become overgrown by dense riparian vegetation.

Reasons for Decline

Threats to the survival of VELB include the alteration and fragmentation of suitable habitat from urban and recreational development. Insecticide use and vegetation control practices also may impact beetle populations (USFWS 1999a). In addition, Huxel (2000) postulated that the introduced, invasive Argentine ant (*Linepithema humile*) may exclude or displace populations of VELB from otherwise suitable habitat.

Designated Critical Habitat

Two critical habitat zones have been established for this species (USFWS 1984):

1. Sacramento Zone: An area in the City of Sacramento enclosed on the north by the Route 160 freeway, on the west and southwest by the Western Pacific railroad tracks, and on the east by Commerce Circle, and its extension southward to the railroad tracks.

2. American River Parkway Zone: An area of the American River Parkway on the south bank of the American River, bounded on the north by latitude 38 37’30”N, on the west and southwest by Elmanto Drive from its junction with Ambassador Drive to its extension to latitude 38 37’30”N, and on the south and east by Ambassador Drive and its extension north to latitude 38 37’30”N, Goethe Park, and that portion of the American River Parkway northeast of Goethe Park, west of the Jedediah Smith Memorial Bicycle Trail, and north to a line extended eastward from Palm Drive.

In addition, two “essential habitat” zones have been established:

1. American River Parkway Zone: An area within the American River Parkway, consisting of both left and right banks, extending from Nimbus Dam downstream to Arden Bar,

adjacent to and encompassing previously-designated "Critical Habitat, American River Parkway Zone" (USFWS 1984).

2. Putah Creek Zone: Solano County. Township 8 North, Range 2 West, Sections 25, 26, 35, and 36 (USFWS 1984).

Conservation Efforts

The USFWS has developed conservation guidelines to assist federal agencies and non-federal project applicants needing incidental take authorization through a section 7 consultation or a section 10(a)(1)(B) permit in developing measures to avoid and minimize adverse effects on the VELB (USFWS 1999a). These guidelines address avoidance, transplanting, planting of additional native species, and monitoring.

The USFWS prepared a formal programmatic consultation permitting projects with relatively small effects on the VELB within the jurisdiction of the Sacramento Field Office, California (Administration File #572.9/9821). Although this consultation was prepared for the U.S. Department of Transportation, Federal Highway Administration, its contents are applicable to other federal projects that have limited effects on the VELB.

By July 2007 Sacramento River National Wildlife Refuge (NWR), in conjunction with The Nature Conservancy and River Partners will have planted 117,235 elderberry shrubs on 3,182 acres of refuge restoration lands, which amounts to approximately 32 elderberry shrubs per acre. The Refuge has identified restoration for VELB (i.e., elderberry shrub plantings in riparian habitat restoration sites), and cooperative monitoring and research as conservation strategies for endangered species objectives of the wildlife and habitat goal for the Sacramento River National Wildlife Refuge Comprehensive Conservation Plan (USFWS 2005).

Recovery Plan and Recovery Guidance

A recovery plan has been prepared for the VELB (USFWS 1984). One of the recovery goals stated in the MSCS (CALFED 2000c) is to maintain and restore connectivity among riparian habitats occupied by the VELB within its historical range along the Sacramento and San Joaquin rivers and their major tributaries.

Research and Monitoring Gaps

As stated in the MSCS (CALFED 2000c), additional research to determine the maximum distance the species can disperse from occupied habitat to colonize suitable unoccupied habitat is necessary. Continuing research on the life history of the VELB also is important.

River Partners surveyed five units of the Sacramento River NWR for VELB colonization at restored sites and discovered VELB presence in restored elderberry shrubs (River Partners 2004). Currently the Sacramento River NWR is cooperating with California State University, Chico on an investigation of VELB habitat characteristics and health (Hatfield *et al.* 2006). The effects of host plant quality, soil composition and associated vegetation on colonization rates by the valley elderberry longhorn beetle (Hatfield *et al.* 2006).

3.2.3.2 Bald Eagle

Legal Status

Legal Status: Federal Threatened/Proposed Delisted, State Endangered
MSCS Goal: 'm' = Maintain

The USFWS initially listed the southern bald eagle as an endangered species in March 1967. In 1995, the bald eagle was reclassified from endangered to threatened in the lower 48 states (60 FR 35999). They are currently proposed for federal delisting (64 36454 (July 6, 1999)).

Life History, Habitat Requirements and Distribution

The bald eagle is the second largest North American bird of prey with an average 7-foot wingspan. It has a distinctive white head and white tail offset against a dark brown body and wings in adult birds. Females are about 25 percent larger than males; sexes are otherwise similar in appearance. Bald eagles are opportunistic foragers and diet varies across the range based on prey species available. They prefer fish, but will eat a great variety of mammals, amphibians, crustaceans, and birds, including many species of waterfowl.

Bald eagles are thought to mate for life unless one mate dies. Bald eagles build large stick nests lined with soft materials and nests are used for several years by the same pair of eagles. Nests measure up to 6 feet across and may weigh hundreds of pounds. Courtship and breeding vary by regions, for example, in Florida, breeding behaviors commence in September; in Ohio, breeding usually occurs in February. In northern California, bald eagle nest initiation reportedly begins during January with most post-breeding migration finished by the end of August. Egg laying reportedly occurs during February while fledging typically ends by August (USFWS 2004). The average clutch size is two eggs. Young eagles can fly in 11 to 12 weeks, but the parents continue to feed them for 4 to 6 weeks while they learn to hunt. Bald eagles have lived up to 36 years in captivity.

The bald eagle is a bird of aquatic ecosystems, frequenting large lakes, rivers, estuaries, reservoirs and some coastal habitats. It feeds primarily on fish, but waterfowl, gulls, cormorants, and a variety of carrion may also be consumed. Bald eagles usually nest in trees near water, but may use cliffs in the southwest United States, and ground nests have been reported from Alaska. Adults use the same breeding territory, and often the same nest, year after year. They also may use one or more alternate nests within their breeding territory (USFWS 2006).

The timing and distance of dispersal from the breeding territory varies. Individuals that breed in California may make only local winter movements in search of food, staying in the general vicinity of their breeding territory while others may migrate hundreds of miles to wintering grounds such as the Klamath Basin remaining there for several months. Eagles seek wintering (non-nesting) areas offering an abundant and readily available food supply with suitable night roosts that typically offer isolation and thermal protection from winds.

The breeding range of the bald eagle is associated with aquatic habitats (coastal areas, river, lakes, and reservoirs) with forested shorelines or cliffs in North America. Throughout their

range, they select large, super-canopy roost trees that are open and accessible, mostly conifers. They winter primarily in coastal estuaries and river systems of the lower 48 states and Alaska, where thousands of bald eagles migrate each fall to take advantage of salmon-spawning runs.

Distribution in the Proposed Action Area

There are no known bald eagle nests in the Proposed Action Area.

Reasons for Decline

The decline of the bald eagle coincided with the introduction of the pesticide DDT in 1947. Other causes of decline included shooting, trapping, and poisoning. Loss of nesting habitat due to development along the coast and near inland rivers and waterways also has resulted in decreasing numbers.

Designated Critical Habitat

Critical habitat has not been designated for bald eagle.

Conservation Efforts

The USFWS developed a Bald Eagle Recovery Plan (USFWS 1986) which outlines the steps needed to recover and maintain bald eagle populations in the Pacific recovery area, which includes California, Nevada, Oregon, Washington, Idaho, Wyoming, and Montana. The plan includes objectives for providing secure habitat, developing inventory, research, and monitoring plans, implementing public awareness and law enforcement programs, and reducing bald eagle mortality. Measures for providing secure habitat include protecting existing nest trees and roost sites, maintaining and improving forest habitat, limiting disturbance at eagle use areas, and maintaining food sources. In addition, bald eagle nesting and wintering habitat management guidelines have been developed by the USFWS, which emphasize the importance of protective buffer areas around the nesting and winter roosting trees (USFWS 2006).

USFWS and many other federal, state, tribal, and local cooperators from across the nation have funded and carried out many of the tasks described within the regional bald eagle recovery plans. Annual expenditures for the recovery and protection of the bald eagle by public and private agencies have exceeded $1 million each year for the past decade. Additionally, state fish and wildlife agencies have played a vital role in restoring eagles to areas from which they were extirpated or their numbers greatly reduced. These activities include conducting annual breeding and productivity surveys, purchasing lands for the protection of bald eagle habitat, reintroduction and habitat management programs, and public outreach (USFWS Website 2006a).

Recovery Plan and Recovery Guidance

The Bald Eagle Recovery Plan (USFWS 1986) outlines the steps needed to recover and maintain bald eagle populations in the Pacific recovery area, which includes California, Nevada, Oregon, Washington, Idaho, Wyoming, and Montana. The plan includes objectives for providing secure

habitat, developing inventory, research, and monitoring plans, implementing public awareness and law enforcement programs, and reducing bald eagle mortality. Measures for providing secure habitat include protecting existing nest trees and roost sites, maintaining and improving forest habitat, limiting disturbance at eagle use areas, and maintaining food sources.

At the time the Bald Eagle Recovery Plan was issued in 1986, bald eagles in California were listed as an endangered species, with 75 known breeding territories statewide (1985) and an average productivity of 0.94 young per occupied territory (1975 to 1985). The plan states that delisting will occur on a region-wide basis when a minimum of 800 breeding pairs are present in the seven-state recovery area, with 1.0 fledged young and an average success rate of at least 65 percent per occupied territory over a 5-year period. The plan includes target recovery goals for 47 management zones; these targets would need to be met in 80 percent of the zones for delisting to occur. Key recovery tasks include the following (USFWS 1986):

- Prohibit logging of known nest trees, perch trees, and winter roost trees;
- Reduce mortality associated with shooting and trapping; and
- Restrict use of poison detrimental to eagles in predator and rodent control programs within important nesting and wintering habitat.

Delisting goals for number of territories, productivity, and breeding success rates were met or exceeded for six of the seven states in the Pacific Recovery Zone, including California, by or before 1999. However, the plan goal for distribution by management zone was not met by 1999.

Research and Monitoring Gap

Since 1973, the USFWS and CDFG conducted annual bald eagle surveys in California. However, because the bald eagle population is increasing, many states, including California are no longer conducting surveys annually (CDFG Website 2006a; USFWS Website 2006a)

3.2.3.3 Western Yellow-Billed Cuckoo

Legal Status

Legal Status: Federal Candidate, State Endangered
MSCS Goal: 'r' = Contribute to Recovery

The western yellow-billed cuckoo is Federal candidate species. The species was listed by the State of California as threatened in 1971, and was reclassified as endangered in 1987.

Life History, Habitat Requirements and Distribution

Western yellow-billed cuckoos breed in large blocks of riparian habitats (particularly woodlands with cottonwoods and willows (66 FR 38611 (July 25, 2001)). Dense understory foliage appears to be an important factor in nest site selection, while cottonwood trees are an important foraging habitat in areas where the species has been studied in California (66 FR 38611 (July 25, 2001)). Clutch size is usually two or three eggs, and development of the young are very rapid, with a breeding cycle of 17 days from egg-laying to fledging of young. Although yellow-billed cuckoos

usually raise their own young, they are facultative brood parasites, occasionally laying eggs in the nests of other yellow-billed cuckoos or of other bird species (66 FR 38611 (July 25, 2001)).

Along the Sacramento River in California, nesting yellow-billed cuckoos occupied home ranges, which included 10 hectares (25 acres) or more of riparian habitat (66 FR 38611 (July 25, 2001)). Another study on the same river found riparian patches with yellow-billed cuckoo pairs to average 40 hectares (99 acres) (66 FR 38611 (July 25, 2001)). Home ranges in the South Fork of the Kern River in California averaged about 17 hectares (42 acres) (66 FR 38611 (July 25, 2001)). Nesting densities ranging from 1 to 15 pairs per 40 hectares (99 acres) were estimated in a New Mexico study, and three plots in Arizona had densities ranging of 8.2, 19.8, and 26.5 pairs per 40 hectares (99 acres) (66 FR 38611 (July 25, 2001)). Nesting west of the Continental Divide occurs almost exclusively close to water, and biologists have hypothesized that the species may be restricted to nesting in moist river bottoms in the west because of humidity requirements for successful hatching and rearing of young (66 FR 38611 (July 25, 2001)). Nesting peaks later (mid-June through August) than in most co-occurring bird species, and may be triggered by an abundance of the cicadas, katydids, caterpillars, or other large prey which form the bulk of the species' diet (66 FR 38611 (July 25, 2001)). The species is inconspicuous on its breeding range, except when calling to attract or to contact mates.

The breeding range of the yellow-billed cuckoo formerly included most of North America from southern Canada to the Greater Antilles and northern Mexico (66 FR 38611 (July 25, 2001)). In recent years, the species' distribution in the west has contracted. The northern limit of breeding in the coastal States is now in the Sacramento Valley, California, and the northern limit of breeding in the western interior States is southern Idaho (66 FR 38611 (July 25, 2001)). East of the Continental Divide, the species breeds from southeastern Montana, the Dakotas, Minnesota, southern Ontario, southeastern Quebec and probably southern New Brunswick south to eastern Colorado, Texas, the Gulf coast, northeastern Mexico, the Florida Keys, the Greater Antilles and the northern Lesser Antilles. The species overwinters from Colombia and Venezuela, south to northern Argentina (Ehrlich *et al.* 1988). The extent to which yellow-billed cuckoos nesting in different regions of North America commingle during migration, or while overwintering, is unknown. Data provided by the USGS Biological Resources Division, Bird Banding Laboratory, from bird band returns to date is insufficient to determine migration or wintering patterns (66 FR 38611 (July 25, 2001)).

In California prior to the 1930s, the species was widely distributed in suitable river bottom habitats, and was locally common (66 FR 38611 (July 25, 2001)). Yellow-billed cuckoos nested primarily in coastal counties from San Diego County near the Mexico border to Sonoma County in the San Francisco Bay region, in the Central Valley from Kern County through Shasta County, and along the lower Colorado River (66 FR 38611 (July 25, 2001)). Yellow-billed cuckoos also bred locally elsewhere in the State, including in Inyo, San Bernardino, and Siskiyou counties (66 FR 38611 (July 25, 2001)).

The early literature relating to the yellow-billed cuckoo in California has been summarized and evaluated by researchers. Collectively they report dozens of locations where the species was historically reported and/or collected, sometimes in apparent abundance, but not subsequently found. Some researchers estimated that in California the species' range was about 30 percent of its historical extent (66 FR 38611 (July 25, 2001)). Researchers provide an estimate of the California breeding population during the late 19th century of 15,000 pairs of breeding birds. Some believed that predevelopment yellow-billed cuckoo populations in California were even

greater than implied by the early literature, due to the species' inconspicuous behavior and the fact that large tracts of floodplain riparian habitat had already been removed for development before the first records and accounts of the species began appearing in literature. Most modern investigators believe that a significant decline of the yellow-billed cuckoo in California occurred following the start of the major era of development beginning about the mid-1800s (66 FR 38611 (July 25, 2001)).

Distribution in the Proposed Action Area

There are no known western yellow-billed cuckoo nests in the Proposed Action Area.

Reasons for Decline

Based on a 1986-1987 state-wide survey only three areas in California regularly support more than approximately five breeding pairs. These areas include: the Sacramento River roughly between Colusa and Red Bluff; the South Fork of the Kern River upstream of Lake Isabella; and the lower Colorado River (66 FR 38611 (July 25, 2001)). Some researchers estimated 31 to 42 breeding pairs in the State, a decline of 66–81 percent from a 1977 survey (66 FR 38611 (July 25, 2001)). Along the lower Colorado River, on the California- Arizona border, researchers estimated an 80 to 90 percent decline by 1986 from an estimated 180 to 240 pairs in 1976–1977, while others estimated a decline of 93 percent over this period, using an initial estimate of 242 pairs in 1976 to 1977. These declines coincided with habitat losses resulting from high water levels of long duration in 1983 to 1984 and 1986 (66 FR 38611 (July 25, 2001)). Final results from a USFWS-funded 1999 State-wide survey indicate that yellow-billed cuckoo numbers in the Sacramento Valley and along the Kern River are comparable to numbers from the 1980s, while only two pairs were located on the California side of the Colorado River. No pairs were found in the part of the State west of the Colorado River and south of the Kern River (66 FR 38611 (July 25, 2001)). Although other biologists detected cuckoos at Prado Flood Control Basin, a pair on the Amargosa River, and a single cuckoo at the Mojave River near Victorville, the lack of detections during the 1999 survey in these and other southern California areas where comparable previous surveys found cuckoos indicates population declines since the 1970s. An example of the species' decline in California is found in the San Joaquin Valley. Yellow-billed cuckoo have been recorded from every county in the San Joaquin Valley region except Kings County, and were locally common as a breeding bird at least in San Joaquin, Kern, Fresno, and Stanislaus counties (66 FR 38611 (July 25, 2001)). Despite surveys for the species (Laymon and Halterman 1987), there have been few records from the San Joaquin Valley since the 1960s. If the species still breeds there, the number of breeding pairs is very small (66 FR 38611 (July 25, 2001)).

Designated Critical Habitat

Critical habitat has not been designated for western yellow-billed cuckoo.

Conservation Efforts

In general, conservation efforts are focused on limiting the amount of riparian habitat removed or converted to other habitat types. Additionally, the Refuge has identified restoration for yellow-

billed cuckoo habitat (i.e., cottonwood forest and mixed riparian forest associated with early succession stage habitat), and cooperative monitoring and research as conservation strategies for endangered species objectives of the wildlife and habitat goal for the Sacramento River NWR Comprehensive Conservation Plan (USFWS 2005). The Riparian Habitat Joint Venture (2004) identified conservation efforts for multiple riparian bird species, including western yellow-billed cuckoo.

Recovery Plan and Recovery Guidance

Recovery plans or recovery guidelines have not been established for western yellow-billed cuckoo in the Proposed Action Area.

Research and Monitoring Gaps

The Riparian Habitat Joint Venture (2004) identified research and monitoring efforts for multiple riparian bird species, including western yellow-billed cuckoo.

3.2.3.4 Bank Swallow

Legal Status

Legal Status: State Threatened
MSCS Goal: 'r' = Contribute to recover

The bank swallow is a State threatened species and has no Federal status.

Life History, Habitat Requirements and Distribution

The current breeding range is primarily confined to parts of the Sacramento Valley and northeastern California (CDFG 1995; CDFG 2000a). Along the Sacramento River, an estimated population of 13,170 pairs in 1986 declined to 4,990 pairs in 1998, then rebounded to 8,210 pairs the following year (CDFG 2000a). These populations were estimated by applying an average 45 percent occupancy rate of potential nest burrows in an active colony. Data from two colonies near Princeton show that this rate ranged from 31.6 to 56.1 percent (N = 6) (CDFG 1995).

Remaining suitable nesting habitat is sparse and distributed throughout the species' remaining California range primarily at coastal river mouths, north of the town of Colusa along the banks of the Sacramento and Feather rivers, wildlife refuges in northeastern California, and occasionally in gravel and sand mines that provide and maintain nesting habitat (Grinnell and Miller 1944). Soil type, height and slope seem to be the primary selection criteria by which bank swallows choose nest sites (Garrison 1989).

Bank swallows excavate nest burrows in nearly vertical banks/cliff faces and require substrates comprised of soft soils such as fine sandy loam, loam, silt loam, and sand (Garrison *et al.* 1987). Burrows are located in the upper portions of the bank or bluff, and burrow density decreases from top to bottom (Sieber 1980). Hjertaas (1988) reported that burrows in Saskatchewan were an average of 43.8 inches from the base of the bank and 25.4 inches form the top of the bank,

while Spencer (1962) found that burrows averaged 33.5 inches from the bank top in Vermont and Pennsylvania. The top burrows were an average of 27.6 inches from the top of bank in California (Humphrey and Garrison 1987). Using average height of vertical banks, burrows were placed an average of 36 percent (Hjertaas *et al.* 1988), 27 percent (Spencer 1962), and 21 percent (Humphrey and Garrison 1987) from the top of the bank. Heights of the vertical banks at nesting colonies in California averaged 10.9 feet (SD=5.6 feet, range 4.3-24.0, n=32) (Humphrey and Garrison 1987). Burrows placed in the top third of the bank are less susceptible to many ground predators (Sieber 1980) and Garrison (2002) suggests that suitable banks for nesting must be at least 1 meter (3.3 feet) above ground or water for predator avoidance.

Bank swallows migrate annually to South America. The first spring migrants arrive in California in mid-March with numbers peaking in May; the first fall migrants leave in late July, with a few birds remaining until mid-September (Garrison 1999; Garrison 2002; Humphrey and Garrison 1987). Bank swallows often join flocks of other species of swallows during migration (Garrison 1999). Bank swallows usually initiate a single breeding attempt in April. They lay clutches of one to nine eggs (usually four to five) and incubate them for 13 to 16 days. The young hatch in May and are fledged by July each year; there is no information on lifetime reproductive success (Garrison 1999). Colony sites are often used in subsequent years as long as the substrate and burrows remain intact. Information exists on fidelity to colony or burrow sites from year to year, but it is likely that adults that breed successfully at a colony one year will return in subsequent years, especially considering the limited number of suitable colony sites. Return rate data are suspect because they do not include mortality rates of non-returning birds (Garrison 1999).

Bank swallow predators at nesting colonies include mammals, birds, and snakes. No information exists on predators during migration or on the wintering range. Documented predators in California include American kestrels (*Falco sparverius*) taking adults in flight, and gopher snakes (*Pituophis melanoleucus*) feeding on nestlings in burrows. Burrows in mining pits and along riverbanks sometimes collapse during erosive events, killing nestlings (Garrison 1999).

Distribution in the Proposed Action Area

A bank swallow colony of about 110 nesting pairs was documented nesting in the eroded bank to be reveted in the Proposed Action Area in 2005 by USFWS biologists (*pers. comm.*, Kevin Foerster, September 23, 2005). Nesting individuals were not observed during 2006. However, on May 1, 2007 3 nesting colonies were identified on the site. Additionally results of the Annual Bank Swallow Survey indicate that from 1999 through 2005 estimates ranging from 50 (during 2002) to 340 (during 2001) nesting pairs were observed on the west bank of the Proposed Action Area.

Reasons for Decline

Bank swallows have been extirpated as a nesting species from southern California, and its range in northern California has been reduced by 50 percent since 1900 primarily from habitat modification and/or destruction (CDFG 1995; Garrison 1999). As of 1999, over 70 percent of the remaining population in California is restricted to portions of the Sacramento River, primarily between Red Bluff and Colusa (CDFG 2000a).

Designated Critical Habitat

Critical habitat has not been designated for bank swallow.

Conservation Efforts

Bank swallow conservation has focused on limiting the removal of known bank swallow habitat in Central Valley rivers. Specifically, state and federal agencies have limited revetment of eroding banks and river surface elevation fluctuations during the bank swallow breeding period as much as possible, while maintaining flood protection and beneficial uses of Central Valley rivers.

The Refuge has identified restoration efforts for bank swallow (i.e., floodplain hydrology restoration/levee removal), and cooperative monitoring and research as conservation strategies for endangered species objectives of the wildlife and habitat goal for the Sacramento River NWR Comprehensive Conservation Plan (USFWS 2005). The Sacramento NWR and CDFG coordinate and conduct the annual Bank Swallow Survey along the Sacramento River to document population trends. The Riparian Habitat Joint Venture (2004) identified conservation efforts for multiple riparian bird species, which would indirectly benefit bank swallow.

Recovery Plan and Recovery Guidance

A State Recovery Plan for the bank swallow was completed and adopted by the California Fish and Game Commission during 1992, which identified habitat preserves and a return to a natural, meandering riverine ecosystem as the two primary strategies for recovering the bank swallow. A recovery planning team also has been established, which has had periodic meetings since 1990. However, the plan has not yet been implemented (CDFG Website 2006a).

Research and Monitoring Gaps

USFWS and CDFG coordinate, and CDFG conducts regular bank surveys to estimate annual breeding population size, colony size and location, and habitat conditions to identify and locate bank swallow nesting habitat along the Sacramento River from Red Bluff to Colusa. The Riparian Habitat Joint Venture (2004) identified research and monitoring needs and efforts for multiple riparian bird species, which would indirectly benefit bank swallow.

3.2.3.5 Swainson's Hawk

Legal Status

Legal Status: State Threatened
MSCS Goal: 'r' = Contribute to recovery

The Swainson's hawk is listed as threatened under the CESA. Although the species is not federally listed and no formal recovery plan has been developed, it is federally protected under the Migratory Bird Treaty Act.

Life History, Habitat Requirements and Distribution

The Swainson's hawk (*Buteo swainsoni*) is listed under CESA as threatened and is identified as a federal species of concern (California State University, Stanislaus Website 2007). Swainson's hawks breed from southwestern Canada to northern Mexico. Nearly all North American populations of Swainson's hawks winter in South America and Mexico. However, a small number of birds regularly winter in southern Florida (Stevenson and Anderson 1994) and in the Sacramento–San Joaquin River Delta of central California (Herzog 1996; Yee *et al.* 1991).

Historically they inhabited open grasslands throughout most of lowland California. A variety of habitat changes, including the conversion of native grasslands to agricultural, urban, and industrial development have caused the Swainson's hawk population to decline by more than 90 percent from levels at the time of European settlement.

Currently, within California, Swainson's hawks begin nesting during late March and the young typically fledge by July (California State University, Stanislaus Website 2007). Nests typically are constructed in riparian habitat with the most commonly used nesting trees consisting of valley oak, Fremont's cottonwood, walnuts, and large willows (CDFG Website 2006a). Over 85 percent of the Swainson's hawk territories in the Central Valley are within riparian systems (CDFG Website 2006a). Suitable nesting sites may also include shrubs, or utility poles ranging in heights from four to 100 feet (California State University, Stanislaus Website 2007). In a study of movements and habitat use, it was found that single trees or riparian areas were used most often for nesting (CDFG 1989a). Swainson's hawks migrate long distances, and are highly gregarious and largely insectivorous during migration. Birds typically return to nest sites in California from early March to April. Migration begins during August and continues through October, however some juveniles do not migrate during their first winter (California State University, Stanislaus Website 2007).

Swainson's hawk diets consist primarily of the California vole, but may also include a variety of bird and insect species (CDFG Website 2006a). Suitable foraging areas for Swainson's hawks include native grasslands or lightly grazed pastures, alfalfa and other hay crops, and certain grain and row croplands (CDFG Website 2006a). Unsuitable foraging habitat includes crops such as vineyards, orchards, certain row crops, rice, corn and cotton crops (CDFG Website 2006a). Schmutz (1987) found that the species is more abundant in areas of moderate cultivation than in either grassland or areas of extensive cultivation.

The mature riparian vegetation within the Action/Project Area may provide suitable nesting habitat for Swainson's hawks. Suitable Swainson's hawk foraging habitat may also exist in the Action/Project Area on the east and west sides of the Sacramento River. According to the CNDDB database there are 14 known occurrences of Swainson's hawk nesting sites within 10 miles of the action area. However, none of the known occurrences have been active within the previous five years. Due to the limitations of the CNDDB, nest sites may be active despite the lack of recorded information regarding active nests in the area.

Distribution in the Proposed Action Area

Per the September 2006 CNDDB and formal consultation with Jenny Marr, CDFG Staff Environmental Scientist, June 19, 2006, no known active (within the last 5 years) Swainson's hawk nests exist within a 10-mile radius of the Proposed Action Area. However, there are 14

pre-2001 Swainson's hawk occurrences within 10 miles of the Proposed Action Area, as well as optimal nesting and foraging habitat within and immediately adjacent to the Proposed Action Area in the form of mature riparian trees and agricultural lands, respectively.

Several potential nesting trees exist within 0.5 mile of the Proposed Action Area. Agricultural lands adjacent to the Proposed Action Area (grasslands and row crops) provide suitable foraging habitat for this species, as well as for other raptors.

Reasons for Decline

Beginning in the late 1800's, levee construction and development of agriculture reduced the available nesting and foraging habitat for Swainson's hawk throughout the Central Valley. The area, including the Proposed Action Area, is frequently disturbed by agricultural activity, heavy equipment, truck and vehicle traffic under existing conditions.

Designated Critical Habitat

Critical habitat has not been designated for Swainson's hawk

Conservation Efforts

Conservation efforts are focused on preserving existing nesting and foraging habitat and on revegetating levees to establish suitable nesting habitat. The Sacramento River NWR considers habitat restoration, and cooperative research and monitoring efforts for the species (USFWS 2005). The Riparian Habitat Joint Venture (2004) identified conservation efforts for multiple riparian bird species, which would indirectly benefit Swainson's hawks.

Recovery Plan and Recovery Guidance

The MSCS "r" recovery goal for the species is to protect, enhance, and increase Swainson's hawk habitat sufficiently to support a viable breeding population, with an interim goal of 1,000 to 2,000 breeding pairs.

Research and Monitoring Gaps

Research and monitoring gaps have not been identified for this species. Information on wintering birds in Mexico and South America is being collected through the use of radio telemetry. The Riparian Habitat Joint Venture (2004) identified research and monitoring needs and efforts for multiple riparian bird species, which would indirectly benefit Swainson's hawks.

3.2.3.6 White-tailed Kite

Legal Status

Legal Status: CDFG: Fully Protected
MSCS Goal: 'm' = Maintain

The white-tailed kite is a fully protected species under the California Fish and Game Code. It is not listed under either the federal ESA or CESA.

Life History, Habitat Requirements and Distribution

White-tailed kites generally inhabit low-elevation grasslands, wetlands dominated by grasses, oak woodlands, and agricultural and riparian areas (Dunk 1995). Nests are built in trees that occur in isolation or in riparian areas (Erichsen *et al.* 1994). Other nesting raptor species as well as other conspecifics are known to compete for nest sites and territory size, but ultimately abundance of prey species is the primary factor that influences their number and distribution (Dunk 1995).

Nest tree selection has not been well studied. White-tailed kites have been found nesting in isolated trees and in trees within large stands (> 100 hectares) (Dunk 1995). Nests are built in several tree species and even in a few shrubs. These species include Valley Oak, Live Oak, Boxelder, Ornamental trees, Cottonwood, Olive, (Dixon *et al.* 1957). The height of nest trees/shrubs ranges from 10 feet (3 meters) [e.g., *Baccharis* and *Atriplex*] (Stendell 1972) to 164 feet (50 meters) [eg. *Sequoia sempervirns* and *Picea sitchensis*] (Dunk 1995). In the Central Valley, white-tailed kites have been observed nesting in Valley Oak, Cottonwood, and Pine Trees (Dunk 1995). White-tailed kites are territorial with conspecifics, and are known to nest at relatively close distances (e.g. 153 meters) (Dixon *et al*. 1957). Erichsen (1996) reported that white-tailed kite nests in riparian areas were typically located within 0.25 miles of one another.

The size and structural diversity of woodlands supporting white-tailed kite nests has not been well documented. Nest sites are rarely found in isolated trees. They are usually located on the edge or riparian habitats, or in hedgerows and groups of trees, and are commonly found adjacent to natural vegetation, pasture crops (alfalfa) and sugar beets (Erichsen *et al.* 1996).

White-tailed kites use a variety of habitat types for foraging and the importance of these habitats is dependent on vegetation structure and prey abundance. Lightly grazed or ungrazed grasslands/pastures support larger prey populations and are thus considered more suitable, although intensively cultivated areas also are used (Dunk 1995). In cultivated areas, perennial crops such as alfalfa and sugar beets tend to support higher prey numbers, and white-tailed kite nest densities have been highly correlated with these two crops (Erichsen *et al.* 1996). Nesting studies conducted by Hawbecker (1942)showed that white-tailed kites foraged up to within 0.5 miles from the nest during the breeding season. During winter and the breeding season, Warner and Rudd (1975) found foraging from nest or perch sites extended up to 1.8 miles, but most were less than 0.6 miles. Foraging primarily occurred in two habitat types, riparian and irrigated cultivated land (e.g. alfalfa, tomatoes, sugar beets).

The occurrence and abundance of white-tailed kites during the breeding and non-breeding seasons are strongly affected by the dynamics of local rodent prey populations. Because rodent population cycles are often irruptive, and kite populations are sensitive to the availability of rodent prey, the suitability of an area and its occupancy by white-tailed kites may vary during certain years. Stendell (1972) found the density of voles at the onset of the breeding season affects the presence and abundance of nesting white-tailed kites. Winter densities of white-tailed kites are strongly correlated with the abundance of voles. The mean number of California Voles/territory was estimated at 1,483 for territories ranging from 3.9-53 acres (1.6 - 21.5

hectares) in northern California (Dunk and Cooper 1994). In other studies occurring in southern California (Henry 1983), no prey abundances were reported with nesting territories.

White-tailed kites are highly dependent on voles, therefore understanding habitat types optimal for prey species is of high importance. Many small mammal studies have been conducted including two studies in and adjacent to the SSHCP Study Area (Jones et al. 1999, Wyatt et al. 1991). The three most abundant species in both studies were the deer mouse (*Peromyscus maniculatus*), house mouse (*Mus musculus*), and meadow vole (*Microtus californicus*). Jones et al. (1999) found the highest numbers of small mammals in perennial grassland, ruderal roadside vegetation, and restored riparian habitat when compared to alfalfa, annual grassland, and seasonal wetland. Abundance indices for these species varied by season and habitat type. When abundance indices for each of the three dominant species were combined for each season, the highest total index (1.47) occurred in perennial grassland habitat during spring.

Distribution in the Proposed Action Area

There are no known white-tailed kite nests in the Proposed Action Area.

Reasons for Decline

Declines during the early part of the century were probably the result of habitat loss, shooting (this kite was considered a pest species), and, to a much lesser extent, egg collecting (Shuford 1993). In the past 20 years, habitat loss has accelerated, including the conversion of agricultural lands to urban/residential; however, declines have occurred even in areas such as Santa Barbara County, where agricultural lands have experienced little conversion. Kite populations also fluctuate greatly with cycles of prey abundance, which, in turn, are significantly correlated with rainfall (Pruett-Jones *et al.* 1980). Such cycles result in natural bottlenecks when the species may be extremely vulnerable to human disturbance. These fluctuations make determination of long-term population trends difficult.

The most important threat still facing this species is loss of habitat. Although kites appear able to withstand some habitat alteration because of grazing and farming, large stretches of agricultural areas devoid of natural vegetation and urbanized areas do not provide suitable supporting habitat for this species.

Designated Critical Habitat

Critical habitat has not been designated for white-tailed kite.

Conservation Efforts

Measures under the CALFED Bay-Delta Program are designed to restore and enhance suitable habitat for this species (CALFED 2000c).

Recovery Plan and Recovery Guidance

A recovery plan has not been prepared and recovery requirements have not been identified for this species.

Research and Monitoring Gaps

The white-tailed kite may compete for nesting sites with other raptors. Research into these interactions would help to identify possible limiting factors for the kite. Additionally, information about current abundance and population trends for this species is warranted (CalPIF 2000).

3.2.3.7 Osprey

Legal Status

Legal Status: California Species of Special Concern
MSCS Goal: 'm' = Maintain

The osprey is a California Species of Special Concern. This species is not listed under the federal ESA.

Life History, Habitat Requirements and Distribution

Osprey breed in northern California from the Cascade Range south to Lake Tahoe, and along the coast south to Marin County. Regular breeding sites include Shasta Lake, Eagle Lake, Lake Almanor, other inland lakes and reservoirs, and northwest river systems. The breeding population was estimated in 1975 at 350-400 pairs in northern California (Henny *et al.* 1978); however, numbers have apparently been increasing in recent years. They are associated strictly with large, fish-bearing waters and require open, clear waters for foraging using rivers, lakes, reservoirs, bays, estuaries, and surf zones. This species preys mostly on fish, but also will take small mammals, birds, reptiles, amphibians, and invertebrates.

Nesting occurs in large trees, snags, and dead-topped trees in open riparian habitats for cover and nesting. Nests are located on platforms of sticks at the top of large snags, dead-topped trees, on cliffs, or on human made structures and may be as high as 71 meters (250 feet) above the ground. Nests are usually within 400 meters (1312 feet) of fish-producing water, but may be up to 1.6 km (1 mile) from water (Airola and Shubert 1981). Osprey require tall, open-branched "pilot trees" nearby for landing before approaching the nest, and for use by young for flight practice. Nest tree averaged 172 centimeters (68 inches) diameter at breast height (range 76-206 centimeters; 30-81 inches diameter at breast height) and nest height averaged 41 meters (135 feet) in a northern California study (Airola and Shubert 1981).

Distribution in the Proposed Action Area

An active osprey nest was observed during June 2006 surveys within the Proposed Action Area along the dredging access road near the Big Chico Creek Sacramento River confluence. Ospreys

also have been observed foraging along the river by USFWS personnel within the Proposed Action Area.

Reasons for Decline

Removal of nesting trees, degradation of riverine and lacustrine habitat quality, boating on nesting lakes, and poaching all are partly responsible for the decline of the species (CDFG Website 2006a).

Designated Critical Habitat

Critical habitat has not been designated for the osprey.

Conservation Efforts

No formal conservation efforts for osprey have been identified. However, as a species of special concern in California, CDFG reviews proposed projects to ensure appropriate measures are taken to avoid nesting ospreys. Riparian restoration efforts by USFWS, CDFG, TNC, and River Partners have contributed to increases in osprey habitat along the middle Sacramento River.

Recovery Plan and Recovery Guidance

A formal recovery plan has not been prepared and recovery requirements have not been identified for this species.

Research and Monitoring Gaps

Specific research and monitoring activities in California have not been identified for this species.

3.2.3.8 Northwestern Pond Turtle

Legal Status

Legal Status: California Species of Special Concern
MSCS Goal: 'm' = Maintain

The northwestern pond turtle is designated as a California species of special concern (CDFG Website 2006b). It is also identified by CALFED as a species of concern.

Life History, Habitat Requirements and Distribution

Northwestern pond turtles inhabit a variety of aquatic habitats from sea level to elevations of 1,980 meters (6,500 feet). They are found in fresh to brackish permanent to intermittent aquatic habitats including marshes, rivers, ponds, streams, and vernal pools. Northwestern pond turtles also may occur in man-made habitats, such as irrigation ditches, reservoirs, and sewage and millponds. Northwestern pond turtles have been found in waters with temperatures as low as

1ºC (34ºF), and rarely in water with temperatures exceeding 39 to 40ºC (102 to 104ºF) (CDFG 1994), but seem to become more active in water that consistently reaches 15ºC (60ºF) (CDFG 1994). Preferred aquatic habitat is characterized by slow moving or quiet water, emergent aquatic vegetation, deep pools with undercut banks for refugia, partially submerged rocks and logs, open mud banks and matted floating vegetation for thermoregulatory basking. Northwestern pond turtles use aquatic habitats primarily for foraging, thermoregulation, and avoidance of predators (Reese and Welsh 1997). Basking occurs intermittently throughout the day and is primarily conducted to maintain a body temperature of 24 to 32ºC (75–90ºF) (Boyer 1965, Bury 1986). Hatchling and young turtles (1 year) require shallow water areas (less than 30 centimeters [11.8 inches] deep) dominated primarily by emergent aquatic reeds (*Juncus* sp.) and sedges (*Carex* sp.) (Holland 1991), and have been observed to avoid areas of open water lacking them (Reese and Welsh 1997; Washington Department of Fish and Wildlife 1999). Highly fluctuating flow rates associated with aquatic habitats may diminish habitat quality for northwestern pond turtles (Reese and Welsh 1997). Conversely, northwestern pond turtles may leave aquatic habitat as pools dry. Holland (1994) reported overland movements of 5 km (3.1 miles), possibly resulting in turtles seeking more appropriate aquatic habitat or they may aestivate for short periods.

Northwestern pond turtles "hibernate" in both aquatic and terrestrial habitats. Aquatic refugia consist of rocks, logs, mud, and undercut areas along banks while terrestrial hibernacula consist of burrows in leaf litter, heavy brush, or soil (Holland 1994). In woodland and sage scrub habitats along coastal streams in central California, most northwestern pond turtles leave the drying creeks during late summer and return after winter floods. These turtles spend an average of 111 days in upland refugia that are an average of 50 meters (164 feet) from the creeks (Rathbun *et al.* 1992). Upland nesting sites must be dry and often have a high clay or silt component. Typically, northwestern pond turtles dig nests in open sunny areas.

Northwestern pond turtles historic and current range includes the area from Puget Sound, Washington, south through Oregon, generally west of the Sierra-Cascade crest, to the American River drainage in central California. The southwestern subspecies ranges from the vicinity of Monterey Bay, California, south through the Coast Ranges to Baja California, Mexico. The area of the Central Valley of California between the American River drainage and the Transverse Ranges is considered to be a zone of introgression between the two subspecies (Seeliger 1945). Historically, the northwestern pond turtles inhabited the vast permanent and seasonal wetlands on the Central Valley, with the Tulare Lake Basin being a stronghold for the species. Today, northwestern pond turtles remain in 90 percent of their historic range, but at greatly reduced numbers (Holland 1991). Records of *C. m. marmorata* from Grant County, Oregon, and British Columbia, Canada, are believed to represent introduced animals (Nussbaum *et al.* 1983). Outlying populations of *C. m. marmorata* occur in Nevada primarily in the Carson River drainage. Whether or not these populations are native or represent introduced animals is debated by the experts (Holland 1991).

Distribution in the Proposed Action Area

Northwestern pond turtles have not been identified using the Sacramento River or Big Chico Creek within the Proposed Action Area. Additionally, no CNDDB occurrences of individuals have been reported within 10 miles of the Proposed Action Area. However, potentially suitable habitat exists within the Proposed Action Area.

Reasons for Decline

Habitat loss and alteration are most responsible for the historic decline of northwestern pond turtles throughout its range (USFWS 1999b). In California, over 90 percent of historic wetlands have been diked, drained and filled primarily for agricultural development and urban development (Frayer *et al.* 1989). Urbanization has significantly altered or eliminated northwestern pond turtles habitat, with significant impacts occurring in southern California. Local extirpation of the southwestern subspecies in the Los Angeles basin has occurred primarily through the channelization and cementing of numerous tributaries comprising the watershed (Brattstrom and Messer 1988, Holland 1991).

Water diversions for agriculture and urban uses also have negatively affected northwestern pond turtle populations. For example, agricultural, aquatic habitats, such as rice lands, are used to convey and store agricultural water, and consequently are subject to changes in the timing and volume of water flow. Many rivers, particularly in more arid regions such as the San Joaquin Valley of California, have had significant portions of their flows diverted for agriculture, which have resulted in low flows or no flows for several miles of stream during summer months. In addition, numerous agricultural drainages are channelized and periodically cleaned of aquatic vegetation, rendering them less suitable for northwestern pond turtles. Furthermore, where northwestern pond turtles persist adjacent to agricultural lands, upland nesting opportunities may be limited or nonexistent due of practice of farming up to the edge of aquatic habitats. Such actions typically result in the elimination of northwestern pond turtles from affected waters and isolation of turtle populations located in other portions of the drainage (Holland 1991). Because northwestern pond turtles are long-lived, populations may persist in these isolated wetlands long after recruitment of young has ceased (USFWS 1999b) resulting in very small and heavily adult biased populations (Holland 1991).

Changes in the nature and timing of water releases from reservoirs adversely affects downstream habitat by eliminating or altering basking sites, upland refugia, foraging areas, and particularly, hatchling microhabitat (Reese and Welsh 1997). High releases of water in the Trinity River during late May to early June in 1991, for example, scoured out several miles of hatchling turtle habitat (Holland 1991) and a similar incident occurred in Piru Creek in southern California (Holland 1991). Reservoirs also are typically stocked with exotic fish species, which may expand into previously isolated turtle habitat. Reservoirs, in general, provide poor habitat for turtles because of the lack of emergent aquatic vegetation and basking sites, high recreational use, and the presence of exotic species. Only small groups of adults are typically seen using reservoir habitats (Holland 1991).

Another significant source of habitat alteration throughout the range of the northwestern pond turtles is livestock grazing. Livestock have been documented as a major cause of excessive habitat disturbance in riparian areas (Behnke and Raleigh 1978, Kauffman and Krueger 1984). Cattle have a disproportionately greater adverse effect on riparian and other wetland habitats because they tend to concentrate in these areas, particularly during the dry season (Marlow and Pogacnik 1985). Cattle trample and eat emergent vegetation (Platts 1981), which serves as foraging habitat for turtles of all sizes and as critical microhabitat for hatchlings and first-year animals. Streambanks also are trampled by cattle often resulting in the collapse of undercut banks (Platts 1981, Kauffman *et al*. 1983) that provide refugia for turtles. Cattle grazing results

in increased erosion in streams (Winegar 1977), which in turn, fills in deep pools, increases stream velocity, and adversely affects aquatic invertebrates (Behnke and Raleigh 1978, Platts 1981). Cattle also may crush turtles (Holland 1991).

Instream and streamside mining operations for sand and gravel also unfavorably alter northwestern pond turtle habitat. These operations may directly eliminate or modify aquatic habitats and adjacent riparian habitat, alter the pattern of water flow, increase siltation, which fills in pools and alters the prey base, and disrupt normal behavior patterns or force displacement (Holland 1991). In addition, removal of basking sites (e.g., logs, snags, and rocks) for aesthetic reasons or to facilitate recreational pursuits has a negative effect on northwestern pond turtles. Loss of basking sites changes thermoregulatory behavior of turtles and reduces available foraging and refugial sites. According to Holland (1992), this activity is a primary factor in the observed decline of northwestern pond turtles in several lakes in Oregon.

Construction of roadways and railroad adjacent to northwestern pond turtle habitat may adversely affect northwestern pond turtles in several ways. First, roads often present a partial or complete barrier to turtles traveling overland to nesting or overwintering sites. Northwestern pond turtles have been observed crushed on roadways in California, Oregon, and Washington, with the majority of these individuals being gravid (with developing young or eggs) or post-partum females (Holland 1985, 1992). In addition to hampering access to nesting areas, roadbeds reduce the area of potential nesting. Roads constructed on south-facing slopes adjacent to the Umpqua River in Oregon likely eliminated both existing and potential nesting habitat (Holland 1992). Train tracks may have similar adverse effects on northwestern pond turtles. At two locations in Oregon, northwestern pond turtles were found dead between railroad tracks. In both cases the railroad tracks paralleled the north side of the watercourse and were located between the watercourse and potential nesting habitat (Holland 1992). Holland (1992) hypothesized that the turtles became trapped between the railroad tracks when unable to find a way to exit under the rail.

The most significant natural factor affecting northwestern pond turtles populations is drought. The six-year drought in California (1987 – 1992) had a major effect on northwestern pond turtles populations. Surveys of eight sites conducted by Holland (1991) from 1987 to 1991 in central and southern California indicated that turtle populations had declined from 65 to 100 percent as a result of drought. One population in the Pajaro-Salinas River drainage of central coastal California, which contained the highest recorded density of turtles, suffered an 85 percent population decline (Holland 1991). Drying of the habitat resulted in: (1) concentrating large numbers of turtles in the few remaining pools; (2) major increases in the distance between pools; (3) exhaustion of the prey base; (4) increased exposure to predators; and (5) a general increase in stress suffered by the turtle population (Holland 1991). Observations of additional sites by Holland (1991) indicated that drought related declines in populations of this subspecies were widespread. Where non-native predators and competitors were present, the adverse effects of drought were probably magnified (Holland 1991).

Designated Critical Habitat

Critical habitat has not been designated for the northwestern pond turtle.

Conservation Efforts

Conservation efforts have not been identified for this species. CDFG (2005) presents important issues to consider in the protection of this species.

Recovery Plan and Recovery Guidance

A recovery plan for this species in California has not been prepared, and requirements have not yet been identified for this species. The Washington State Department of Fish and Wildlife has prepared a recovery plan for this species (Washington Department of Fish and Wildlife 1999).

Research and Monitoring Gaps

While there may be approximately two hundred extant occurrences of the pond turtle in California, the viability of these populations is not known, and better information on the demography of this species is needed. Studying metapopulation dynamics, movement responses, and recolonizing ability would help elucidate the status and ecology of this species in California (CDFG Website 2006a) The role of introduced predators in the decline of this species requires further study. Recovery efforts would be enhanced by developing better monitoring and management methods.

3.3 NATURAL COMMUNITY CONSERVATION PLAN COMMUNITIES

The term "NCCP community" refers to both habitats and fish groups addressed in the MSCS. The MSCS provides the information for a programmatic NCCP for 20 natural communities, encompassing 18 habitat types and two ecologically-based fish groups. Four NCCP communities would be affected by the Proposed Action: (1) Valley Riverine Aquatic; (2) Valley/Foothill Riparian; (3) Grassland; and (4) Upland Cropland. A description of each NCCP community is provided below.

3.3.1 Valley Riverine Aquatic

Valley Riverine Aquatic habitat includes the water column of flowing streams and rivers in low-gradient channel reaches below an elevation of about 300 feet that are not tidally influenced. This includes associated SRA habitat, pool, riffle, run, and unvegetated channel substrate (including seasonally exposed channel bed) habitat features, and sloughs, backwaters, overflow channels, and flood bypasses hydrologically connected to stream and river channels.

The Valley Riverine Aquatic habitat contains large and small woody debris (contributed by the adjacent Valley/Foothill Riparian), which serve as cover and flow refuge for fish species occurring at this reach of the river. This area also serves as a deepwater pool for larger fish, or schools of fish, to hold unseen from terrestrial predators, while migrating to spawning grounds at higher reaches of the watershed.

3.3.2 Valley/Foothill Riparian

Valley/Foothill Riparian habitat includes all successional stages of woody vegetation, commonly dominated by willow, Fremont cottonwood (*Populus fremontii*), valley oak (*Quercus lobata*), or sycamore (*Plantanus racemosa*), within the active and historical floodplains of low-gradient reaches of streams and rivers generally below an elevation of 300 feet.

Valley/Foothill Riparian vegetation at the site is composed of mature native and nonnative trees occurring as an isolated patch between agricultural fields and the river's edge. This vegetation is located along the adjacent bank of the proposed longitudinal stone toe and tree revetment. About 250-feet of remnant riparian vegetation occurs along the most highly eroded area. This stand of riparian vegetation is located on the top of a nearly vertical bank about 10 to 12 feet from surface water. This habitat type also occurs on the east side of the Sacramento River within and immediately adjacent to the gravel removal construction area.

Riparian vegetation helps reduce water temperatures by providing SRA cover. Large and small woody debris also are deposited into the river as the west bank continues to erode, and flows undercut this existing stand of vegetation. Woody debris creates cover for fish species and serves as habitat for many riverine invertebrates and organisms. This section of riverbank will be most affected by the construction of the longitudinal toe revetment.

Riparian forest in the vicinity of the Proposed Action Area has a tall overstory of deciduous broadleaf trees comprised primarily of valley oak (*Quercus lobata*). Other native riparian forest species include Fremont cottonwood (*Populus fremontii*), box elder (*Acer negundo*), Oregon ash (*Fraxinus latifolia),* western sycamore (*Platanus racemosa*) and northern California black walnut (*Juglans californica* var. *hindsii*). Understory species in the riparian forest community include poison oak (*Toxicodendron diversilobum*), wild blackberry (*Rubus ursinus*), Himilayan blackberry (*Rubus discolor*), wild grape (*Vitis californica*), elderberry (*Sambucus mexicana*) and saplings of tree species.

Valley/Foothill Riparian habitats provide food, water, migration and dispersal corridors, and escape, nesting, and thermal cover for an abundance of wildlife. At least 50 amphibians and reptiles occur in lowland riparian systems. Many are permanent residents; others are transient or temporal visitors (Mayer and Laudenslayer 1988). In one study conducted in the Sacramento River, 147 bird species were recorded as nesters or winter visitants (Mayer and Laudenslayer 1988). Additionally, 55 species of mammals are known to use California's Central Valley riparian communities (Mayer and Laudenslayer 1988).

3.3.3 Grassland

Grassland habitat includes upland vegetation communities dominated by introduced and native annual and perennial grasses and forbs, including non-irrigated and irrigated pasturelands. Grassland habitat includes the entire ERP perennial grassland habitat and the much more extensive annual grassland vegetation that is not addressed in the ERP.

3.3.4 Upland Cropland

Upland cropland habitat includes agricultural lands farmed for grain, field, truck, and other crops for profit that are not seasonally flooded. Upland Cropland borders the work area, staging and storage area, and access road on the west side of the river and the access road on the east side. Much of this habitat-type has recently been taken out of agricultural production and incorporated into the Capay Unit of the Sacramento River National Wildlife Refuge.

4.0 EFFECTS OF THE PROPOSED ACTION AND DEVELOPMENT OF CONSERVATION MEASURES

4.1 INTRODUCTION

This chapter describes the potential effects of Proposed Action on special-status fishery and wildlife resources within the Proposed Action Area. Special-status species and critical habitat within the Proposed Action Area that may be affected by the Proposed Action include the following: (1) species that are federally and/or state-listed; (2) species that are proposed for federal listing; (3) critical habitat for listed species; (4) state species of special concern, and (6) other species that were evaluated by CALFED in its MSCS that are known to occur or have the potential to occur in the Proposed Action Area. These species are listed below.

- Sacramento River winter-run Chinook salmon (*Oncorhynchus tshawytscha*)
- Critical habitat for Sacramento River winter-run Chinook salmon
- Central Valley spring-run Chinook salmon (*Oncorhynchus tshawytscha*)
- Critical habitat for Central Valley spring-run Chinook salmon
- Central Valley steelhead (*Oncorhynchus mykiss*)
- Critical habitat for Central Valley steelhead
- Green sturgeon (*Acipenser medirostris*)
- Central Valley fall-run/late fall-run Chinook salmon (*Oncorhynchus tshawytscha*)
- Sacramento splittail (*Pogonichthys macrolepidotus*)
- Hardhead (*Mylophardon concephalus*)
- River Lamprey (*Lampetra ayresi*)
- Valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*)
- Bald Eagle (*Haliaeetus leucocephalus*)
- Western Yellow-Billed Cuckoo (*Coccyzus americanus*)
- Bank Swallow (*Riparia riparia*)
- Swainson's hawk (*Buteo swainsonii*)
- White-tailed kite (*Elanus leucurus*)
- Osprey (*Pandion haliaetus*)
- Northwestern pond turtle (*Clemmys marmorata marmorata*)

Evaluating potential effects on fishery and wildlife resources within the Proposed Action Area requires an understanding of each species' life history and life-stage-specific environmental requirements. This information is provided in *Chapter 3, Environmental Baseline* of this ASIP.

4.2 ANALYSIS FRAMEWORK

The analysis of effects of a particular action on a biological resource is comprised of one or more types of effects, including direct and indirect effects, interrelated and interdependent effects, and cumulative effects.

Direct effects include those effects that are the direct result of a proposed action. Indirect effects are caused by, or result from, a proposed action, occur later in time, and are reasonably certain to occur.

The Proposed Action is not anticipated to result in changes to water temperature and flow; thus, the analyses for direct and indirect effects focus on: (1) Proposed Action construction activities;

(2) habitat considerations associated with the Proposed Action Area; and (3) known or presumed occurrence of protected species in the Proposed Action Area. Data sources for the analysis of effects include:

- CDFG's 2006 CNDDB;
- USFWS and California Native Plant Society's Inventory. A list of state and federally protected species known to occur in the Grimes/Colusa area was compiled (**Appendix A**) and reviewed prior to conducting the field surveys;
- Information collected from the Sacramento River by the USFWS and CDFG;
- Information on the seasonal timing of occurrence for various life stages of protected fish species, including winter-run and spring-run Chinook salmon and fall-run/late fall-run Chinook salmon and Central Valley steelhead.
- Information on substrate size in relation to habitat value and carrying capacity determined by the Standard Assessment Methodology for the Sacramento River Bank Protection Project.
- Field surveys by qualified biologists on August 10 and 12, 2005, October 4, 2005, and June 15, 21 and 27, 2006.

Direct and indirect effects also include the effects of interrelated actions (actions that are part of the larger proposed action and depend on the larger action for their justification) and interdependent actions (actions having no independent utility apart from the proposed action). Interrelated and interdependent actions are described in *Section 4.6: Assessment of Interrelated and Interdependent Actions.*

Cumulative effects are those effects of future state or private activities, not involving federal activities, that are reasonably certain to occur within the Proposed Action Area of the Federal action subject to consultation (50 CFR 402.02). Future federal actions that require separate consultation (unrelated to the proposed action) are not considered in the cumulative effects section USFWS and NMFS 1998). For a description of cumulative effects associated with the Proposed Action, please refer to *Section 4.7: Assessment of Cumulative Effects.*

4.3 ENVIRONMENTAL BASELINE

The analysis of the Proposed Action's potential effects on protected species was conducted by comparing habitat conditions and species populations under existing conditions to expected future-with-action conditions. The existing conditions baseline for evaluated species used to conduct the analysis is described in the individual species accounts in *Chapter 3, Environmental Baseline,* of this ASIP.

4.4 DIRECT AND INDIRECT EFFECTS ASSESSMENT METHODS

4.4.1 Short-Term Construction-Related Direct Effects and Indirect Effects Associated with Altered Habitat Conditions

The assessment methodology includes evaluation of both short-term, potential construction-related direct effects, as well as potential indirect effects associated with altered habitat conditions. Potential short-term, direct effects would be limited to the immediate Proposed Action Area and would primarily be associated with construction-related activities.

Construction-related effects to be assessed in this ASIP include those associated with dredging and bank revetment. The evaluation of potential short-term, construction-related direct effects is based on several considerations including construction timing, physical habitat disturbance, potential for physical injury, hazardous spills, turbidity, sedimentation and erosion resulting from dredging and bank revetment, short-term changes in habitat conditions, and the life stage periodicity and habitat utilization of special status species in the Proposed Action Area.

The evaluation of altered habitat conditions (indirect effects) extends from the time of construction through the five-year planning horizon adopted for this ASIP. Altered habitat conditions would include changes in the evaluated species utilization of available habitats associated with changes in specific habitat variables. Habitat variables considered include structural features (bank slope, substrate size, instream woody material, riparian vegetation and instream object cover), hydraulics (water depth and velocity), riparian habitat/overhanging shade/cover, and associated predation potential.

4.4.2 Effect Indicators and Technical Evaluation Guidelines

Effect indicators and technical evaluation guidelines have been included for each species evaluated in this ASIP. Effect indicators and technical evaluation guidelines have been developed as a means to assess potential short-term construction-related and habitat alteration-related effects of the Proposed Action on listed, proposed species, or covered sensitive communities, including designated critical habitat**.** The technical evaluation guidelines serve as the basis of the conclusion and determination of potential action-related effects on species and habitat protected under the federal ESA. In addition, the technical and evaluation guidelines are applicable to EFH according to the provisions of the MSFCMA.

4.4.2.1 Determination of Species-Specific Effects Under the Endangered Species Act

Five possible determinations exist regarding a proposed action's effects on protected species under the ESA (NMFS and USFWS 1998). These determinations are as follows:

- ***No effect*** - *"No effect"* is the appropriate conclusion when it is determined that the Proposed Action will not affect a listed species or designated critical habitat.
- ***Is not likely to adversely affect*** - "*Is not likely to adversely affect"* is the appropriate finding when effects on ESA protected species are expected to be discountable, insignificant, or completely beneficial. *"Insignificant effects relate to the size of the impact, and should never reach the scale where take occurs. Discountable effects are those extremely unlikely to occur* (NMFS and USFWS 1998) ."
- ***Is likely to adversely affect*** - *"Is likely to adversely affect"* is the appropriate finding if any adverse effect to listed species may occur as a direct or indirect result of the Proposed Action or its interrelated or interdependent actions, and the effect is not discountable, insignificant, or beneficial. In fact, in the event the overall effect of the Proposed Action is beneficial to an ESA-protected species, but also is likely to cause some adverse effects, then the Proposed Action *"is likely to adversely affect"* the listed species. If incidental take is anticipated to occur as a result of the Proposed Action, an "*is likely to adversely affect*" determination should be made (NMFS and USFWS 1998).

- ***Is likely to jeopardize the continued existence of a listed species or result in the destruction or adverse modification of critical habitat*** - *"May affect, and is likely to jeopardize the continued existence of a listed species or result in the destruction or adverse modification of critical habitat"* is the appropriate determination when the action agency or the USFWS and/or NMFS identify situations where the Proposed Action is likely to jeopardize the species or adversely modify critical habitat. Jeopardy occurs when a Proposed Action is likely to directly or indirectly appreciably reduce the likelihood of both the survival and recovery of a protected species in the wild by reducing their reproduction, numbers, or distribution. Destruction or adverse modification of critical habitat is a direct or indirect alteration that appreciably diminishes the value of critical habitat for the survival or recovery of a listed species. Such alterations include, but are not limited to, alterations adversely modifying any of those physical or biological features that were the basis for determining the habitat to be critical(NMFS and USFWS 1998).
- ***Is likely to jeopardize a proposed species or adversely modify proposed critical habitat-*** ***"****Is likely to jeopardize a proposed species or adversely modify proposed critical habitat"* is the appropriate conclusion if the proposed action is likely to jeopardize the continued existence of the proposed species or adversely modify the proposed critical habitat.

The ESA Consultation Handbook identifies six factors that should be examined, as appropriate for the proposed action under consideration, to assess the direct and indirect effects of a proposed action. These factors are: (1) proximity of the proposed action to the species, management units or designated critical habitat units; (2) geographic areas where the proposed action-induced disturbance occurs; (3) timing of the proposed action in relationship to sensitive period of a species' lifecycle; (4) the nature of the effects of the proposed action on elements of a species lifecycle, population size or variability, or distribution; or on the primary constituent elements of the critical habitat; (5) duration of the effects (i.e., pulse effect- short term event whose effects are relaxed almost immediately; press effect- sustained, long-term, or chronic event whose effects are not relaxed; and threshold effect- permanent event that sets a new threshold for some feature of a species' environment); and (6) the disturbance frequency of the effects resulting from the proposed action, and how it affects a species based on the species recovery rate (NMFS and USFWS 1998).

The factors described above are to be evaluated, as appropriate, to determine if the Proposed Action would be associated with the overriding consideration of take, which is the main discriminating factor for selecting the appropriate ESA determination. As can be discerned from the definitions of the five possible determinations under ESA (described above), the amount and extent of a protected species take would determine which conclusion would be appropriate for effects associated with a proposed action.

Under the federal ESA, take is defined as "*…to harm, harass, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to engage in any such conduct [ESA§3(19)]*. Harass, pursue, hunt, shoot, wound, kill, trap, capture or collect can be classified as actions that would have a direct impact on a species, at the individual level. Conversely, harm, which is a form of take, is further defined to include "*…significant habitat modification or degradation that results in death or injury to listed species by significantly impairing behavioral patterns such as breeding, feeding, or sheltering* (NMFS and USFWS 1998)." Proposed actions that result in adverse changes of habitat (e.g., flows and water temperatures) would result in harm and, thus, result in

take of a listed species. When determining the amount and extent of take in order to select the appropriate ESA determination associated with the anticipated effects resulting from a proposed action, both the direct effects on a protected species at the individual level, and the effects to the habitat of that species should be thoroughly evaluated.

To guide the effective and correct evaluation of the anticipated effects associated with the Proposed Action, and to ensure that the appropriate steps are taken to select the correct ESA determination, technical evaluation guidelines have been developed. The technical evaluation guidelines take into consideration the interplay between the six previously identified factors to assess direct and indirect effects of an action, and the effects' contribution to the different forms of take (i.e., harm, harass, pursue, hunt, shoot, wound, kill, trap, capture, collect). Thus, the technical evaluation guidelines are used as the primary tool to appropriately evaluate and identify the amount and extent of take associated with the Proposed Action. In turn, this information is used to select the appropriate ESA determination for the Proposed Action potential effects on ESA-protected species.

4.4.2.2 Determination of Effects on Essential Fish Habitat Under the Magnuson-Stevens Fisheries Conservation and Management Act

The MSFCMA, as amended by the *Sustainable Fisheries Act of 1996* (Public Law 104-267), established procedures designed to identify, conserve, and enhance EFH for those species regulated under a federal fisheries management plan. The MSFCMA requires all federal agencies to consult with NMFS on all actions, or proposed actions, which are permitted, authorized, funded, or undertaken by the agency that may adversely affect EFH[3] (MSFCMA §305(b)(2)).

The phrase "*adversely affect*" refers to the creation of any impact that reduces the suitability and/or quantity of EFH, and may include direct, indirect, site-specific or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions (50 CFR 600.810). Freshwater diversions taken from lakes, streams, and rivers for commercial and domestic water use can affect EFH by: (1) altering natural flows and the process associated with flow rates; (2) affecting shoreline riparian habitats; (3) affecting prey bases; (4) affecting water quality; and (5) entrapping fish. Further, water diversions may affect EFH through either: (1) withdrawals, which could result in flow reductions; or (2) discharges, which could increase flow. The analysis of potential effects of the Proposed Action on EFH includes the aforementioned impact considerations, as appropriate.

Pursuant to the direction provided by NMFS guidelines for integrating ESA and EFH consultations (NMFS 2001a), the information prepared by the federal action agency as part of either informal or formal consultation under the ESA may serve as the EFH assessment if it includes all the components required in an EFH assessment (50 CFR 600.920(g)), rendering separate analysis for EFH consideration unnecessary. Therefore, the logic and rationale presented for assessing potential effects of the Proposed Action through the evaluation of

[3] EFH is defined as "waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." "*Waters*" include aquatic areas and their associated physical, chemical, and biological properties. "*Substrate*" includes sediment in underlying waters. "*Necessary*" means the habitat required to support a sustainable fishery and the managed species' contribution to a healthy ecosystem. "*Spawning, breeding, feeding, or growth to maturity*" covers all habitat types utilized by a species throughout its life cycle (50 CFR 600.10; Hanson *et al.* 2004).

changes to, or modification of, a species' habitat suitability or quantity for ESA purposes also can be applied to the assessment of Chinook salmon EFH.

4.5 DIRECT AND INDIRECT EFFECTS ANALYSIS

4.5.1 Short-term, Direct, Construction-related Effects

The evaluation of potential short-term, direct construction-related effects is based on several considerations including construction timing, physical habitat disturbance, potential for physical injury, hazardous spills, turbidity, sedimentation and erosion resulting from dredging and bank revetment, short-term changes in habitat conditions, and the life stage periodicity and habitat utilization of evaluated covered species in the Proposed Action Area.

4.5.1.1 Gravel Bar Dredging

The gravel bar dredging component of the Proposed Action consists of three major elements including: provision of access to the gravel bar across Big Chico Creek; dredging of the gravel bar itself; and spoils disposal.

Gravel Bar Access across Big Chico Creek

A temporary stream crossing over Big Chico Creek will be constructed to provide heavy equipment access to the gravel bar dredging site from the M&T Chico Ranch/Llano Seco Rancho. Construction of the access road will require removal of a limited, thin strip of willows on the bank of the gravel bar near the waters edge where the access road crosses Big Chico Creek. Although the thin strip of willows presently does not provide shade or overhead object cover in Big Chico Creek, removal of these willows would represent a temporary loss of SRA. However, upon completion of the gravel bar dredging activities, the temporary stream crossing over Big Chico Creek will be removed and impacted vegetation will be restored.

The temporary stream crossing over Big Chico Creek includes one or more corrugated metal culverts covered with gravel fill. Installation of the stream crossing on Big Chico Creek would not be expected to substantively affect movement of fishes potentially present in the area, because of the inclusion of culverts which would continue to allow passage. During construction, low flow conditions may preclude or substantively affect fish passage irrespective of construction activities including stream-crossing activities. However, because flow conditions are not affected by the Proposed Action fish passage also would not be affected by the Proposed Action.

Subsequent to gravel bar dredging activities, the temporary stream crossing over Big Chico Creek would be removed, the original shoreline contours restored, and some gravel would be left in the creek after removing the culverts. Addition of gravel to the lower portion of Big Chico Creek would be expected to provide improved substrate conditions for juvenile fish foraging due to increased opportunity for aquatic macroinvertebrate colonization.

Gravel Bar Dredging

During excavation of gravels from the gravel bar, a 5 to 10-feet berm would be left on the outer edge of the dry bar to separate the Sacramento River and Big Chico Creek from the dredging activities. The area inside the gravel bar would be excavated to about 5-feet below the fall low-flow (4,000 cfs Sacramento River flow) water surface elevation. Separation of excavation activities from the Sacramento River and Big Chico Creek would reduce or eliminate any turbidity caused by re-suspension of sands and slits during excavation. This buffer also would isolate turbid seep water in the excavation area from the Sacramento River and Big Chico Creek during construction activities. Silt would settle in the excavation area and would be subject to re-suspension when high Sacramento River flows inundate the area during the winter/spring period. However, temporary turbidity increases and subsequent sedimentation associated with the initial period of high flow inundation would be temporary, and masked relative to turbidities expected in the Sacramento River during high flow events.

Spoils Disposal

The substrate excavated from the gravel bar would be relocated to a spoils area located about 1,000 feet to the east of the gravel bar. Excavated materials would be deposited on top of materials excavated from the gravel bar during 2001. The spoils site is located within the floodplain of the Sacramento River. Excavated materials from the dredged gravel bar would be dispersed evenly over the spoils area and sloped toward the mainstem Sacramento River to eliminate low areas and potential ponding after flooding, which otherwise could result in the stranding of covered species. In addition the gravel and sand deposited at the spoils disposal site would be made available only for river and flood plain restoration activities at a future date. If materials are removed from the spoils disposal storage site for restoration activities, removal would be in a progression from the downstream to the upstream end of the storage area, while maintaining the drainage gradient.

4.5.1.2 Bank Revetment

The Proposed Action would place 1,520 linear feet of rock toe and tree revetment on the west bank of the Sacramento River. Application of the design procedure resulted in a requirement of 6 tons of rock per linear foot of bank. Based on an analysis of the flow-duration curve for the Hamilton City gage and the results of the USACE 1-D HEC-RAS model of the site, the likely flow depth at the base of the bank at the site was estimated to be on the order of eight feet during the period of construction of the longitudinal stone toe revetment.

The Proposed Action would result in a triangular-shaped section of stone placed along the toe of the Sacramento River bank. Backfilling behind the stone toe would be done to thicken the toe, and to provide a medium for vegetation growth. Construction can be accomplished from the landward side with appropriate equipment. No bank grading is anticipated at the site. Rock would be imported to the site by truck, dumped on a 20 foot wide working area along the top of the nearly vertical 15-foot high bank, and placed in the water at the base of the bank by either a dragline or a long-reach excavator with a 33 to 40 foot reach. Excavation for the rock tiebacks would be done with a long-reach excavator. The velocity and characteristics of the stream dictate the size of the stone used to form the longitudinal stone toe revetment. The stone would be large enough to resist being transported by the river, and the stone would be well-graded.

Sufficient stone would be incorporated to account for toe scour. Brush incorporation into the revetment would require anchoring with cables and large boulders to prevent loss during overtopping flows. Orchard-type trees would be placed continuously along the top of the rock by excavator following construction of the toe revetment. Trees would be cabled to the boulder anchors and each other. Addition of woody material to the top of the rock revetment provides an element of self-mitigation for the loss of SRA habitat. Additionally, native riparian vegetation would be planted atop the rock revetment between the tree clusters incorporated into the revetment.

Because construction of the bank revetment can be accomplished from the landward side with appropriate equipment, and because no bank grading is anticipated at the site, minimal temporary increases in turbidity would be expected. Consequently, the subsequent potential for sedimentation and potential effects on aquatic macroinvertebrates also would be minimal.

The Proposed Action would remove 250 linear feet of bankline Valley/Foothill Riparian habitat. The removal of riparian habitat *via* bank revetment would temporarily discontinue recruitment of IWM and SRA at this restricted portion of the west bank of the Sacramento River. However, bank revetment with embedded tree and/or brush clusters and riparian restoration would lessen these effects by increasing the IWM to greater than pre-project levels and alleviating temporary loss of SRA. Thus, the effect on IWM and SRA would be expected to be of short duration, extending only through the construction period prior to completion of establishment of embedded tree and/or brush clusters, as well as addition of woody material to the top of the rock revetment.

In addition to potential effects on instream and bank habitat elements for fish species (e.g., SRA removal), the bank revetment would remove approximately 1,520 feet of known and potential bank swallow habitat. Although the habitat removal would be permanent, mitigation to restore two linear feet of habitat for every foot removed is incorporated into the Proposed Action to minimize the potential effects on bank swallows.

4.5.1.3 Hazardous spills and other construction-related considerations

The construction activities associated with both the gravel bar dredging and bank revetment components of the Proposed Action have the potential to adversely affect fisheries and aquatic resources through the inadvertent discharge of toxic substances. Toxic substances used at construction sites, including gasoline, lubricants, and other petroleum-based products, could enter the Sacramento River or Big Chico Creek as a result of spills or leaks from machinery. These substances can kill aquatic organisms through exposure to lethal concentrations or exposure to non-lethal levels that cause physiological stress and increased susceptibility to other sources of mortality such as predation. Petroleum products also tend to form oily films on the water surface that can reduce dissolved oxygen levels available to aquatic organisms.

The following actions would be implemented as part of the Proposed Action to avoid the potential for adverse environmental effects that could occur due to construction-related activities associated with implementation of the Proposed Action.

M&T Chico Ranch/Llano Seco Rancho would apply for certification from the Central Valley Regional Water Quality Control Board (RWQCB) under section 401 of the Clean Water Act, and

implement an Erosion Control Plan and Post Construction Stormwater Management Plan (PCSWMP). An SWPPP also would be implemented as required by the conditions of an NPDES permit. Additionally, hazardous materials, which would be present during project construction, would be limited to petroleum products. M&T Chico Ranch/Llano Seco Rancho would develop a Hazardous Materials Control, Spill Prevention and Response Plan to reduce the potential effects of hazardous materials use and spills. The Hazardous Materials Control, Spill Prevention and Response Plan and SWPPP would include provisions to ensure that potential hazardous materials issues would be less than significant.

Construction Best Management Practices (BMPs) are incorporated as part of the Proposed Action Description, and include:

- Prevention of any substances that could be hazardous to aquatic life from contaminating the soil or entering watercourses, including ditches and canals;
- Establishing a spill prevention and countermeasure plan before project construction that includes strict on-site handling rules to keep construction and maintenance materials out of drainage and waterways;
- Cleaning up all spills immediately according to the spill prevention and countermeasure plan, and notifying CDFG and the Central Valley RWQCB immediately of spills and cleanup procedures; and
- Providing staging and storage areas for equipment, materials, fuels, lubricants, solvents, and other possible contaminants away from watercourses and their watersheds.

Project personnel would participate in an environmental awareness training program provided by the project biologist. Construction workers would be informed about any sensitive biological resources associated with the project and that disturbance of sensitive habitat or special-status species is a violation of the ESA and Section 404 of the Clean Water Act. Workers would be informed of the nearshore presence of juvenile listed fish species and that actions causing injury or death to fish could result in civil or criminal penalties to the individuals who commit such actions. Workers would be informed of the need to carefully place rock in order to avoid impacts to juvenile fish.

M&T Chico Ranch/Llano Seco Rancho would develop a plan to avoid, compensate and enhance natural vegetation, including riparian habitats and Instream Woody Material prior to, during and post construction activities. When required for the implementation of the Proposed Action, either a "veneer" of stone less than 8 inches in diameter will fill interstitial spaces created by large quarry stone or "pit run rock" which consists of various sizes of rock that lock together eliminating cavities would be used in the construction of the longitudinal stone toe revetment to reduce refuges for predator fish species.

4.5.2 Habitat Alteration (Five-year Period)

4.5.2.1 Dredged Gravel Bar

Construction of the access road across Big Chico Creek would require removal of a limited, thin strip of willows on the bank of the gravel bar near the waters edge, although the thin strip of willows presently does not provide shade or overhead object cover in Big Chico Creek. Removal of these willows would represent a temporary loss of SRA of limited habitat value. However, upon completion of the gravel bar dredging activities, the temporary stream crossing

over Big Chico Creek would be removed and impacted vegetation would be restored. Restoration of riparian vegetation at a ratio of 2:1 for every acre of removed habitat at this location along Big Chico Creek is expected to result in increased amounts of nesting and foraging habitat for riparian terrestrial species, SRA, and associated shade, which incrementally helps moderate stream temperatures and prevent direct solar exposure of fish at shallow depths. The role of riparian shade in moderating stream temperatures is greatest on small streams such as Big Chico Creek.

4.5.2.2 Bank Revetment

The evaluation of altered habitat conditions extends from the time of construction through the five-year planning horizon adopted for this ASIP. Altered habitat conditions would include changes in the evaluated aquatic and terrestrial species utilization of available habitats associated with changes in specific habitat variables. Habitat variables considered include structural features (bank slope, substrate size, instream woody material, and instream object cover), hydraulics (water depth and velocity), riparian habitat/overhanging shade/cover, and associated predation potential. However, each habitat variable evaluated does not apply to all species. Specifically, alterations in structural features such as substrate size, IWM, and instream object cover, hydraulics, and predation potential could potentially affect fish species, while alterations in bank slope and riparian habitat could affect both fish and terrestrial species.

Bank Slope

In the Proposed Action Area, the average existing west Sacramento River bank slope, within the 1,520 foot Proposed Revetment Area, appears to be a steep slope of about 1:1, based on the Temporary Maintenance Project permitting report provided by Ducks Unlimited Inc. As proposed by Ducks Unlimited Inc. the stone toe would be constructed with a 10:1 cross grade and could, therefore significantly reduce the slope of the west bank within the Proposed Action Area.

The change in bank slope from the existing condition (very steep, approximately 1:1) to a very gradual slope under the Proposed Action (10:1 cross grade) is expected to affect evaluated fish species through the alteration of important habitat variables. Water depth and water velocity on the Sacramento River are hydrologic variables indicative of the availability of shallow water habitat to sensitive species. Shallow water depth and relatively low water velocities are important habitat variable for evaluated species, because they provide areas suitable for predator avoidance, and increased food availability. An average bank slope of 10:1 in the bank revetment area provides a reliable index to the availability of shallow water habitat over a range of flows in the Proposed Action Area.

The biological response of evaluated species to bank slope is highly dependent on life stage (USACE and The Reclamation Board 2004). Adult evaluated species may have limited access to shallow water habitat created by the Proposed Action during relatively low Sacramento River flows and, therefore, are considered less sensitive to the bank slope habitat variable. However, the Proposed Action bank slope of 10:1 would be expected to provide juvenile evaluated species with habitat highly valued for its contribution to predator avoidance from larger piscivorous fish, and increased macroinvertebrate foraging o opportunities.

The Proposed Action with a bank slope of 10:1 will increase available shallow water habitat relative to the existing steep condition (approximately 1:1). The shallow bank slope of the Proposed Action is not expected to substantively increase suitable habitat for the adult life stage of evaluated species. By contrast, the increase in highly valued bank slope habitat along the bank of the Sacramento River is expected to result in increased habitat use, increased predator avoidance, and increased food availability and foraging utilization by juvenile species of primary concern. These beneficial affects to the juvenile life stage of evaluated species would be realized immediately at the completion of construction, and throughout the five-year period of evaluation.

In addition to the beneficial effects of the reduced bank slope, the revetment would reduce the slope to a grade that would reduce the suitability of 1,520 linear feet of bank swallow habitat above the revetment and remove the opportunity for recolonization during the five-year planning period, potentially resulting in a permanent loss of bank swallow habitat in the Proposed Action Area. The habitat removal would be mitigated by restoration of two linear feet of bank swallow habitat for every linear foot of habitat removed. Additionally, upon removal of the revetment following the five-year planning period, the bank could potentially become suitable for recolonization. However, the suitability of the bank after the five-year planning period would depend on the type of permanent solution implemented by the Steering Committee.

Substrate Size

The soils of the Sacramento River floodplain consist of moderately well drained, or somewhat poorly drained soils of recent alluvium. The Columbia Soil Series occupies areas along both sides of the Sacramento River. Like most alluvial soils these are generally stratified, contain a small amount of organic matter in the surface layer, and have little or no differentiation between horizons. Columbia soils are characterized by stratified fine sandy loam, or silt loam soils. Deeper layers may include very fine sandy loam, contain stratified thin layers of loamy fine sand and sand that are massive to single grain. In the Proposed Action, the eroding west bank of the Sacramento River can be characterized as primarily containing loose sands and loamy fine sand with little cobble or gravel sized substrate.

The Proposed Action would place 1,520-feet of rock toe and tree revetment on the west side of the river. Hydraulic information used in selection of the rock size (D_{50} = 0.75 ft.) and the depth of toe scour (4.1 ft.) was derived from Mussetter Engineering, Inc's (MEI) two-dimensional hydrodynamic model of the reach (Ducks Unlimited 2005). Rock volumes were increased by a factor of 1.75 to account for the use of quarry rock. Application of the design procedure resulted in a requirement of 6 tons of rock per linear feet of bank, for a total of 9,300 tons, including four intermediate tiebacks and the up- and downstream tie-ins.

Habitat use studies on the Feather River (DWR 2003), Sacramento River (CDFG 1983; Micheny 1989; Micheny and Deibel 1986) and in several western states (Peters *et al.* 1998; Tiffan *et al.* 2002) have shown lower juvenile salmonid rearing densities, and higher predator densities, along riprapped banks. Presumably, these observations are in relation to naturally eroding banks containing substantive amounts of predator escape cover such as Instream Woody Material, vegetation and other hydraulic roughness/cover elements. A variety of particle sizes, characterized by a heterogeneous surface substrate particle size composition, provides high habitat suitability value for juvenile salmonids *via* foraging opportunities and predator avoidance/escape cover.

The particle size distribution proposed for use in the bank revetment portion of the Proposed Action would be expected to provide evaluated species benefits in foraging and predator avoidance (USACE and The Reclamation Board 2004). The 0.75 ft.-sized rock used in the Proposed Action would provide flow breaks, hydraulic roughness, and velocity refugia elements important to evaluated species as shelter and feeding stations (USACE and The Reclamation Board 2004). When required for the implementation of the Proposed Action, a "veneer" would be placed on top of the 0.75 feet-sized rock to fill interstitial space created by large quarry stone, in order to reduce refuges for predator fish species. The "veneer" would consist of stone less than 8 inches in diameter, or of "pit run rock" which consists of various sizes of rock. In addition to providing water velocity refugias, feeding stations, predator avoidance shelters, and predator exclusion habitat, the heterogeneous surface substrate particle size composition also would be expected to increase the amount of habitat suitable for aquatic macroinvertebrate colonization (USACE and The Reclamation Board 2004). These beneficial effects to the juvenile life stage of evaluated would be realized immediately at the completion of construction, and throughout the five-year period of evaluation.

Instream Woody Material

On the west bank of the Sacramento River of the Proposed Action Area, IWM currently largely is not present. For the most part, vegetation above the eroding bank consists of grasses, and continued erosion will not recruit substantive, if any, amounts of IWM. The exception is the riparian vegetation associated with the estimated 250 linear feet of riparian habitat bordering the Sacramento River in the downstream portion of the Proposed Action Area. The specific amount of presently inundated IWM at this location has not been estimated. As the west bank of the Sacramento River continues to erode, flows will continue to undercut existing stands of vegetation resulting in the deposit of small and large woody material into the Sacramento River. Although restoration efforts to restore the Proposed Action Area to a riparian forest are anticipated to occur over the five-year planning period, the amount of IWM that the restoration effort would contribute to the west bank is unknown. The Proposed Action includes a tree and/or brush component of the proposed revetment that consists of several tree and/or brush clusters, each occupying 40 to 50 linear feet with 10 to 15 feet clearings between clusters. This placement results in approximately 1,322 total linear feet of IWM along the 1,520 linear feet of the Sacramento River's west bank within the Proposed Action.

IWM, which is sometimes referred to as large woody debris, consists of small and large pieces of wood that provide high value habitat for juvenile and adult fishes by creating velocity and temperature refuges, structural diversity in the form of downstream plunge pools, upstream sand traps and traps for snagging anadromous salmonid carcasses, an important source of marine-derived nitrogen, which is important to ecosystem productivity in river systems. The influence of IWM on the bioenergetics and the mortality risk of species of evaluated species likely varies with the size of the fish, and their predators. Instream object cover, such as IWM, may produce offsetting effects. Although IWM provides juvenile fish with predator avoidance/escape cover, IWM also may attract and provide velocity refugia and feeding station for predators. Nonetheless, IWM is assumed to provide overall benefits for juvenile fish evaluated species by providing velocity refugia, feeding stations, and predator avoidance/escape cover.

The tree and/or brush cluster IWM rehabilitation proposed for use in the bank revetment portion of the Proposed Action is expected to provide evaluated species benefits in foraging and predator avoidance. A net increase of approximately 1,072 linear feet of IWM is expected immediately following revetment construction. IWM placement structures are not expected to substantially decay over the five-year evaluation period. These beneficial effects to the juvenile and adult life stages of evaluated species would be realized immediately at the completion of construction, and throughout the five-year period of evaluation.

Overhanging Shade/Cover

In the Action/Project Area, approximately 250 linear feet of Valley/Foothill Riparian vegetation (as per aerial photography estimates) exists along the downstream portion of the Action/Project Area on the west bank of the Sacramento River. Riparian forest in the Action/Project Area consists of a tall overstory of deciduous broadleaf trees comprised primarily of valley oak. Other native riparian forest species include Fremont cottonwood, box elder (*Acer negundo*), Oregon ash (*Fraxinus latifolia)*, western sycamore (*Platanus racemosa*) and northern California black walnut (*Juglans californica* var. *hindsii*). Understory species in the Action/Project Area riparian forest community include poison oak (*Toxicodendron diversilobum*), wild blackberry (*Rubus ursinus*), Himilayan blackberry (*Rubus discolor*), wild grape (*Vitis californica*), elderberry (*Sambucus mexicana*) and saplings of tree species. The dense riparian habitat along the west bank of the Sacramento River potentially serves as the primary source of overhanging shade/cover within the Action/Project Area, because the remaining 1,270 linear feet is essentially devoid of overhanging shade/cover. Although restoration efforts to restore the Proposed Action Area to a riparian forest are anticipated to occur over the five-year planning period, the amount of overhanging shade/cover provided by the plantings over the five-year planning period is unknown.

The Proposed Action/Project will place 1,520-feet of rock toe and tree revetment on the west side of the river extending above and below the Valley/Foothill Riparian habitat. The Proposed Action/Project would remove 250 linear feet of bankline Valley/Foothill Riparian habitat. The removal of riparian vegetation would replace SRA habitat with reveted bank, and discontinue recruitment of IWM at this restricted portion of the west bank of the Sacramento River.

Overhanging shade/cover resulting from the 250-feet of riparian vegetation provides predator avoidance/escape cover from avian and aquatic predators, increased productivity and nutrient inputs from allochthonous leaf litter, and increased macroinvertebrate food sources to juvenile and adult lifestages of species of primary management concern. In annual surveys by USFWS (Micheny 1989; Micheny and Deibel 1986) above the SRBPP project area (between Chico Landing and Red Bluff), only about 10–20 percent as many juvenile salmon were present along riprap as along natural riverbanks, and the highest densities of juveniles always occurred in areas with shaded riparian cover. Presumably, these observations are in relation to riprapped banks, lacking substantive amounts of predator avoidance/escape cover such as IWM, vegetation and other hydraulic roughness/cover elements.

The Proposed Action/Project will temporarily remove 250 feet of bankline riparian vegetation providing overhanging shade/cover in the Action/Project Area, which would reduce the existing amount of predator avoidance/escape cover. However, the inclusion of riparian vegetation restoration between the IWM layer and the bank, as part of the Proposed Action/Project, would

be expected to provide an overall increase in the amount of riparian vegetation (hence, overhanging cover/shade) as the riparian vegetation matures over time, relative to Existing Conditions. In addition, the immediate large amount of increased IWM resulting from the Proposed Action/Project is expected to provide species of primary management concern increased predator avoidance/escape cover and feeding stations. These beneficial IWM effects to the juvenile and adult lifestages of species of management concern would be realized immediately at the completion of construction, and throughout the 5-year period of evaluation.

4.5.3 Sacramento River Winter-Run Chinook Salmon

The following information is described for Sacramento River winter-run Chinook salmon: (1) Status in the Proposed Action Area; (2) Effects Assessment Methods; (3) Project Effects (4) Conservation Measures; and (5) Contribution to Recovery.

4.5.3.1 Status in the Proposed Action Area

The Sacramento River mainstem in the vicinity of the Proposed Action is the primary upstream and downstream migration corridor for winter-run Chinook salmon. Within this reach of the river, winter-run Chinook salmon require relatively cool water throughout their juvenile residence, good water quality, and foraging/cover areas. Adult winter-run Chinook salmon generally migrate upstream through the Proposed Action Area from December through July. Juvenile winter-run Chinook salmon generally can migrate downstream in the Upper Sacramento River from July through April, although it is believed that most juvenile emigration occurs through the Proposed Action Area after October. Winter-run Chinook salmon do not spawn within the Sacramento River in the vicinity of the Proposed Action.

4.5.3.2 Effects Assessment Methods

Section 4.3, Direct and Indirect Effects Assessment Methods, discusses the assessment methods for the fish species evaluated in this ASIP. **Table 4-1** presents the effect indicators and technical evaluation guidelines used in the analysis of potential effects on Sacramento River winter-run Chinook salmon. As previously discussed, for species protected under the federal ESA, effect indicators and technical evaluation guidelines are based on the potential for take.

Table 4-1. Effect Indicators and Technical Evaluation Guidelines for Sacramento River Winter-Run Chinook Salmon.

Effect Indicators	Technical Evaluation Guidelines	Life Stage of Concern	Project Specific Evaluation Period
Habitat Quantity and Suitability	Short-term reduction in physical habitat availability or suitability resulting in habitat modification or degradation to cause take[a] of Sacramento River winter-run Chinook salmon.	Juvenile Emigration (July through April)	October
Habitat Quantity and Suitability	Long-term reduction in physical habitat availability or suitability resulting in habitat modification or degradation to cause take[a] of Sacramento River winter-run Chinook salmon.	Adult Immigration (December through July)	December through July
		Juvenile Emigration (July through April)	July through April
Riparian Habitat, Instream Woody	Loss of existing SRA habitat value, acreage and riverside length resulting in	Juvenile Emigration (July through April)	July through April

Effect Indicators	Technical Evaluation Guidelines	Life Stage of Concern	Project Specific Evaluation Period
Material and SRA Habitat	habitat modification or degradation to cause take[a] of Sacramento River winter-run Chinook salmon.	Adult Immigration (December through July)	December through July
Fish Passage	Impedance with the movement of listed species resulting in habitat modification or degradation to cause take[a] of Sacramento River winter-run Chinook salmon.	Juvenile Emigration (July through April)	October
Predation	Increase in predation of Sacramento River winter-run Chinook salmon.	Juvenile Emigration (July through April)	July through April
Direct Mortality	Crushing of Sacramento River winter-run Chinook salmon	Juvenile Emigration (July through April)	October
[a] For habitat modification and/or degradation, take is expected to occur in the form of harm, thus, these terms are used interchangeably throughout the ASIP.			

4.5.3.3 Project Effects

Construction Activities

During the construction period (October 1 through October 31), the life stage of winter-run Chinook salmon in the Proposed Action Area includes juvenile emigration. Although juvenile winter-run Chinook salmon generally can migrate downstream in the Upper Sacramento River from July through April, it is believed that most juvenile emigration occurs through the Proposed Action Area after October (NMFS 1993; NMFS 1997; Snider *et al.* 2000). No other life stages of winter-run Chinook salmon could potentially be affected by short-term, direct construction-related activities.

The following are summary discussions derived from *Section 4.5.1 Short-term, Direct, Construction-related Effects*

Gravel Bar Access across Big Chico Creek

- Construction of the temporary stream crossing over Big Chico Creek will require removal of a limited, thin strip of willows on the bank of the gravel bar near the waters edge where the access road crosses Big Chico Creek. Removal of these willows would represent a temporary loss of SRA.

- Installation of the stream crossing on Big Chico Creek would not be expected to impede the movement of winter-run Chinook salmon potentially present in the area, because of the inclusion of culverts which would continue to allow passage. During construction, low flow conditions may preclude or substantively affect fish passage irrespective of construction activities including stream-crossing activities. However, because flow conditions are not affected by the Proposed Action fish passage also would not be affected.

- Subsequent to gravel bar dredging activities, the temporary stream crossing over Big Chico Creek would be removed, the original shoreline contours restored, and some gravel would be left in the creek after removing the culverts. Addition of gravel to the lower portion of Big Chico Creek would be expected to provide improved substrate conditions for juvenile fish foraging due to increased opportunity for aquatic macroinvertebrate colonization.

Although upon completion of the gravel bar dredging activities the temporary stream crossing over Big Chico Creek will be removed and impacted vegetation will be restored, the temporary removal of SRA habitat in the Proposed Action Area would have the potential to cause "harm" to Sacramento River winter-run Chinook salmon.

Gravel Bar Dredging

- Silt would settle in the excavation area and would be subject to re-suspension when high Sacramento River flows inundate the area during the winter/spring period. However, temporary turbidity increases and subsequent sedimentation associated with the initial period of high flow inundation would be temporary, and masked relative to turbidities expected in the Sacramento River during high flow events.

Gravel bar dredging activities are not expected to result in harm of Sacramento River winter-run Chinook salmon.

Spoils Disposal

- The substrate excavated from the gravel bar would be relocated to a spoils area located about 1,000 feet to the east of the gravel bar.

- Excavated materials from the dredged gravel bar would be dispersed evenly over the spoils area and sloped toward the mainstem Sacramento River to eliminate low areas and potential ponding after flooding.

- If materials are removed from the spoils disposal storage site for restoration activities, removal would be in a progression from the downstream to the upstream end of the storage area, while maintaining the drainage gradient.

Spoils disposal are not expected to result in harm of Sacramento River winter-run Chinook salmon.

Bank Revetment

- The Proposed Action would result in a triangular-shaped section of stone placed along the toe of the Sacramento River bank. Backfilling behind the stone toe would be done to thicken the toe, and to provide a medium for vegetation growth.

- When required for the implementation of the Proposed Action, either a "veneer" of stone less than 8 inches in diameter will fill interstitial spaces created by large quarry stone or "pit run rock" which consists of various sizes of rock that lock together eliminating cavities would be used in the construction of the longitudinal stone toe revetment to reduce refuges for predator fish species. Although very limited, the potential exist that individuals may be killed as quarry rock is introduced into the river.

- Orchard-type trees would be placed continuously along the top of the rock by excavator following construction of the toe revetment. Trees would be cabled to the boulder anchors

and each other. Addition of woody material to the top of the rock revetment provides an element of self-mitigation for the loss of SRA habitat.

- Because construction of the bank revetment can be accomplished from the landward side with appropriate equipment, and because no bank grading is anticipated at the site, minimal temporary increases in turbidity would be expected. Consequently, the subsequent potential for sedimentation and potential effects on aquatic macroinvertebrates also would be minimal.

- The Proposed Action will remove 250 linear feet of bankline Valley/Foothill Riparian habitat. The removal of riparian habitat *via* bank revetment would temporarily discontinue recruitment of IWM and SRA at this restricted portion of the west bank of the Sacramento River.

Even though bank revetment with embedded tree and/or brush clusters and riparian restoration would increase the IWM to greater than pre-project levels and alleviate temporary loss of SRA, the temporary removal of SRA habitat in the Proposed Action Area would have the potential to cause "harm" to Sacramento River winter-run Chinook salmon. In addition, harm to Sacramento River winter-run Chinook salmon may result from placement of quarry rock in the river.

Hazardous spills

- The construction activities associated with both the gravel bar dredging and bank revetment components of the Proposed Action have the potential to adversely affect fisheries and aquatic resources through the inadvertent discharge of toxic substances. Preventive measures, BMPs and environmental awareness training program described in *Section 4.5.1 Short-term, Direct, Construction-related Effects* would be implemented as part of the Proposed Action to avoid the potential for adverse environmental effects that could occur due to construction-related activities associated with implementation of the Proposed Action.

Hazardous spills are not expected to result in harm of Sacramento River winter-run Chinook salmon.

Habitat Alteration (Five-year Period)

Adult and juvenile winter-run Chinook salmon primarily utilize the Sacramento River in the Proposed Action Area as a migration corridor. Adult winter-run Chinook salmon generally migrate upstream through the Proposed Action Area from December through July. Juvenile winter-run Chinook salmon generally can migrate downstream in the Upper Sacramento River from July through April, although it is believed that most juvenile emigration occurs through the Proposed Action after October.

The following are summary discussions derived from *Section 4.5.2 Habitat Alteration (Five-year Period)*

Dredged Gravel Bar

- Restoration of riparian vegetation at the Proposed Action Area at a ratio of 2:1 is expected to result in increased amounts of SRA, and associated shade which incrementally helps moderate stream temperatures and prevent direct solar exposure of fish at shallow depths. The role of riparian shade in moderating stream temperatures is greatest on small streams such as Big Chico Creek.

Because the Proposed Action would be expected to result in additional riparian habitat resulting from restoration of two acres of habitat for each acre removed, and instream object and overhead cover elements, harm to Sacramento River winter-run Chinook Salmon is not expected to occur.

Bank Revetment

- The stone toe would be constructed with a 10:1 cross grade and could therefore significantly reduce the slope of the west bank within the Proposed Action Area. The Proposed Action bank slope of 10:1 would be expected to provide juvenile winter-run Chinook salmon with habitat highly valued for its contribution to predator avoidance from larger piscivorous fish, and increased macroinvertebrate foraging opportunities.

- The particle size distribution proposed for use in the bank revetment portion of the Proposed Action would be expected to provide winter-run Chinook salmon benefits in foraging and predator avoidance. The 0.75 ft.-sized rock used in the Proposed Action would provide flow breaks, hydraulic roughness, and velocity refugia elements important to winter-run Chinook salmon as shelter and feeding stations.

- When required for the implementation of the Proposed Action, a "veneer" would be placed on top of the 0.75 feet-sized rock to fill interstitial space created by large quarry stone, in order to reduce refuges for predator fish species. The heterogeneous surface substrate particle size composition also would be expected to increase the amount of habitat suitable for aquatic macroinvertebrate colonization.

- The Proposed Action includes a tree and/or brush component of the proposed revetment that consists of several tree and/or brush clusters, each occupying 40 to 50 linear feet with 10 to 15 feet clearings between clusters. This placement results in approximately 1,322 total linear feet of IWM along the 1,520 linear feet of the Sacramento River's west bank within the Proposed Action. The proposed revetment is expected to provide winter-run Chinook salmon benefits in foraging and predator avoidance. A net increase of approximately 1,072 linear feet of IWM is expected immediately following revetment construction.

- The Proposed Action will place 1,520-feet of rock toe and tree revetment on the west side of the river extending above and below the Valley/Foothill Riparian habitat. The Proposed Action Area will remove 250 linear feet of bankline Valley/Foothill Riparian habitat. The removal of riparian vegetation would discontinue recruitment of IWM and SRA at this restricted portion of the west bank of the Sacramento River. However, bank revetment with embedded tree and/or brush clusters and riparian restoration would compensate for these effects by increasing the IWM to greater than pre-project levels and mitigating temporary loss of SRA.

Implementation of the Proposed Action would reduce the bank slope, which could reduce available deep pool habitat and alter the distribution of velocity refuges for upmigrating adults. However, because the Proposed Action would be expected to: (1) increase highly valued bank slope habitat along the bank of the Sacramento River; (2) provide flow breaks, hydraulic roughness, and velocity refugia elements important to winter-run Chinook salmon as shelter and feeding stations; (3) increase the amount of habitat suitable for aquatic macroinvertebrate colonization; (4) rehabilitate and increase IWM cover, harm to Sacramento River winter-run Chinook Salmon is not expected to occur.

Potential Effects on Critical Habitat for Sacramento River Winter-Run Chinook Salmon

Because the majority of the discussions presented for Sacramento River winter-run Chinook are habitat-based analyses, these discussions also are applicable for evaluation of effects on critical habitat for Sacramento River winter-run Chinook salmon.

Potential Effects on Essential Fish Habitat

EFH includes specifically identified waters and substrate necessary for fish spawning, breeding, feeding, or growing to maturity. The NMFS Programmatic Biological Opinion for the CALFED Bay-Delta Program identifies EFH as follows:

> *…EFH is defined in the MSFCMA as "…those waters and substrate necessary to fish for spawning, breeding, feeding or growth and maturity…" NMFS regulations further define "waters" to include aquatic areas and their associated physical, chemical, and biological properties that are used by fish and may include aquatic areas historically used by fish where appropriate; "substrate" to include sediment, hard bottom, structures underlying the waters, and associated biological communities; "necessary" to mean habitat required to support a sustainable fishery and the managed species' contribution to a healthy ecosystem; and "spawning, breeding, feeding, or growth to maturity" to cover a species' full life cycle.*

EFH includes all anadromous streams (including some intermittent streams) up to impassible barriers. In the Central Valley, EFH also includes accessible waters of the Delta, Sacramento River up to Keswick Dam, and tributaries up to impassible barriers.

Because EFH for Chinook salmon in the Proposed Action Area is contained within designated critical habitat for Sacramento River winter-run Chinook salmon, the habitat based analyses provided above also would encompass potential adverse effects to EFH (NMFS 2001a). However, removal of SRA habitat would be the only habitat-based consideration associated with the Proposed Action with the potential to temporarily reduce anadromous salmonid habitat availability or suitability. According to the definition of EFH, removal of SRA habitat should not factor in the evaluation of potential effects on EFH. EFH designations occur only in aquatic areas necessary to support federally managed marine and anadromous fish. Unlike critical habitat, upland areas, riparian buffer zones and other terrestrial areas adjacent to river and coasts cannot be designated as EFH (NMFS 2001a).

4.5.3.4 Conservation Measures

The following conservation measures would help to avoid, minimize, and compensate for potential Proposed Action effects on Sacramento River winter-run Chinook salmon. These conservation measures are recommended by the MSCS:

- Survey suitable habitat to determine the presence and distribution of species before actions are taken that could result in the loss or degradation of occupied habitat;

- Avoid actions, including construction, operation, land management and incidental use, that could disturb evaluated species during sensitive periods (such as spawning);

- Comply with applicable measures identified in USFWS and NMFS biological opinions previously issued for evaluated species, as well as any biological opinions resulting from this ASIP.

Specific conservation measures for the Proposed Action that also would help to avoid, minimize, and compensate potential effects on Sacramento River winter-run Chinook salmon are described below. These measures are considered part of the Proposed Action Description.

- A tree revetment, in the form of orchard trees and live native trees and shrubs will be installed along the entire top of the longitudinal stone toe revetment increasing IWM in the Proposed Action Area and offsetting any lost IWM during construction activities. The placement of IWM will potentially increase the amount of juvenile fish rearing habitat by creating flow refuge and cover.

- Installation of revetment materials will be done using a dragline, or long-reach excavator, as opposed to dumping materials from the top of the bank. Setting a crane bucket into the specific area and gradually filling spaces would potentially minimize take of protected species resulting from rock placement in the river.

- Construction activities including the installation of revetment materials will be done continuously during the construction window, thus creating a bank side environment in which salmonids would likely avoid rather than congregate.

- Downed trees and other debris that is avoidable during construction would be incorporated into the project construction.

- Installation of a “veneer” of stone less than eight inches in diameter or “pit run rock” which consists of various sizes of rock that lock together eliminating cavities will fill interstitial spaces created by large quarry stone used in the construction of the longitudinal stone toe revetment. The lack of interstitial spaces could potentially decrease the amount of predatory fish since they are known to use rip-rapped banks with large interstitial spaces.

- The Proposed Action will enhance the linear footage of affected shaded riverine aquatic overhead cover.

- Valley/foothill Riparian will be restored between the soils storage area and Big Chico Creek on the M&T Chico Ranch Property and on the west side of the Sacramento River between the bank and the rock toe revetment. Additionally, riparian vegetation will be restored adjacent to the Sacramento River for a final valley/foothill riparian habitat restoration ratio of 2:1 (i.e., two acres restored for every acre removed). **Appendix D**, Vegetation Restoration Plan, provides greater detail of riparian habitat restoration activities.

- Restoration will occur within one year of the start of construction. These areas are presently inhabited with non-native invasive plants. Proposed restoration activities would include the removal of non-native vegetation and the establishment of habitats with native plant compositions.

- Conservation and avoidance measures would be implemented in accordance with RWQCB's requirements.

- The construction contractor would be required to prepare and implement a hazardous materials control and spill prevention and response plan.

- A soil erosion control plan would be prepared and implemented by the contractor prior to grading and excavation activities to minimize potential effects of silt entering the river and increasing river turbidity. The project specifications require that the construction contractor prepare an erosion control plan and a stormwater pollution prevention plan to be revised and approved by USFWS, NMFS, CDFG and the RWQCB.

4.5.3.5 Contribution to Recovery

The proposed recovery objectives for the Sacramento River winter-run Chinook salmon ESU include: (1) the mean annual spawning abundance during any 13 consecutive years will be 10,000 females; and (2) the geometric mean of the Cohort Replacement Rate during those same 13 years will be greater than 1.0. Estimates of these criteria will be based on natural production alone, and will not include hatchery-produced fish. If the precision for estimating spawning run abundance has a standard error greater than 25 percent, then the sampling period over which the geometric mean of the Cohort Replacement Rate is estimated will be increased by one year for each 10 percent of error over 25 percent (CALFED 2000c).

The analysis of potential effects on Sacramento River winter-run Chinook salmon provided in *Section 4.5.3.3* demonstrates that implementation of the Proposed Action (including the above conservation measures) will contribute to the recovery of Sacramento River winter-run Chinook salmon. The Proposed Action would remove sediment to increase sweeping velocities across the M&T Chico Ranch/Llano Seco Rancho intake screens, rendering the fish screens consistent with NMFS and CDFG screening criteria. The NMFS and CDFG screening criteria minimize effects associated with impingement and entrainment of anadromous salmonids, including the Sacramento River winter-run Chinook salmon. In addition, the Proposed Action is expected to increase highly valued bank slope habitat along the bank of the Sacramento River, provide flow breaks, hydraulic roughness, and velocity refugia elements important to juvenile winter-run Chinook salmon as shelter and feeding stations, increase the amount of habitat suitable for

aquatic macroinvertebrate colonization, and rehabilitate and increase IWM cover and SRA habitat.

4.5.4 Spring-Run Chinook Salmon

The following information is described for Central Valley spring-run Chinook salmon: (1) Status in the Proposed Action Area; (2) Effects Assessment Methods; (3) Project Effects; (4) Conservation Measures; and (5) Contribution to Recovery.

4.5.4.1 Status in the Proposed Action Area

Adult and juvenile spring-run Chinook salmon primarily utilize the Sacramento River in the Proposed Action Area as a migration corridor. Spring-run Chinook salmon are not known to spawn within the Sacramento River in the vicinity of the Proposed Action Area. Adult spring-run Chinook salmon generally migrate upstream through the Proposed Action Area from mid-February through July. It is believed that most juvenile emigration occurs through the Proposed Action Area from October through March.

4.5.4.2 Effects Assessment Methods

Section 4.4: Direct and Indirect Effects Assessment Methods discusses the assessment methods for the fish species discussed in this ASIP. **Table 4-2** presents the effect indicators and technical evaluation guidelines used in the analysis of potential effects on Central Valley spring-run Chinook salmon. For species protected under the federal ESA, effect indicators are based on the potential for take.

Table 4-2. Effect Indicators and Technical Evaluation Guidelines for Central Valley Spring-Run Chinook Salmon.

Effect Indicators	Technical Evaluation Guidelines	Life Stage of Concern	Project Specific Evaluation Period
Habitat Quantity and Suitability	Short-term reduction in physical habitat availability or suitability resulting in habitat modification or degradation to cause take[a] of Central Valley spring-run Chinook salmon.	Juvenile Emigration (October through March)	October
Habitat Quantity and Suitability	Long-term reduction in physical habitat availability or suitability resulting in habitat modification or degradation to cause take[a] of Central Valley spring-run Chinook salmon.	Adult Immigration (March through July)	March through July
		Juvenile Emigration (October through March)	October through March
Riparian Habitat, Instream Woody Material and SRA Habitat	Loss of existing SRA habitat value, acreage and riverside length resulting in habitat modification or degradation to cause take[a] of Central Valley spring-run Chinook salmon.	Juvenile Emigration (October through March)	July through April
		Adult Immigration (March through July)	March through July

Effect Indicators	Technical Evaluation Guidelines	Life Stage of Concern	Project Specific Evaluation Period
Fish Passage	Impedance with the movement of listed species resulting in habitat modification or degradation to cause take[a] of Central Valley spring-run Chinook salmon.	Juvenile Emigration (October through March)	October
Predation	Increase in predation of Central Valley spring-run Chinook salmon.	Juvenile Emigration (October through March)	October through March
Direct Mortality	Crushing of Central Valley spring-run Chinook salmon.	Juvenile Emigration (October through March)	October

[a] For habitat modification and/or degradation, take is expected to occur in the form of harm, thus, these terms are used interchangeably throughout the ASIP.

4.5.4.3 Project Effects

Construction Activities

Spoils disposal activities and hazardous spills are not expected to result in harm to Central Valley spring-run Chinook salmon. However, "harm" to Central Valley spring-run Chinook salmon may result from placement of quarry rock in the river. Also, harm to Central Valley spring-run Chinook salmon may result from the temporary removal of SRA Habitat in the Proposed Action Area. For additional detail on project effects resulting from construction activities, refer to *Section 4.5.3.3: Sacramento River Winter-run Chinook Salmon Project Effects.*

Habitat Alteration (Five-year Period)

The Proposed Action would be expected to result in: (1) increased highly valued bank slope habitat; (2) additional riparian habitat; (3) provide flow breaks, hydraulic roughness, and velocity refugia elements important to juvenile spring-run Chinook salmon as shelter and feeding stations; (4) increased amounts of habitat suitable for aquatic macroinvertebrate colonization; and (5) rehabilitated and increased IWM cover. Hence, harm to Central Valley spring-run Chinook Salmon from the five-year period habitat alteration is not expected to occur. For additional detail on project effects resulting from habitat alteration, refer to *Section 4.5.3.3: Sacramento River Winter-run Chinook Salmon Project Effects.*

Potential Effects on Critical Habitat for Central Valley Spring-Run Chinook Salmon

The Proposed Action Area is designated as critical habitat for Central Valley spring-run Chinook salmon. Therefore, the analysis presented under *Potential Effects on Critical Habitat for Sacramento River Winter-Run Chinook Salmon* also is applicable to Central Valley spring-run Chinook salmon critical habitat. Please refer to *Section 4.5.3: Sacramento River Winter-Run Chinook Salmon* for the appropriate discussions on this subject.

Essential Fish Habitat Considerations

Please refer to *Section 4.5.3: Sacramento River Winter-Run Chinook Salmon* for the appropriate discussions on this subject.

4.5.4.4 Conservation Measures

The discussion presented under *Conservation Measures* in *Section 4.5.3.4: Sacramento River Winter-Run Chinook Salmon Conservation Measures,* also is applicable for the Central Valley spring-run Chinook salmon.

4.5.4.5 Contribution to Recovery

The Central Valley spring-run Chinook salmon ESU will be regarded as restored when the ESU meets specific viability criteria to be established in the NMFS recovery plan for the Central Valley salmonids. Viability of the Central Valley spring-run Chinook salmon ESU will be assessed according to the Viability Salmonid Population framework developed by NMFS (CALFED 2000a). The framework deals with four population characteristics:

- *Abundance:* Populations are large enough to resist extinction due to random environmental, demographic and genetic variation.
- *Productivity:* Populations have enough reproductive capacity to ensure resistance to episodes of poor freshwater or ocean conditions, and the ability to rebound rapidly during favorable periods, without the aid of artificial propagation.
- *Spatial Distribution:* Populations are distributed widely and with sufficient connectivity such that catastrophic events do not deplete all populations, and stronger populations can rescue depleted populations.
- *Diversity:* Populations have enough genetic and life history diversity to enable adaptation to long-term changes in the environment. Populations achieve sufficient expression of historical life history strategies, are not negatively impacted by outbreeding depression resulting from straying of domesticated hatchery fish, and are not negatively impacted by inbreeding depression due to small population size and inadequate connectivity between populations (CALFED 2000a).

The analysis of potential effects on the Sacramento River winter-run Chinook salmon (which also is applicable for Central Valley spring-run Chinook salmon) provided in *Section 4.5.3*, demonstrates that implementation of the Proposed Action (including the conservation measures) will contribute to the recovery of the Central Valley spring-run Chinook salmon.

The Proposed Action would remove sediment to increase sweeping velocities across the M&T Chico Ranch/Llano Seco Rancho intake screens, rendering the fish screens consistent with NMFS and CDFG screening criteria. The NMFS and CDFG screening criteria minimize effects associated with impingement and entrainment of anadromous salmonids, including the Central Valley spring-run Chinook salmon. In addition, the Proposed Action is expected to increase highly valued bank slope habitat along the bank of the Sacramento River, provide flow breaks, hydraulic roughness, and velocity refugia elements important to spring-run Chinook salmon as shelter and feeding stations, increase the amount of habitat suitable for aquatic macroinvertebrate colonization, and rehabilitate and increase IWM cover and SRA habitat. However, implementation of the Proposed Action would reduce the bank slope, which could reduce available deep pool habitat and alter the distribution of velocity refuges for upmigrating adults.

4.5.5 Central Valley Steelhead

The following information is described for Central Valley steelhead: (1) Status in the Proposed Action Area; (2) Effects Assessment Methods; (3) Project Effects; (4) Conservation Measures; and (5) Contribution to Recovery.

4.5.5.1 Status in the Proposed Action Area

Adult and juvenile steelhead primarily utilize the Sacramento River in the Proposed Action Area as a migration corridor. Adult steelhead are not known to spawn within the Sacramento River in the vicinity of the Proposed Action Area. Adult steelhead generally migrate upstream through the Proposed Action Area from August through March, with peak immigration occurring during January and February. The primary period of steelhead smolt emigration occurs from January through June.

4.5.5.2 Effects Assessment Methods

Section 4.4: Direct and Indirect Effects Assessment Methods discusses the assessment methods for the fish species discussed in this ASIP. **Table 4-3** presents the effect indicators and technical evaluation guidelines used in the analysis of potential effects on Central Valley steelhead.

4.5.5.3 Project Effects

During the construction period (October 1 through October 31), the lifestage of steelhead in the Proposed Action Area includes adult immigration. Although adult steelhead generally migrate upstream through the Proposed Action Area from August through March, with peak immigration generally occurring during January and February.

Table 4-3 Effect Indicators and Technical Evaluation Guidelines for Central Valley Steelhead.

Effect Indicators	Technical Evaluation Guidelines	Life Stage of Concern	Project Specific Evaluation Period
Habitat Quantity and Suitability	Long-term reduction in physical habitat availability or suitability resulting in habitat modification or degradation to cause take[a] of Central Valley steelhead	Adult Immigration (August through March)	August through March
		Juvenile Emigration (January through June)	January through June
Riparian Habitat, Instream Woody Material and SRA Habitat	Loss of existing SRA habitat value, acreage and riverside length resulting in habitat modification or degradation to cause take[a] of Central Valley steelhead	Juvenile Emigration (January through June)	January through June
		Adult Immigration (August through March)	August through March
Fish Passage	Impedance with the movement of listed species resulting in habitat modification or degradation to cause take[a] of Central Valley steelhead	Adult Immigration (August through March)	August through March

Effect Indicators	Technical Evaluation Guidelines	Life Stage of Concern	Project Specific Evaluation Period
Predation	Increase in predation of Central Valley steelhead.	Juvenile Emigration (January through June)	January through June

[a] For habitat modification and/or degradation, take is expected to occur in the form of harm, thus, these terms are used interchangeably throughout the ASIP.

Construction Activities

Spoils disposal activities and hazardous spills are not expected to result in harm to Central Valley steelhead. Moreover, harm to Central Valley steelhead is not expected to result from placement of the quarry rock in the river because juveniles are not expected to be in the river during construction activities. Presumably, adults are able to avoid materials as they are being placed in the water.

Harm to Central Valley steelhead may result from the temporary removal of SRA habitat in the Proposed Action Area. For additional detail on project effects resulting from construction activities, refer to *Section 4.5.3.3: Sacramento River Winter-run Chinook Salmon Project Effects.*

Habitat Alteration (Five-year Period)

The Proposed Action would be expected to result in the following beneficial habitat alterations: (1) increased highly valued bank slope habitat; (2) additional riparian habitat; (3) provide flow breaks, hydraulic roughness, and velocity refugia elements important to steelhead as shelter and feeding stations; (4) increase the amount of habitat suitable for aquatic macroinvertebrate colonization; and (5) rehabilitate and increase IWM cover. However, implementation of the Proposed Action also would reduce the bank slope, which could reduce available deep pool habitat and alter the distribution of velocity refuges for upmigrating adults. Overall, harm to Central Valley steelhead from the five-year period habitat alteration is not expected to occur. For additional detail on project effects resulting from habitat alteration, refer to *Section 4.5.3.3: Sacramento River Winter-run Chinook Salmon Project Effects.*

Potential Effects on Critical Habitat for Central Valley Steelhead

The Proposed Action Area is designated as critical habitat for Central Valley steelhead. Therefore, the analysis presented under Potential Effects on Critical Habitat for Sacramento River Winter-Run Chinook Salmon also is applicable to Central Valley steelhead critical habitat. Please refer to *Section 4.3.3: Sacramento River Winter-Run Chinook Salmon* for the appropriate discussions on this subject.

4.5.5.4 Conservation Measures

The conservation measures for Sacramento River winter-run Chinook salmon described in *Section 4.3.1* apply to the Central Valley steelhead.

4.5.5.5 Contribution to Recovery

NMFS defines a viable salmonid population as an independent population of any Pacific salmonid (*Oncorhynchus* spp.) that has a negligible risk of extinction due to threats from demographic variation, local environment variation, and genetic diversity changes over a 100-year time frame. Both the Central Valley spring-run Chinook salmon and Central Valley steelhead are Pacific salmonids. Hence, discussions presented under *Section 4.5.4.5* are applicable to Central Valley Steelhead.

4.5.6 Southern Distinct Population Segment of Green Sturgeon

The following information is described for green sturgeon: (1) Status in the Proposed Action Area; (2) Effects Assessment Methods; (3) Project Effects; (4) Conservation Measures; and (5) Contribution to Recovery.

4.5.6.1 Status in the Proposed Action Area

Green sturgeon adult upstream migration occurs from February through July. Green sturgeon potentially may spawn in suitable habitat both upstream and downstream of the Proposed Action Area in the Sacramento River. Thus, because juveniles rear year-round it is possible that green sturgeon larvae or juveniles could be in the Proposed Area throughout the year.

4.5.6.2 Effects Assessment Methods

Section 4.4: Direct and Indirect Effects Assessment Methods discusses the assessment methods for the fish species discussed in this ASIP. **Table 4-4** presents the effect indicators and technical evaluation guidelines used in the analysis of potential effects on green sturgeon.

Table 4-4. Effect Indicators and Technical Evaluation Guidelines for Green Sturgeon

Effect Indicators	Technical Evaluation Guidelines	Life Stage of Concern	Project Specific Evaluation Period
Habitat Quantity and Suitability	Short-term reduction in physical habitat availability or suitability resulting in habitat modification or degradation to cause take[a] of the southern DPS of Green Sturgeon.	Juvenile Emigration (Year round)	October
Habitat Quantity and Suitability	Long-term reduction in physical habitat availability or suitability resulting in habitat modification or degradation to cause take[a] of the southern DPS of Green Sturgeon.	Adult Immigration (February through July)	February through July
		Juvenile Emigration (Year round)	Year Round
Fish Passage	Impedance with the movement of listed species resulting in habitat modification or degradation to cause take[a] of the southern DPS of Green Sturgeon.	Juvenile Emigration (Year round)	October
Predation	Increase in predation of the southern DPS of Green Sturgeon.	Juvenile Emigration (Year round)	Year Round
Direct Mortality	Crushing of Central Valley spring-run Chinook salmon.	Juvenile Emigration (Year round)	Year Round

Effect Indicators	Technical Evaluation Guidelines	Life Stage of Concern	Project Specific Evaluation Period
[a] For habitat modification and/or degradation, take is expected to occur in the form of harm, thus, these terms are used interchangeably throughout the ASIP.			

4.5.6.3 Project Effects

Because juvenile green sturgeon rear year-round, it is possible that green sturgeon larvae or juveniles could be in the Proposed Action Area during the construction period (October 1 through October 31). No other lifestages of green sturgeon could potentially be affected by short-term, construction-related activities.

Construction Activities

Spoils disposal activities and hazardous spills are not expected to result in harm to the southern DPS of green sturgeon. However, harm to the southern DPS of green sturgeon may result from placement of quarry rock in the river. For additional detail on project effects resulting from construction activities, refer to *Section 4.5.3.3: Sacramento River Winter-run Chinook Salmon Project Effects.*

Habitat Alteration (Five-year Period)

Harm to the Southern DPS of green sturgeon from the five-year period habitat alteration is not expected to occur. Green sturgeon potentially may spawn in suitable habitat both upstream and downstream of the Action/Project Area in the Sacramento River. Juveniles rear year-round in the Sacramento River. Therefore, potentially affected life stages in the Proposed Action Area include adult immigration, juvenile rearing and juvenile emigration.

The Proposed Action could alter habitat variables such as structural features (bank slope, substrate size, IWM, and instream object cover), hydraulics (water depth and velocity), overhanging shade/cover, and associated predation potential. Specifically, the Proposed Action would reduce the bank slope, which could reduce available deep pool habitat and alter the distribution of velocity refuges for upmigrating adults.

Shallow water depth and relatively low water velocities can be important habitat variables for juvenile green sturgeon because they may provide areas suitable for predator avoidance and increased food availability. An average bank slope of 10:1 in the bank revetment area associated with the Proposed Action will provide increased amounts of shallow water habitat over a range of flows. Additionally, the particle size distribution proposed for use in the bank revetment portion of the Proposed Action Area is expected to provide green sturgeon benefits in foraging and predator avoidance.

The Proposed Action may temporarily remove 250 feet of bankline riparian vegetation providing overhanging shade/cover in the Proposed Action Area, which would reduce the existing amount of predator avoidance/escape cover. However, the inclusion of riparian vegetation restoration between the IWM layer and the bank, as part of the Proposed Action, would be expected to provide an overall increase in the amount of riparian vegetation (hence, overhanging cover/shade) as the riparian vegetation matures over time, relative to the Environmental

Baseline. In addition, the immediate large amount of increased IWM resulting from the Proposed Action is expected to provide juvenile green sturgeon increased predator avoidance/escape cover and feeding stations. These beneficial IWM effects to emigrating juveniles and immigrating adult green sturgeon would be realized immediately at the completion of construction, and throughout the 5-year period of evaluation.

Therefore, based on the consideration and evaluation of physical structural features, hydraulics, overhanging shade/cover, and associated predation potential presented above, harm to the southern distinct DPS of green sturgeon from the 5-year period habitat alteration is not expected to occur.

Potential Effects on Proposed Critical Habitat for the Southern Distinct Population Segment of Green Sturgeon

Critical habitat has not been designated for green sturgeon. However, NMFS is compiling information to prepare a critical habitat proposal for the southern DPS (70 FR 17386 (April 6, 2005)), and has solicited information from the public to assist the agency with final determination of critical habitat. It is currently unclear when a final rule outlining critical habitat for the southern DPS of green sturgeon will be issued. Because the majority of the discussions presented for green sturgeon are habitat-based analyses, it is expected that these discussions also will be applicable for evaluation of effects on critical habitat, once critical habitat for the southern DPS of green sturgeon is designated.

4.5.6.4 Conservation Measures

The following conservation measures would help to avoid, minimize, and compensate for potential Proposed Action effects on non-salmonid species which include: green sturgeon, Sacramento Splittail, hardhead, and river lamprey. These conservation measures are recommended by the MSCS:

- Survey suitable habitat to determine the presence and distribution of species before actions are taken that could result in the loss or degradation of occupied habitat;
- Avoid actions, including construction, operation, land management and incidental use, that could disturb evaluated species during sensitive periods (such as spawning);
- Comply with applicable measures identified in USFWS and NMFS biological opinions previously issued for evaluated species.

Specific conservation measures for the Proposed Action that also would help to avoid, minimize, and compensate potential effects on green sturgeon are described below. These measures are considered part of the Proposed Action Description.

- Installation of revetment materials will be done using a dragline, or long-reach excavator, as opposed to dumping from top of bank. Setting a crane bucket into the specific area and gradually filling spaces would potentially minimize take of protected species associated with rock placement into the river.

- Conservation and avoidance measures would be implemented in accordance with RWQCB's requirements.

- The construction contractor would be required to prepare and implement a hazardous materials control and spill prevention and response plan.

- A soil erosion control plan would be prepared and implemented by the contractor prior to grading and excavation activities to minimize potential effects of silt entering the river and increasing river turbidity. The project specifications require that the construction contractor prepare an erosion control plan and a stormwater pollution prevention plan to be revised and approved by USFWS, NMFS, CDFG and the RWQCB.

4.5.6.5 Contribution to Recovery

The analysis of potential effects on the southern DPS of green sturgeon provided in *Section 4.4.5* demonstrates that implementation of the Proposed Action (including the above conservation measures) will contribute to achieve the recovery objectives identified for green sturgeon in the *Recovery Plan for the Sacramento/San Joaquin Delta Native Fishes* (USFWS 1996). The Proposed Action would remove sediment to increase sweeping velocities across the M&T Chico Ranch/Llano Seco Rancho intake screens, rendering the fish screens consistent with NMFS and CDFG screening criteria. The NMFS and CDFG screening criteria minimize effects associated with impingement and entrainment of anadromous salmonids, and is expected to reduce entrainment and impingement of many of the non salmonid species covered in this ASIP.

4.5.7 Central Valley Fall-Run/Late Fall-Run Chinook Salmon and Essential Fish Habitat for Central Valley Pacific Salmon

The following information is described for Central Valley fall-run/late fall-run Chinook salmon: (1) Status in the Proposed Action Area; (2) Effects Assessment Methods; (3) Project Effects; (4) Conservation Measures; and (5) Contribution to Recovery.

4.5.7.1 Status in the Proposed Action Area

Adult and juvenile fall-run/late-fall-run Chinook salmon primarily utilize the Sacramento River in the Proposed Area as a migration corridor. Adult fall-run/late-fall-run Chinook salmon are not known to spawn within the Sacramento River in the vicinity of the Proposed Action Area.

Adult fall-run Chinook salmon generally migrate upstream through the Proposed Action Area from July through December. It is believed that most juvenile emigration occurs through the Proposed Action Area from December through June.

Adult late fall-run Chinook salmon generally migrate upstream through the Proposed Action Area from October through April. It is believed that most juvenile emigration occurs through the Proposed Action Area from April through December.

4.5.7.2 Effects Assessment Methods

Section 4.4: Direct and Indirect Effects Assessment Methods discusses the assessment methods for the fish species discussed in this ASIP. **Table 4-5** presents the effect indicators and technical evaluation guidelines used in the analysis of potential effects on Central Valley fall-run/late fall-run Chinook salmon.

Table 4-5. Effect Indicators and Technical Evaluation Guidelines for Central Valley Fall-Run/Late Fall-Run Chinook Salmon.

Effect Indicators	Technical Evaluation Guidelines	Life Stage of Concern	Project Specific Evaluation Period
Habitat Quantity and Suitability	Short-term reduction in physical habitat availability or suitability of habitat of sufficient magnitude and/or frequency to potentially reduce long-term population levels of Central Valley fall-run/late fall-run Chinook salmon.	Fall- run Juvenile Emigration (December through June) Late Fall- run Juvenile Emigration (April through December)	October
Habitat Quantity and Suitability	Long-term reduction in physical habitat availability or suitability of habitat of sufficient magnitude and/or frequency to potentially reduce long-term population levels of Central Valley fall-run/late fall-run Chinook salmon.	Fall- run Adult Immigration (July through December) Late fall-run Chinook Salmon Adult Immigration (October through April)	July through April
		Fall- run Juvenile Emigration (December through June) Late Fall- run Juvenile Emigration (April through December)	Year round
Riparian Habitat, Instream Woody Material and SRA Habitat	Loss of existing SRA habitat value, acreage and riverside length resulting in reduced long-term population levels of Central Valley fall-run/late fall-run Chinook salmon.	Fall- run Juvenile Emigration (December through June) Late Fall- run Juvenile Emigration (April through December)	Year round
		Fall- run Adult Immigration (July through December) Late fall-run Chinook Salmon Adult Immigration (October through April)	July through April
Fish Passage	Impede movement of Central Valley fall-run/late fall-run Chinook salmon with substantial magnitude and/or frequency to potentially reduce long-term population levels.	Fall- run Juvenile Emigration (December through June) Late Fall- run Juvenile Emigration (April through December) Fall- run Adult Immigration (July through December) Late fall-run Chinook Salmon Adult Immigration (October through April)	October October
Predation	Increase in predation of Central Valley fall-run/late fall-run Chinook salmon to potentially reduce long-term population levels of Central Valley fall-run/late fall-run Chinook salmon.	Fall- run Juvenile Emigration (December through June) Late Fall- run Juvenile Emigration (April through December)	Year round

Effect Indicators	Technical Evaluation Guidelines	Life Stage of Concern	Project Specific Evaluation Period
Direct Mortality	Crushing of Central Valley fall-run Chinook salmon that would potentially reduce long-term population levels of Central Valley fall-run/late fall-run Chinook salmon.	Fall- run Juvenile Emigration (December through June) Late Fall- run Juvenile Emigration (April through December)	October

4.5.7.3 Project Effects

During the construction period (October 1 through October 31), the life stage of fall-run Chinook salmon in the Proposed Action includes adult immigration. Adult fall-run Chinook salmon generally migrate upstream through the Proposed Action Area from July through December. Therefore, no other life stages of fall-run Chinook salmon could potentially be affected by short-term, construction-related activities.

The life stages of late fall-run Chinook salmon in the Proposed Action Area affected by construction activities include adult immigration and juvenile emigration. Adult late fall-run Chinook salmon generally migrate upstream through the Proposed Action Area from October through April, and it is believed that most juvenile emigration occurs through the Proposed Action Area from April through December. Therefore, no other life stages of late fall-run Chinook salmon could potentially be affected by short-term, construction-related activities.

Construction Activities

Construction activities, including temporary removal of SRA habitat, are not expected to reduce long-term population levels of fall-run/late fall run Chinook salmon. For additional detail on project effects resulting from construction activities, refer to *Section 4.5.1: Short-term, Direct, Construction-related Effects*.

Habitat Alteration (Five-year Period)

The Proposed Action would be expected to result the following beneficial habitat alterations in: (1) increased highly valued bank slope habitat; (2) additional riparian habitat; (3) provide flow breaks, hydraulic roughness, and velocity refugia elements important to fall-run/late fall-run Chinook salmon as shelter and feeding stations; (4) increase the amount of habitat suitable for aquatic macroinvertebrate colonization; and (5) rehabilitate and increase IWM cover. However, implementation of the Proposed Action also would reduce the bank slope, which could reduce available deep pool habitat and alter the distribution of velocity refuges for upmigrating adults. Overall, the five-year period habitat alteration is not expected to reduce long-term population levels of fall-run/late fall run Chinook salmon. For additional detail on action effects resulting from habitat alteration, refer to *Section 4.5.2: Habitat Alteration (Five-year Period).*

Potential Effects on Essential Fish Habitat

Please refer to *Section 4.5.3: Sacramento River Winter-Run Chinook Salmon* for the appropriate discussions on this subject.

4.5.7.4 Conservation Measures

Although conservation measures specific to Central Valley fall-run/late fall-run Chinook salmon are not provided in the MSCS, the discussion presented under the Sacramento River winter-run Chinook salmon conservation measures in *Section 4.5.3.4: Sacramento River Winter-Run Chinook Salmon Conservation Measures*, also is applicable for the Central Valley fall-run/late fall-run Chinook salmon.

4.5.7.5 Contribution to Recovery

The Central Valley fall-run/late fall-run ESU is a species of concern under the federal ESA. Therefore, the NMFS recovery plan for Central Valley salmonids will not include formal recovery goals for populations in this ESU. The recovery plan for Central Valley salmonids will identify factors of concern and measures to ensure the long-term conservation of the Central Valley fall-run/late fall-run Chinook salmon ESU, and recovery actions proposed for listed ESUs will be evaluated to ensure that they do not place unlisted species at significant risk.

The analysis of potential effects demonstrates that implementation of the Proposed Action (including the conservation measures provided in *Section 4.1.3*) will be consistent with measures to ensure the long-term conservation of the Central Valley fall-run/late fall-run Chinook salmon ESU, identified in the recovery plan for Central Valley salmonids.

The Proposed Action would remove sediment to increase sweeping velocities across the M&T Chico Ranch/Llano Seco Rancho intake screens, rendering the fish screens consistent with NMFS and CDFG screening criteria. The NMFS and CDFG screening criteria minimize effects associated with impingement and entrainment of anadromous salmonids, including the Central Valley fall-run/late fall-run Chinook salmon. In addition, the Proposed Action is expected to increase highly valued bank slope habitat along the bank of the Sacramento River, provide flow breaks, hydraulic roughness, and velocity refugia elements important to Central Valley fall-run/late fall-run Chinook salmon as shelter and feeding stations, increase the amount of habitat suitable for aquatic macroinvertebrate colonization, and rehabilitate and increase IWM cover and SRA habitat.

4.5.8 Sacramento Splittail

The following information is described for Sacramento splittail: (1) Status in the Proposed Action Area; (2) Effects Assessment Methods; (3) Project Effects; (4) Conservation Measures; and (5) Contribution to Recovery.

4.5.8.1 Status in the Proposed Action Area

Historically, Sacramento splittail were found as far up the Sacramento River as Redding, yet today are largely absent from the upper parts of their distribution range (Moyle 2002). However, in wet years Sacramento splittail may migrate up the Sacramento River as far as the Red Bluff Diversion Dam at river mile 243 in Tehama County (Moyle 2002). It is unlikely that splittail spawn in the vicinity of the Proposed Action Area. Therefore, in the Proposed Action Area,

Sacramento splittail habitat utilization may be restricted to infrequent upstream migration episodes, and incidental rearing during the downstream movement portion of their early life history, which most likely may occur between late February and July.

4.5.8.2 Effects Assessment Methods

Section 4.4: Direct and Indirect Effects Assessment Methods discusses the assessment methods for the fish species discussed in this ASIP. **Table 4-6** presents the effect indicators and technical evaluation guidelines used in the analysis of potential effects on Sacramento splittail.

Table 4-6. Effect Indicators and Technical Evaluation Guidelines for Sacramento Splittail.

Effect Indicators	Technical Evaluation Guidelines
Habitat Quantity and Suitability	Short-term reduction in physical habitat availability or suitability of habitat of sufficient magnitude and/or frequency to potentially reduce long-term population levels of Sacramento splittail
Habitat Quantity and Suitability	Long-term Reduction in quantity and/or suitability of habitat of sufficient magnitude and/or frequency to potentially reduce long-term population levels of Sacramento splittail.

4.5.8.3 Project Effects

Construction Activities

Because it is most likely that Sacramento splittail do not substantively utilize habitat in the Proposed Action Area during the construction period (October 1 through October 31), and based on the consideration and evaluation of physical habitat disturbance, potential for physical injury, hazardous spills, turbidity, and sedimentation and erosion presented above, construction activities associated with the Proposed Action would not be anticipated to result in long-term population reductions of Sacramento Splittail.

Habitat Alteration (Five-year Period)

In wet years, Sacramento splittail may migrate up the Sacramento River as far as the Red Bluff Diversion Dam at river mile 243 in Tehama County (Moyle 2002), although it is unlikely that splittail spawn in the vicinity of the Proposed Action Area. Sacramento splittail habitat utilization in the Proposed Action Area may be restricted to infrequent upstream migration episodes, and incidental rearing during the downstream movement portion of their early life history, which most likely may occur between late February and July. Therefore, potentially affected life stages in the Proposed Action Area include adult immigration and juvenile downstream movement (and incidental rearing).

Although the Proposed Action could result in the temporary loss of SRA (and overhanging shade/cover), restoration of riparian vegetation would result in increased amounts of SRA as the riparian vegetation matures over time, which would be anticipated to potentially benefit downstream moving juvenile splittail. Relative to the Environmental Baseline, implementation of the Proposed Action is expected to result in a lower gradient bank slope (i.e., a greater range of water depth and velocity), a more heterogeneous substrate size composition, and increased amounts of water velocity refugia, all of which would be expected to provide more suitable

conditions for adult splittail upstream migration. These factors, in addition to increased instream object and overhead cover and, therefore, reduced predation potential, would be expected to provide more suitable conditions for juvenile splittail downstream movement (and incidental rearing). Therefore, relative to Environmental Baseline, the Proposed Action is not expected to result in long-term population levels reduction of Sacramento splittail.

4.5.8.4 Conservation Measures

The general conservation measures for green sturgeon described in *Section 4.5.6.4 Southern DPS of Green Sturgeon Conservation Measures* apply to the non-salmonid species evaluated, including Sacramento Splittail.

4.5.8.5 Contribution to Recovery

Implementation of the Proposed Action (including the above conservation measures) will be consistent with the recovery objectives identified for Sacramento splittail in the *Recovery Plan for the Sacramento/San Joaquin Delta Native Fishes* (USFWS 1996). The Proposed Action would remove sediment to increase sweeping velocities across the M&T Ranch/Llano Seco Rancho intake screens, rendering the fish screens consistent with NMFS and CDFG screening criteria. The NMFS and CDFG screening criteria minimize effects associated with impingement and entrainment of anadromous salmonids, and is expected to reduce entrainment and impingement of Sacramento splittail covered in this ASIP.

It is important to note the changed legal status of the Sacramento splittail. Sacramento splittail are currently designated as a California species of special concern. In 1999, the USFWS listed the Sacramento splittail as threatened under the federal ESA. On August 17, 2001, and again on March 21, 2002, USFWS announced re-opening of the comment period for the final rule on the Sacramento splittail to "*....invite comments and to obtain peer-review on the statistic analysis completed by the Service to re-analyze the available splittail abundance data*." USFWS also invited additional comments on the status of the species (66 FR 43145). The public comment period ended December 2, 2002. In response to the public comment period, and after reviewing the available scientific and commercial information, USFWS determined that the Sacramento splittail listing as a threatened or endangered species under the ESA was not warranted. As a result, the USFWS removed the Sacramento splittail from the list of threatened species on September 22, 2003. Therefore, the applicability of the recovery objectives identified for Sacramento splittail in the *Recovery Plan for the Sacramento/San Joaquin Delta Native Fishes* (USFWS 1996) will need to be revisited.

4.5.9 Hardhead

The following information is described for hardhead: (1) Status in the Proposed Action Area; (2) Effects Assessment Methods; (3) Project Effects; (4) Conservation Measures; and (5) Contribution to Recovery.

4.5.9.1 Status in the Proposed Action Area

In the Proposed Action Area, juvenile rearing and adult foraging has the potential to occur, specifically in the backwater area of the Big Chico Creek—Sacramento River confluence.

4.5.9.2 Effects Assessment Methods

Section 4.4: Direct and Indirect Effects Assessment Methods discusses the assessment methods for the fish species discussed in this ASIP. **Table 4-7** presents the effect indicators and technical evaluation guidelines used in the analysis of potential effects on hardhead.

Table 4-7. Effect Indicators and Technical Evaluation Guidelines for Hardhead.

Effect Indicators	Technical Evaluation Guidelines
Habitat Quantity and Suitability	Short-term reduction in quantity of habitat, and/or degradation of habitat suitability of sufficient magnitude and/or frequency, thereby potentially reducing long-term population levels of hardhead.
Habitat Quantity and Suitability	Long-term reduction in quantity and/or suitability of habitat of sufficient magnitude and/or frequency to potentially reduce long-term population levels of hardhead.
Fish Passage	Impede movement of hardhead with substantial magnitude and/or frequency to potentially reduce long-term population levels.
Predation	Increase in predation to potentially reduce long-term population levels of hardhead.

4.5.9.3 Project Effects

Construction Activities

Considering what has been reported regarding habitat utilization and water temperature suitability, there is a limited potential that hardhead could be present in the Action/Project Area, specifically in the backwater area of the Big Chico Creek—Sacramento River confluence. Because of the limited potential habitat suitability and, therefore, the limited potential for substantive habitat utilization in the Proposed Action Area during the construction period (October 1 through October 31), and based on the consideration and evaluation of physical habitat disturbance, potential for physical injury, hazardous spills, turbidity, and sedimentation and erosion presented above, the Proposed Action is not expected to result in reduced long-term population levels of hardhead.

Habitat Alteration (Five-year Period)

As previously described, the Proposed Action includes the provision of gravels at the access road crossing in Big Chico Creek at the conclusion of construction. The provision of gravels may provide additional substrate for macroinvertebrates, which serve as a food base for hardhead juveniles and adults.

Although there is limited potential that hardhead could be present in the Sacramento River portion of the Proposed Action Area, implementation of the Proposed Action could result in the temporary loss of SRA (and overhanging shade/cover). However, restoration of riparian vegetation would result in increased amounts of SRA as the riparian vegetation matures over

time, which would be anticipated to potentially benefit juvenile hardhead. Relative to the Environmental Baseline, implementation of the Proposed Action is expected to result in a lower gradient bank slope (i.e., a greater range of water depth and velocity), a more heterogeneous substrate size composition, and increased amounts of water velocity refugia, all of which would be expected to provide more suitable conditions for juvenile hardhead. These factors, in addition to increased instream object and overhead cover and, therefore, reduced predation potential, would be expected to provide more suitable conditions for juvenile hardhead. Therefore, relative to the Environmental Baseline, the Proposed Action is not expected to result in long-term population levels reduction of hardhead.

4.5.9.4 Conservation Measures

The general conservation measures for green sturgeon described in *Section 4.5.6.4* apply to the non-salmonid species evaluated, including hardhead.

4.5.9.5 Contribution to Recovery

This section is not applicable to hardhead.

4.5.10 River Lamprey

The following information is described for river lamprey: (1) Status in the Proposed Action Area; (2) Effects Assessment Methods; (3) Project Effects; (4) Conservation Measures; and (5) Contribution to Recovery.

4.5.10.1 Status in the Proposed Action Area

It is unknown to what extent, if any, river lamprey potentially utilize habitat in the vicinity of the Proposed Action Area. However, in California most records are for the lower Sacramento-San Joaquin River systems (Moyle 2002).

4.5.10.2 Effects Assessment Methods

Section 4.3: Direct and Indirect Effects Assessment Methods discusses the assessment methods for the fish species discussed in this ASIP. **Table 4-8** presents the effect indicators and technical evaluation guidelines used in the analysis of potential effects on river lamprey.

Table 4-8. Effect Indicators and Technical Evaluation Guidelines for River Lamprey.

Effect Indicators	Technical Evaluation Guidelines
Habitat Quantity and Suitability	Short-term reduction in quantity of habitat, and/or degradation of habitat suitability of sufficient magnitude and/or frequency, thereby potentially reducing long-term population levels of river lamprey.
Habitat Quantity and Suitability	Long-term reduction in quantity and/or suitability of habitat of sufficient magnitude and/or frequency to potentially reduce long-term population levels of river lamprey.
Fish Passage	Impede movement of river lamprey with substantial magnitude and/or frequency to potentially reduce long-term population levels.

4.5.10.3 Project Effects

Construction Activities

It is unknown to what extent, if any, river lamprey spawning occurs proximate to the Proposed Action Area. After spawning (February through May), ammocetes are carried downstream by water currents and burrow in mud- or soft sand-bottomed water and stream edges, where they begin a filter-feeding existence. Dredging of the gravel bar, however, will occur in areas that have been exposed to desiccation (dewatered) for several months prior to excavation. Therefore, ammocetes would not be expected to be present in the dredged area. Because construction (October 1 through October 31) is not concurrent with spawning, and ammocetes would not be present, and based on the consideration and evaluation of physical habitat disturbance, potential for physical injury, hazardous spills, turbidity, and sedimentation and erosion presented above, the Proposed Action would not be anticipated to result in reduced population levels of river lamprey.

Habitat Alteration (Five-year Period)

It is unknown to what extent, if any, river lamprey spawning occurs proximate to the Proposed Action Area. River lamprey adults need clean, gravelly riffles in permanent streams for spawning. Implementation of the Proposed Action is not expected to change the amount of gravely riffle habitat in the Proposed Action Area. The dredged area will be altered by transforming a previously inundated gravel bar into a more flowing section of the river, neither of which is likely river lamprey spawning habitat. After spawning (February through May), ammocetes are carried downstream by water currents and burrow in mud- or soft sand-bottomed water and stream edges, where they begin a filter-feeding existence. Transformation of the gravel bar (via dredging) will not affect the amount of suitable ammocete habitat due to resultant similar amounts of stream edge with suitable substrate. The presently eroding west bank of the Sacramento River in the Proposed Action Area may contain suitable substrate for ammocete burrowing. However, the instream areas proximate to the present steep bank may not be suitable for ammocete habitation due to hydraulic characteristics (water depth and velocity). Moreover, if river lamprey ammocetes did inhabit the present west bank of the Sacramento River in the Proposed Action Area, they likely would be displaced, suspended in the water column and transported downstream due to the continued, rapid erosion occurring at that site. Therefore, relative to the Environmental Baseline, the Proposed Action is not expected to result in long-term population levels reduction of river lamprey.

4.5.10.4 Conservation Measures

The general conservation measures for green sturgeon described in *Section 4.5.6.4* apply to the non-salmonid species evaluated, including river lamprey.

4.5.10.5 Contribution to Recovery

This section is not applicable to river lamprey.

4.5.11 Valley Elderberry Longhorn Beetle (VELB)

The following information is described for the VELB: (1) Status in the Proposed Action Area; (2) Effects Assessment Methods; (3) Project Effects; (4) Conservation Measures; and (5) Contribution to Recovery.

4.5.11.1 Status in the Proposed Action Area

There are 33 elderberry shrubs in the Proposed Action Area, including several with VELB exit holes (Figure 1-5). Three elderberry shrubs including E05, E07, and EO8 may be directly affected by the project. However, a recent visit to the Proposed Action Area by Kelley Moroney (USFWS Assistant Refuge Manager) indicated that shrubs EO5 and E07 may have eroded into the river or become overgrown by dense riparian vegetation. Due to the presence of exit holes, presence of VELB in the Proposed Action Area is assumed.

4.5.11.2 Effects Assessment Methods

Section 4.4: Direct and Indirect Effects Assessment Methods discusses the assessment methods for terrestrial species evaluated in this ASIP. **Table 4-9** presents the effect indicators and technical evaluation guidelines used in the analysis of potential effects on VELB.

Table 4-9. Effect Indicators and Technical Evaluation Guidelines for VELB

Effect Indicators	Technical Evaluation Guidelines
Habitat Quantity and Suitability	Short-term reduction in quantity of habitat, and/or degradation of habitat suitability of sufficient magnitude and/or frequency, thereby potentially reducing long-term population levels of VELB.
Habitat Quantity and Suitability	Long-term reduction in quantity and/or suitability of habitat of sufficient magnitude and/or frequency to potentially reduce long-term population levels of VELB.

4.5.11.3 Project Effects

Effects of Longitudinal Stone Toe Revetment Construction

If all shrubs are present during the construction period (i.e., have not eroded into the river or been overgrown by riparian vegetation), three (3) elderberry shrubs (E05, E07, and EO8) would be directly affected (i.e., destroyed or transplanted) by construction activities associated with the construction of the rock and tree revetment (Figure 1-5). The Proposed Action would avoid and minimize effects on VELB by implementing the minimization and avoidance measures listed in the VELB Conservation Guidelines (USFWS 1999a) as part of the Proposed Action description. The measures to avoid potential affects to VELB include transplanting shrubs that would otherwise be directly affected by the Proposed Action. The shrubs that would be directly affected would be transplanted under the supervision of the USFWS and complying with the VELB Conservation Guidelines (USFWS 1999a) prior to the onset of construction activities. For each stem greater than one inch in diameter at ground level that is transplanted, elderberry seedlings or cuttings will be planted in the Proposed Action Area at a ratio specified in the VELB Conservation Guidelines (USFWS 1999a). Additionally, all shrubs within the Action/Project Area will be protected by the impact avoidance and minimization measures incorporated into the Proposed Action/Project, as described below.

If the Proposed Action is implemented with measures incorporated from the USFWS Conservation Guidelines (USFWS 1999a) as described below, the Proposed Action is not likely to adversely affect the valley elderberry longhorn beetle.

Effects of Dredging

No elderberry shrubs occur within the dredging area or within 100 feet of the dredging area. Therefore, VELB will not be affected by dredging activities.

Effects of Spoils Deposition

Twenty-three (23) elderberry shrubs could potentially be affected by spoils deposition-related activities. The shrubs exist in close proximity (1 to 75 feet) to the existing access road and could potentially be impacted by dust associated with construction traffic and inadvertent contact with construction equipment. The Proposed Action/Project would avoid and minimize impacts to VELB by implementing the minimization and avoidance measures listed in the VELB Conservation Guidelines (USFWS 1999a).

Effects of Construction Vehicle Access

Many elderberry shrubs are located near currently disturbed access roads in the Proposed Action Area on both sides of the Sacramento River. Inadvertent contact with shrubs could occur while construction vehicles are entering or leaving the area. However, implementation of the impact avoidance and minimization measures described in the VELB Conservation Guidelines (USFWS 1999a) and incorporated into the Proposed Action, as described above, would minimize access-related impacts.

Habitat Alteration (Five-year Period)

Implementation of the Proposed Action could potentially result in transplantation of several elderberry shrubs, which would result in VELB habitat alteration. However, the shrubs would be transplanted to an area immediately adjacent to the Proposed Action Area within the USFWS Sacramento River National Wildlife Refuge. Therefore, following the USFWS VELB Conservation Guidelines, the shrubs would be planted in an area where potential future effects would be minimized. Additionally, the shrubs would be planted near other elderberry shrubs, thereby maintaining the continuity of VELB habitat.

Subsequent to construction, the impacted area would be revegetated with riparian species, which could include elderberry shrubs, which would avoid long-term disruptions in habitat continuity within the construction area.

4.5.11.4 Conservation Measures

The Proposed Action has the potential to affect VELB through removal of elderberry shrubs. The following conservation measures are provided by the MSCS:

- Before implementing actions that could result in the loss or degradation of occupied habitat, conduct surveys in suitable habitat within the species' range that could be affected by proposed project actions to determine the presence and distribution of the valley elderberry longhorn beetle. These surveys were conducted by Gallaway Consulting Inc. biologists during 2006. VELB presence is assumed and specific conservation measures listed in the VELB Conservation Guidelines (USFWS 1999a) will be implemented to avoid or minimize potential effects.

- Until the valley elderberry longhorn beetle has been recovered, implement the USFWS' guidelines for mitigating project effects on the valley elderberry longhorn beetle to compensate for proposed project impacts on the species.

In addition to the general conservation measures provided by the MSCS, the following conservation measures would help to avoid, minimize, and compensate for potential Proposed Action effects on VELB. These conservation measures are contained in the VELB Conservation Guidelines (USFWS 1999a):

Avoid and Minimize Effects

According to the VELB Conservation Guidelines, complete avoidance (i.e., no adverse effects) may be assumed when a 100-foot buffer is established and maintained around elderberry shrubs containing stems measuring one inch or greater in diameter at ground level. The USFWS must be consulted before any disturbances within the 100-ft. buffer area are considered. However, when construction would be required to occur within 100 feet of elderberry shrubs, a minimum buffer of 20 feet from drip line may be approved by the USFWS. By following avoidance and protection measures contained in the Guidelines, no adverse impacts to VELB are anticipated as a result of this Project. The following conditions will be implemented to minimize impacts to the existing bushes:

1) Orange barrier fencing will be placed 100 feet from the drip line of elderberry shrubs where practicable, and a minimum of 20 feet from the drip line of each elderberry shrub with one or more stems measuring one inch or greater in diameter at ground level where approved by USFWS. Construction personnel and/or activities will avoid fenced areas;

2) Construction contractors will employ erosion and dust control measures during all construction activities;

3) No insecticides, herbicides, fertilizers, or other chemicals will be applied within 100 feet of elderberry plants with one or more stems measuring one inch or greater in diameter at ground level during construction activities. All drainage water during and following construction will be diverted away from shrubs with stems measuring one inch or greater at ground level.

4) Signs will be erected every 50 feet along the protective fences that describes the sensitivity of the elderberry shrubs and the federally listed beetle

5) All construction personnel will receive environmental awareness training regarding the elderberry shrubs, the status of the beetle, and the need to avoid the elderberry shrubs

6) Any damage occurring within areas within 100 feet of elderberry shrubs will be restored with native plant species

7) Monitoring will be conducted randomly several times during construction and continuously during transplanting to ensure compliance with these measures.

Transplanting of Elderberry Plants

If avoidance is not possible shrubs, E05, E07, and EO8 will be transplanted within a mitigation area immediately adjacent to the Proposed Action Area within the Capay Unit of the USFWS Sacramento River National Wildlife Refuge (pers. comm., Foerster 2005; pers. comm., Foerster 2006). A qualified biologist will be onsite during the transplanting to assure compliance with the VELB Conservation Guidelines. Transplanting will take place prior to the onset of construction activities after the bushes have lost the majority of their leaves, or as permitted by USFWS under their authority granted within the programmatic Section 7 consultation #1-1-98-F-13. Plants will be cut back to 3-6 feet from the ground or to 50 percent of their height, which ever is tallest. All stems measuring greater than 1 inch will be transplanted. A backhoe will be used to excavate a hole of adequate size in the conservation area for each bush, and then the bushes will be excavated. The root ball and surrounding soil will be maintained during the transplanting process. Before transplantation would occur, the site receiving the shrubs would be watered and otherwise prepared appropriately following the USFWS VELB Conservation Guidelines. After the plants have been moved, a watering basin that measures a minimum of three feet in diameter with a continuous water berm measuring 8 inches wide and 6 inches tall will be placed around each bush.

4.5.11.5 Contribution to Recovery

The MSCS outlines species conservation goals that have been incorporated into the CALFED plan. The goals generally are intended to enable USFWS, NMFS, and CDFG to make necessary findings and determinations under ESA, CESA, and NCCPA (CALFED 2000c). The VELB is designated an "R" species in the Ecosystem Restoration Program (ERP) Plan and MSCS. This means that CALFED will make specific contributions toward the recovery of the species' populations within the MSCS focus area to levels that ensure the species' long-term survival in nature. Specifically, CALFED recommends maintaining and restoring the connectivity among riparian habitats occupied by the VELB and within its historical range along the Sacramento and San Joaquin rivers and their major tributaries.

4.5.12 Bald Eagle

The following information is described for the bald eagle: (1) Status in the Proposed Action Area; (2) Effects Assessment Methods; (3) Project Effects; (4) Conservation Measures; and (5) Contribution to Recovery.

4.5.12.1 Status in the Proposed Action Area

There are no known bald eagle nests in the Proposed Action Area.

4.5.12.2 Effects Assessment Methods

Section 4.4: Direct and Indirect Effects Assessment Methods discusses the assessment methods for terrestrial species evaluated in this ASIP. **Table 4-10** presents the effect indicators and technical evaluation guidelines used in the analysis of potential effects on bald eagle.

Table 4-10. Effect Indicators and Technical Evaluation Guidelines for Bald Eagle

Effect Indicators	Technical Evaluation Guidelines
Habitat Quantity and Suitability	Short-term reduction in quantity of habitat, and/or degradation of habitat suitability of sufficient magnitude and/or frequency, thereby potentially reducing long-term population levels of bald eagles.
Habitat Quantity and Suitability	Long-term reduction in quantity and/or suitability of habitat of sufficient magnitude and/or frequency to potentially reduce long-term population levels of bald eagles.

4.5.12.3 Project Effects

Effects of Longitudinal Stone Toe Revetment Construction

Bald eagles have the potential to be present in or around the Proposed Action Area during the late fall and winter months when northern populations enter the Sacramento River basin to reside for the winter (CDFG Website 2007). Removal of large trees within riparian habitat could temporarily eliminate bald eagle nesting/roosting trees. Construction-related noise and activity have the potential to result in abandonment of nesting/wintering sites if the disturbance is within 0.5 mile of nesting/wintering locations. This activity could cause site abandonment if sensitive birds were to nest/winter in close proximity to areas disturbed by construction-related vehicle traffic, human activity, or elevated noise levels prior to or during the nesting/wintering period.

However, based on the reported bald eagle habitat requirements and general habitat utilization the riparian habitat in the Proposed Action Area is not considered high quality nesting and wintering habitat (USFWS 2004). In fact, it is likely that the riparian habitat within the Proposed Action Area contains only low quality habitat. Therefore, it is likely that potential impacts associated with revetment activities would be minimal. Additionally, revetment activities and associated noise-related potential impacts would be temporary.

Because the bald eagle breeding season extends from February through July in California with northward migration occurring prior to September (USFWS 2004), construction-related effects on nesting bald eagles associated with revetment activities likely would not occur because the anticipated construction schedule for the Proposed Action would occurs from October 1 through October 31.

Although revetment-related activities are not expected to affect nesting bald eagles, pre-construction surveys conducted by USFWS biologists are incorporated into the Proposed Action along with a commitment to consult with USFWS prior to the onset of construction activities if nesting eagles are observed. As part of the avoidance measures incorporated into the Proposed Action, construction activities will not occur within 0.5 miles of an active bald eagle nest or winter roosting site. If this distance is not able to be maintained, construction activities will be halted and USFWS will be consulted to identify appropriate avoidance measures.

Effects of Dredging

Potential effects associated with dredging would be equivalent to those associated with bank revetment. Therefore, avoidance and minimization measures associated with the bank revetment, including a pre-construction survey, would be implemented prior to and during dredging activities. Additionally, the anticipated construction period also would be concurrent with bank revetment. Therefore, it is unlikely that bald eagles would be affected by construction activities.

Effects of Spoils Deposition

Potential effects associated with spoils deposition would be similar to those associated with bank revetment. Therefore, avoidance and minimization measures associated with the bank revetment, including a pre-construction survey, would be implemented prior to and during spoils disposal activities. Additionally, the anticipated construction period also would be concurrent with bank revetment. Therefore, it is unlikely that bald eagles would be affected by activities associated with spoils deposition.

4.5.12.4 Conservation Measures

The proposed project has the potential to affect nesting/wintering bald eagles by disturbing and/or adversely modifying suitable habitat. The following conservation measures taken from the MSCS will be incorporated to mitigate impacts:

- Avoid or minimize construction related disturbances that are associated with implementing proposed project actions within 0.5 miles of active nest sites during the nesting period (February-July).

- Avoid proposed project actions that could result in the loss of traditional nesting trees or degradation of natural habitat within 0.5 miles of traditional nest trees.

In addition to the conservation measures from the MSCS, a pre-construction survey will be conducted by USFWS biologists for nesting bald eagles. The USFWS will be contacted for remedial measures if nesting bald eagles are observed within 0.5 miles of where construction activities would occur.

4.5.12.5 Contribution to Recovery

This section is not applicable to bald eagle.

4.5.13 Western yellow-billed Cuckoo

The following information is described for the western yellow-billed cuckoo (1) Status in the Proposed Action Area; (2) Effects Assessment Methods; (3) Project Effects; (4) Conservation Measures; and (5) Contribution to Recovery.

4.5.13.1 Status in the Proposed Action Area

There are no known western yellow-billed cuckoo nests in the Action/Project Area.

4.5.13.2 Effects Assessment Methods

Section 4.4: Direct and Indirect Effects Assessment Methods discusses the assessment methods for terrestrial species evaluated in this ASIP. **Table 4-11** presents the effect indicators and technical evaluation guidelines used in the analysis of potential effects on western yellow-billed cuckoo.

Table 4-11. Effect Indicators and Technical Evaluation Guidelines for Western yellow-billed Cuckoo

Effect Indicators	Technical Evaluation Guidelines
Habitat Quantity and Suitability	Short-term reduction in quantity of habitat, and/or degradation of habitat suitability of sufficient magnitude and/or frequency, thereby potentially reducing long-term population levels of western yellow-billed cuckoo.
Habitat Quantity and Suitability	Long-term reduction in quantity and/or suitability of habitat of sufficient magnitude and/or frequency to potentially reduce long-term population levels of western yellow-billed cuckoo.
Direct Mortality	Activities resulting in injury or direct mortality; thereby resulting in take of Western yellow-billed Cuckoo

4.5.13.3 Project Effects

Effects of Longitudinal Stone Toe Revetment Construction

The western yellow-billed cuckoo typically utilizes large areas of riparian vegetation (greater than 25 acres and a minimum width of 300-feet) for foraging and nesting activities. The riparian habitat on the west bank of the Sacramento River is approximately 250 feet wide, and totals less than 25 acres. Therefore, the riparian habitat on the west bank of the Sacramento River is not considered suitable for western yellow-billed cuckoo nesting activities. Because the habitat requirements of the western yellow-billed cuckoo are not met at the revetment site location, the removal of riparian vegetation in this area would not have an adverse effect on the western yellow-billed cuckoo.

Additionally, western yellow-billed cuckoos reportedly only are in California during mid-summer. Spring migration into California begins during late May and lasts until late June (California Partners in Flight Website 2007) and the breeding season generally begins with pair formation during mid-June, and lasts until mid-August. Fall migration begins during late August and lasts until mid-September (Ehrlich *et al*. 1988). Therefore, western yellow-billed cuckoos are restricted to the mid-summer period for breeding presumably due to a seasonal peak in large insect abundance (USFWS Website 2006b). Construction activities are anticipated to occur from October 1 through October 31. Therefore, construction of the rock toe and tree revetment would not affect western yellow-billed cuckoos because construction would remove habitat considered unsuitable for the species, and would occur when the species is not present.

Effects of Dredging

Potential effects on western yellow-billed cuckoo associated with dredging activities would include noise-related disturbance and habitat removal. Because construction activities would occur after western yellow-billed cuckoos reportedly have migrated away from nest sites, no effects associated with construction noise are anticipated.

Western yellow-billed cuckoos potentially utilize the riparian vegetation adjacent to the access road and the gravel removal site for foraging and nesting activities. Implementation of this action would affect a small amount of riparian habitat. The activities associated with the installation of the culvert creek crossing would result in the removal of a thin strip of riparian vegetation consisting mainly of willows. There may be additional removal of riparian vegetation during gravel removal activities. The removal of riparian vegetation in this area could potentially affect western yellow-billed cuckoos. However, riparian habitat affected by construction activities associated with dredging would be restored following construction.

Effects of Spoils Deposition

Because spoils deposition occurs near the dredging area, potential noise-related impacts on western yellow-billed cuckoo associated with dredging also could occur associated with spoils deposition. However, because construction activities would occur after western yellow-billed cuckoos reportedly have migrated away from nest sites, no effects associated with construction noise are anticipated.

No additional riparian habitat is anticipated to be removed during spoils disposal activities. Therefore, habitat removal associated with spoils deposition activities would not affect western yellow-billed cuckoos.

Habitat Alteration (Five-year Period)

Implementation of the Proposed Action could potentially result in riparian vegetation removal, which would result in western yellow-billed cuckoo habitat alteration. However, the vegetation would be restored and monitored for success after construction activities are completed. Therefore, no affects associated with habitat alteration over a five-year period would occur.

4.5.13.4 Conservation Measures

The proposed project has the potential to affect western yellow-billed cuckoo by disturbing nesting, and/or adversely modifying suitable nesting habitat. The following conservation measures provided by the MSCS will be incorporated to mitigate potential effects:

- Before implementing actions that could result in take or the loss or degradation of occupied habitat, conduct surveys in suitable habitat within portions of the species' range that proposed project actions could affect to determine the presence and distribution of the species. USFWS biologists will conduct pre-construction surveys for nesting bird species including western yellow-billed cuckoo within the Proposed Action Area and provide remedial measures if nesting cuckoos are observed.

- Avoid or minimize actions that could degrade or result in the loss of suitable nesting habitat within the species current and historical range.

- Avoid proposed project actions near active nest sites that could result in disturbance during the breeding period (May-August)

4.5.13.5 Contribution to Recovery

The MSCS outlines species conservation goals that have been incorporated into the CALFED plan. The goals generally are intended to enable USFWS, NMFS, and CDFG to make necessary findings and determinations under ESA, CESA, and NCCPA (CALFED 2000c). The western yellow-billed cuckoo is designated an "R" species in the MSCS, which means that CALFED will make specific contributions toward the recovery of the species' populations within the MSCS focus area to levels that ensure the species' long-term survival in nature. Following construction activities, riparian habitat will be restored at a ratio of 2:1. Specifically, approximately 1.7 acres of riparian habitat will be removed to accommodate construction activities. Therefore, approximately 3.4 acres of riparian habitat will be restored on both banks of the Sacramento River and on the south bank of Big Chico Creek.

4.5.14 Bank Swallow

The following information is described for the bank swallow: (1) Status in the Proposed Action Area; (2) Effects Assessment Methods; (3) Project Effects; (4) Conservation Measures; and (5) Contribution to Recovery.

4.5.14.1 Status in the Proposed Action Area

A bank swallow colony of about 110 nesting pairs was documented nesting in the eroded bank to be reveted in the Proposed Action Area in 2005 by USFWS biologists (*pers. comm.*, Kevin Foerster, September 23, 2005). Nesting individuals were not observed during 2006. However, on May 1, 2007 3 nesting colonies were identified on the site. Additionally results of the Annual Bank Swallow Survey indicate that from 1999 through 2005 estimates ranging from 50 (during 2002) to 340 (during 2001) nesting pairs were observed on the west bank of the Proposed Action Area.

4.5.14.2 Effects Assessment Methods

Section 4.4: Direct and Indirect Effects Assessment Methods discusses the assessment methods for terrestrial species evaluated in this ASIP. **Table 4-12** presents the effect indicators and technical evaluation guidelines used in the analysis of potential effects on western yellow-billed cuckoo.

Table 4-12. Effect Indicators and Technical Evaluation Guidelines for Bank Swallows

Effect Indicators	Technical Evaluation Guidelines
Habitat Quantity and Suitability	Short-term reduction in quantity of habitat, and/or degradation of habitat suitability of sufficient magnitude and/or frequency, thereby potentially reducing long-term population levels of bank swallow.

Effect Indicators	Technical Evaluation Guidelines
Habitat Quantity and Suitability	Long-term reduction in quantity and/or suitability of habitat of sufficient magnitude and/or frequency to potentially reduce long-term population levels of bank swallow.
Direct Mortality	Activities resulting in injury or direct mortality; thereby resulting in take of Bank Swallows

4.5.14.3 Project Effects

Effects of Longitudinal Stone Toe Revetment Construction

A bank swallow colony of about 110 nesting pairs was documented using the eroded bank to be reveted by the proposed action in 2005 by USFWS biologists (pers. comm., Kevin Foerster, September 23, 2005). The colony was not found nesting during additional surveys on June 27, 2006 by Gallaway Consulting, Inc. biologists (see Surveyor Qualifications in Appendix B). Three colonies were observed by USFWS personnel during 2007. Bank swallows reportedly nest in colonies in nearly vertical banks from approximately mid-March through July (Garrison 1999; Garrison 2002; Humphrey and Garrison 1987). Potential effects associated with construction of the rock toe and tree revetment include direct mortality and nesting activity disruption due to noise and construction disturbance (i.e., rock placement). Because construction of the rock toe and tree revetment is anticipated to occur during October, direct effects (i.e., injuring or killing nesting swallows) are unlikely to occur.

Effects of Dredging

Potential effects on bank swallow associated with dredging activities include noise-related nesting disruption. However, because construction of the Proposed Action would occur during October, outside the reported bank swallow nesting period, potential noise-related effects on bank swallows would be avoided.

Effects of Spoils Deposition

Potential effects on bank swallow associated with spoils deposition activities include noise-related nesting disruption. However, because construction of the Proposed Action would occur during October, outside the reported bank swallow nesting period, potential noise-related effects on bank swallows would be avoided.

Habitat Alteration (Five-year Period)

Implementation of the Proposed Action would affect bank swallows by removing approximately 1,520 feet of known and potential bank swallow habitat from the Proposed Action Area. Specifically, the revetment would reduce the suitability of the habitat above the revetment and remove the opportunity for recolonization during the five-year planning period, potentially resulting in a permanent loss of bank swallow habitat in the Proposed Action Area. Permanent habitat loss in the Proposed Action Area would result in a reduction of habitat within the region, which also would result in a reduction of habitat for the species (i.e., a large proportion of remaining suitable bank swallow habitat exists on the banks of the Sacramento River north of Colusa).

Because the Proposed Action is a temporary feature identified by the Steering Committee as having a five-year lifespan, upon removal of the revetment following the five-year period, the bank could potentially become suitable for recolonization. However, the potential for the bank to again become suitable for bank swallow recolonization after the five-year planning period would depend on the type of permanent solution implemented by the Steering Committee.

Because the west bank of the Sacramento River is suitable habitat for bank swallows, and nesting colonies often (almost annually) have been observed using the site, the Proposed Action includes measures to restore, replace, or conserve in perpetuity bank swallow habitat in the reach from Butte City to Hamilton City (RM 169-199) at a ratio of 2:1 for removed habitat (i.e., two square feet of habitat will be restored replaced, or conserved in perpetuity for every square foot of suitable habitat removed).

The Project Proponents shall mitigate for the loss of bank swallow habitat through the acquisition of fee title or a conservation easement on riverfront property. The specific mitigation site or sites, and the entity holding title or easement shall be approved by the CDFG. Such sites shall not be on existing lands owned by, or under easement to the CDFG.

Mitigation shall occur as close as is reasonably possible to the project site, and may be applied through the protection of existing bank swallow habitat, through restoration of habitat (including removal of rock at historic sites), or through a combination of these measures. Mitigation shall be based on an assessment of the quality of the habitat being lost (including its potential to support nesting bank swallows over time) and the quality of the proposed mitigation site or sites, and shall be at a minimum of 2:1. The Project Proponents shall prepare a detailed Mitigation Plan, to be approved by the CDFG. Such plan shall include, at a minimum, the following:

- The specific location of the mitigation site or sites;
- A description of the existing habitat values at the site(s) and of the values that will be protected and/or restored;
- A detailed description of the proposed conservation/restoration activities to be carried out on the site(s);
- A detailed description of ongoing management activities to be carried out to ensure that bank swallow habitat is maintained over time.

Prior to the onset of construction activities, Project Proponents shall secure both the rights to the specified mitigation property, and the funding necessary to complete the acquisition of the property.

4.5.14.4 Conservation Measures

The Conservation Prescriptions and Guidelines for bank swallow as outlined in the MSCS states… "*allow reaches of the Sacramento River and its tributaries that are unconfined by flood control measures (i.e., bank revetment and levees) to continue to meander freely, thereby creating bank nesting substrates through the process of bank erosion*". Under the MSCS, for species designated as "R" species, such as the bank swallow, the Proposed Action is required to make contributions toward the recovery of the species for which Proposed Actions affect only a limited portion of the species' range and/or have limited effects on the species (CALFED 2000a).

The Proposed Action will affect bank swallows by removing 1,520 feet of known or potential bank swallow habitat. The following conservation measures provided by the MSCS will be incorporated into the Proposed Action to mitigate potential effects:

- Before implementing actions that could result in take, or the loss or degradation of occupied habitat, conduct surveys in suitable habitat within portions of the species' range that proposed project actions could affect to determine the presence and distribution of the species. Pre-construction surveys would be conducted by USFWS biologists to determine if nesting swallows are present prior to the onset of construction activities. If swallows are present, CDFG would be contacted to determine appropriate remedial measures.

- Avoid or minimize actions that could adversely affect known colonies or unoccupied river reaches with eroding banks composed of soils that would provide suitable nesting substrate.

- Avoid actions near active colonies from April through August.

- To the extent practicable, avoid actions that would create suitable, but temporary, nesting habitat that could create population sinks by attracting bank swallows, or implement additional actions to render such habitat unattractive to bank swallows.

- Coordinate permanent protection and restoration of channel meander belts and existing bank swallow colonies with other federal and State programs (e.g., the Senate Bill [SB] 1086 program and the COE Sacramento and San Joaquin Basin Comprehensive Study), federal and state refuges, and private landowners via fee title or conservation easement in the affected reach (RM 169-199, Butte City to Hamilton City). Coordination would avoid conflicts among management objectives and identify opportunities for achieving multiple management objectives.

In addition to the conservation measures from the MSCS, Proposed Action includes measures to ensure that bank swallow habitat is mitigated at a ratio of 2:1 (i.e., two linear feet of habitat restored, replaced, or conserved in perpetuity for every linear foot of habitat removed). The Project Proponents shall mitigate for the loss of bank swallow habitat through the acquisition of fee title or a conservation easement on riverfront property. The specific mitigation site or sites, and the entity holding title or easement shall be approved by the CDFG. Such sites shall not be on existing lands owned by, or under easement to the CDFG.

Mitigation shall occur as close as is reasonably possible to the project site, and may be applied through the protection of existing bank swallow habitat, through restoration of habitat (including removal of rock at historic sites), or through a combination of these measures. Mitigation shall be based on an assessment of the quality of the habitat being lost (including its potential to support nesting bank swallows over time) and the quality of the proposed mitigation site or sites, and shall be at a minimum of 2:1. The Project Proponents shall prepare a detailed Mitigation Plan, to be approved by the CDFG. Such plan shall include, at a minimum, the following:

- The specific location of the mitigation site or sites;

- A description of the existing habitat values at the site(s) and of the values that will be protected and/or restored;
- A detailed description of the proposed conservation/restoration activities to be carried out on the site(s);
- A detailed description of ongoing management activities to be carried out to ensure that bank swallow habitat is maintained over time.

Prior to the onset of construction activities, Project Proponents shall secure both the rights to the specified mitigation property, and the funding necessary to complete the acquisition of the property.

4.5.14.5 Contribution to Recovery

The MSCS outlines species conservation goals that have been incorporated into the CALFED plan. The goals generally are intended to enable USFWS, NMFS, and CDFG to make necessary findings and determinations under ESA, CESA, and NCCPA (CALFED 2000c). The bank swallow is designated an "R" species in the MSCS, which means that CALFED will make specific contributions toward the recovery of the species' populations within the MSCS focus area to levels that ensure the species' long-term survival in nature.

The objective of contributing to a species recovery implies that the Proposed Action would undertake actions under its control and within its scope that are necessary to recover the species. When a species has a recovery plan, the proposed project may implement plan measures that are within the CALFED Problem Area (i.e., the reach extending from Butte City to Hamilton City [RM 169-199]), and measures that are outside the Problem Area. For species without a recovery plan, such as the bank swallow, the proposed project would implement specific conservation measures that will benefit the species pursuant to the MSCS (CALFED 2000a). The conservation measures listed above will be implemented as part of the Proposed Action, to contribute to the recovery of the bank swallow.

4.5.15 Swainson's Hawk

The following information is described for the Swainson's hawk: (1) Status in the Proposed Action Area; (2) Effects Assessment Methods; (3) Project Effects; (4) Conservation Measures; and (5) Contribution to Recovery.

4.5.15.1 Status in the Proposed Action Area

Based on a current CNDDB query (expires June 2007) and formal consultation with Jenny Marr, CDFG Staff Environmental Scientist, June 19, 2006, there are no known active (within the last 5 years) Swainson's hawk nests within a 10-mile radius of the Proposed Action Area. However, there are 14 pre-2001 Swainson's hawk occurrences within 10 miles of the Proposed Action Area, as well as suitable nesting and foraging habitat within and immediately adjacent to the Proposed Action Area in the form of mature riparian trees and agricultural lands, respectively.

Several potential nesting trees exist within 0.5 miles of the proposed project site. Agricultural lands adjacent to the Proposed Action Area (grasslands and row crops) provide suitable foraging habitat for this species, as well as other raptors.

4.5.15.2 Effects Assessment Methods

Section 4.4: Direct and Indirect Effects Assessment Methods discusses the assessment methods for terrestrial species evaluated in this ASIP. **Table 4-13** presents the effect indicators and technical evaluation guidelines used in the analysis of potential effects on Swainson's hawk.

Table 4-13. Effect Indicators and Technical Evaluation Guidelines for Swainson's Hawk

Effect Indicators	Technical Evaluation Guidelines
Habitat Quantity and Suitability	Short-term reduction in quantity of habitat, and/or degradation of habitat suitability of sufficient magnitude and/or frequency, thereby potentially reducing long-term population levels of Swainson's hawk.
Habitat Quantity and Suitability	Long-term reduction in quantity and/or suitability of habitat of sufficient magnitude and/or frequency to potentially reduce long-term population levels of Swainson's hawk.
Direct Mortality	Activities resulting in injury or direct mortality; thereby resulting in take of Swainson's Hawk

4.5.15.3 Project Effects

Effects of Longitudinal Stone Toe Revetment Construction

According to a current CNDDB query (expires June 2007) and formal consultation with Jenny Marr, CDFG, Staff Environmental Scientist, June 19, 2006, there are no known active (within the last 5 years) Swainson's hawk nests within a 10-mile radius of the Proposed Action Area. However, there are 14 pre-2001 Swainson's hawk occurrences within 10 miles of the Proposed Action Area, one of which was recorded in the Proposed Action Area. Additionally, suitable nesting and foraging habitat occurs within, and immediately adjacent to the Proposed Action Area in the form of mature riparian trees and agricultural lands, respectively. Therefore, construction-related activity and noise could potentially affect Swainson's hawks directly through removal of suitable habitat and indirectly as a result of construction-related noise. Specifically, nest abandonment could result if construction occurs within 0.5 miles of nests. Temporary conversion of grasslands to disturbed land would result in a temporary loss of foraging habitat for Swainson's hawk. It is anticipated that approximately 1.8 acres of Swainson's hawk foraging habitat would be temporarily affected by the Proposed Action.

Swainson's hawk nesting reportedly occurs from March through August and construction activities are anticipated to occur during October. Therefore, nest disturbance and resultant nest abandonment are unlikely to occur as a result of construction activities, because construction activities would occur outside the Swainson's hawk nesting period. Additionally, the temporary loss of foraging habitat also is unlikely to affect nesting Swainson's hawks because construction is outside the nesting period. However, the potential exists for the species to take up year-round residency. Thus, a temporary loss of foraging habitat could potentially affect the species.

As a precautionary measure, pre-construction raptor surveys would be conducted by USFWS biologists. Any nesting activities would be reported to CDFG and appropriate measures would be implemented.

Effects of Dredging

Dredging activities could potentially affect Swainson's hawks directly by removing riparian habitat and indirectly by disturbing nesting activities. However, it is not anticipated that direct or indirect effects on Swainson's hawks would occur because only a small amount of relatively young willows would be removed during dredging activities, and would occur outside the Swainson's hawk nesting season. Additionally, no suitable foraging habitat would be removed during dredging activities.

As a precautionary measure, pre-construction raptor surveys would be conducted. Any nesting activities would be reported to CDFG and appropriate remedial measures would be implemented.

Effects of Spoils Deposition

Potential effects on Swainson's hawks associated with spoils deposition would be similar to those identified for dredging activities. Specifically, noise-related nest abandonment could potentially occur. However, nest abandonment is unlikely because construction activities are anticipated to occur during October, outside the Swainson's hawk nesting period (March through August).

As a precautionary measure, pre-construction raptor surveys would be conducted. Any nesting activities would be reported to CDFG and appropriate measures would be implemented.

Habitat Alteration (Five-year Period)

Although year-round resident Swainson's hawks could potentially be affected by a loss of habitat, the effects would be temporary and discountable. Specifically, a relatively small amount of grassland would be removed, relative to other available foraging habitat in the areas adjacent to the Proposed Action Area. Additionally, the disturbed habitat would be replaced at a ratio of 1:1 for disturbed grassland habitat and 2:1 for disturbed riparian habitat. Therefore, greater amounts of habitat would be available after restoration than were available prior to construction of the Proposed Action.

4.5.15.4 Conservation Measures

The Proposed Action has the potential to affect Swainson's hawk by disturbing nesting birds and removing suitable foraging and nesting habitat. To avoid and minimize potential impacts to nesting Swainson's hawks, CDFG-recommended, protocol-level surveys would be conducted by a qualified biologist pursuant to the *Recommended Timing and Methodology for Swainson's Hawk Nesting Surveys in California's Central Valley* (CDFG Website 2000) prior to construction. If no active nests are found within 0.5 miles of the construction area, construction would proceed without any further measures to prevent disturbance to nesting Swainson's hawks. The following conservation measures provided by the MSCS will be incorporated into the Proposed Action to mitigate potential effects if active nests are identified:

- Before implementing actions that could result in take or the loss or degradation of occupied habitat, conduct surveys in suitable habitat within portions of the species' range that the proposed project actions could affect to determine the presence and distribution of the species. USFWS biologists will conduct pre-construction surveys for nesting bird species including Swainson's hawks within the Proposed Action Area and provide remedial measures if nesting cuckoos are observed

- Avoid or minimize actions near locations that support high densities of nesting pairs that could adversely affect high value foraging and nesting habitat.

- Avoid or minimize actions within .5 miles of active nest sites that could result in disturbance during the breeding period (April-September).

- To the extent consistent with proposed project objectives, adhere to DFG Region II mitigation guidelines for avoiding or minimizing impacts of actions on the Swainson's hawk, which include the following:

If active nests are detected during surveys, no construction activities that could cause nest abandonment or force fledging (e.g., heavy equipment operation), should be initiated within 0.5 mile (buffer zone) of an active nest. Nest trees should not be removed unless there is no feasible way of avoiding them. If a nest tree must be removed, a Management Authorization (including conditions to offset the loss of the nest tree) must be obtained from DFG with the tree removal period specified in the Management Authorization, generally between October 1 and February 1.

If construction or other project-related activities that may cause nest abandonment or force fledging are necessary within the buffer zone, monitoring of the nest site (funded by the project proponent) by a qualified biologist will be conducted to determine if the nest is abandoned. If the nest is abandoned and living nestlings are found the recovery and hacking (controlled release of captive reared young) of the nestling(s) would be funded by the M&T Chico Ranch/Llano Seco Rancho. Routine disturbances such as agricultural activities, commuter traffic, and routine facility maintenance activities within 0.25 mile of an active nest should not be prohibited.

This project will not result in the permanent loss of foraging habitat for Swainson's hawk. Therefore additional compensatory mitigation above the 1:1 restoration ratio would not be necessary pursuant to the *Staff Report regarding Mitigation for Impacts to Swainson's hawks (Buteo swainsoni) in the Central Valley* (1994).

4.5.15.5 Contribution to Recovery

The MSCS outlines species conservation goals that have been incorporated into the CALFED plan. The goals generally are intended to enable USFWS, NMFS, and CDFG to make necessary findings and determinations under ESA, CESA, and NCCPA (CALFED 2000c). The Swainson's hawk is designated an "r" or "contribute to recovery" species. For this designation, the CALFED agencies will make specific contributions towards the recovery of the species (CALFED 2000c).

The specific prescription of the MSCS for the Swainson's hawk is to "Protect, enhance, and increase Swainson's hawk habitat sufficiently to support a viable breeding population. The

interim prescription is to increase the current estimate of breeding pairs in the Central Valley from 1,000 to 2,000."

Implementation of the Proposed Action would allow the continued use of the M&T Chico Ranch/Llano Seco Rancho water diversion facility, which would continue to supply water to agricultural lands that provide foraging habitat for Swainson's hawks. Additionally, restoring riparian vegetation at a ratio of two acres for every acre temporarily removed, and restoring grassland habitat at a ratio of one acre for every acre lost, would double the amount of potential nesting habitat and offset any loss of foraging habitat, respectively, within the Proposed Action Area.

4.5.16 White-tailed Kite

The following information is described for the white-tailed kite: (1) Status in the Proposed Action Area; (2) Effects Assessment Methods; (3) Project Effects; (4) Conservation Measures; and (5) Contribution to Recovery.

4.5.16.1 Status in the Proposed Action Area

There are no known white-tailed kite nests in the Proposed Action Area.

4.5.16.2 Effects Assessment Methods

Section 4.4: Direct and Indirect Effects Assessment Methods discusses the assessment methods for terrestrial species evaluated in this ASIP. **Table 4-14** presents the effect indicators and technical evaluation guidelines used in the analysis of potential effects on white-tailed kite.

Table 4-14. Effect Indicators and Technical Evaluation Guidelines for white-tailed kite.

Effect Indicators	Technical Evaluation Guidelines
Habitat Quantity and Suitability	Short-term reduction in quantity of habitat, and/or degradation of habitat suitability of sufficient magnitude and/or frequency, thereby potentially reducing long-term population levels of white-tailed kite.
Habitat Quantity and Suitability	Long-term reduction in quantity and/or suitability of habitat of sufficient magnitude and/or frequency to potentially reduce long-term population levels of white-tailed kite.

4.5.16.3 Project Effects

Effects of Longitudinal Stone Toe Revetment Construction

The Proposed Action has the potential to affect white-tailed kites as a result of nesting and foraging habitat removal or nest abandonment resulting from construction-related noise. Because there are no known, active nests (i.e., within the last 5 years) within the Proposed Action Area, construction activities would not affect known nesting individuals or remove known nest trees. However, construction-related noise and activity have the potential nest abandonment if the disturbance is within 500 feet of nesting locations. Construction of the rock toe and tree revetment could potentially cause nest abandonment if kites were nesting in close proximity to construction activities prior to or during the nesting period.

White-tailed kite nesting reportedly occurs from February through August and construction activities are anticipated to occur during October. Therefore, nest disturbance and resultant nest abandonment are unlikely to occur as a result of construction activities because construction activities would occur outside the white-tailed kite nesting period. Additionally, the temporary loss of nesting and foraging habitat also is unlikely to affect white-tailed kites because the habitat removal would be temporary. Riparian and grassland habitat would be restored after construction has been completed.

Additionally, as a precautionary measure, pre-construction raptor surveys would be conducted. Any nesting activities would be reported to CDFG and appropriate measures would be implemented.

Effects of Dredging

Dredging activities could potentially affect white-tailed kites directly by removing riparian habitat and indirectly by disturbing nesting activities. However, it is not anticipated that direct or indirect effects on white-tailed kites would occur because only a small amount of relatively young willows would be removed during dredging activities, and would occur outside the white-tailed kites nesting season. Additionally, no suitable foraging habitat would be removed during dredging activities.

As a precautionary measure, pre-construction raptor surveys would be conducted. Any nesting activities would be reported to CDFG and appropriate remedial measures would be implemented.

Effects of Spoils Deposition

Potential effects on white-tailed kites associated with spoils deposition would be similar to those identified for dredging activities. Specifically, noise-related nest abandonment could potentially occur. However, nest abandonment is unlikely because construction activities are anticipated to occur during October, outside the white-tailed kite nesting period (February through August).

As a precautionary measure, pre-construction raptor surveys would be conducted. Any nesting activities would be reported to CDFG and appropriate measures would be implemented.

Habitat Alteration (Five-year Period)

Although white-tailed kites could potentially be affected by a loss of habitat, the effects would be temporary and discountable. Specifically, a relatively small amount of grassland would be removed, relative to other available foraging habitat in the areas adjacent to the Proposed Action Area. Additionally, the disturbed habitat would be replaced at a ratio of 1:1 for disturbed grassland habitat and 2:1 for disturbed riparian habitat. Therefore, greater amounts of habitat would be available after restoration than were available prior to construction of the Proposed Action.

4.5.16.4 Conservation Measures

The Proposed Action has the potential to affect white-tailed kites by disturbing nesting, and/or adversely modifying suitable nesting habitat. The following conservation measures provided by the MSCS will be incorporated into the Proposed Action to mitigate potential effects::

- Before implementing actions that could result in the loss or degradation of occupied nesting habitat, or disturbance to nesting pairs, surveys would be conducted in suitable nesting habitat to locate active nest sites.

- Avoid or minimize disturbances to nesting pairs that could be associated with implementing the proposed project actions within 0.25 mile of active nest sites during the nesting period (February-August).

- Avoid or minimize actions that could result in the loss of traditional nesting trees.

- If suitable habitat is determined to be present during field surveys, restore or enhance two acres of suitable nesting habitat near affected areas for each acre of occupied nesting habitat that is converted to unsuitable nesting habitat as a result of the Proposed Action, resulting in a 2:1 ratio of mitigation. Restored or enhanced compensation habitat would be located in areas that support nesting pairs near valley oak woodlands.

- To the extent consistent with Ecosystem Restoration Report objectives, enhance and restore natural habitats and agricultural habitats adjacent to occupied nesting habitats to create a buffer zone of natural habitat. This buffer zone would protect nesting pairs from adverse effects that could be associated with future changes in land use on nearby lands and provide foraging and nesting habitat suitable for the natural expansion of populations.

- To the extent consistent with Ecosystem Restoration Program objectives, manage restored or enhanced habitats under the Ecosystem Restoration Report to maintain desirable rodent populations and minimize impacts associated with rodent control.

If active nests are detected during surveys, no construction activities that could cause nest abandonment or force fledging (e.g., heavy equipment operation), should be initiated within 0.25 mile (buffer zone) of an active nest.

If construction or other project-related activities that may cause nest abandonment or force fledging are necessary within the buffer zone, monitoring of the nest site (funded by the project proponent) by a qualified biologist will be conducted to determine if the nest is abandoned. If the nest is abandoned and living nestlings are found the recovery and hacking (controlled release of captive reared young) of the nestling(s) would be funded by the M&T Chico Ranch/Llano Seco Rancho.

4.5.16.5 Contribution to Recovery

The MSCS outlines species conservation goals that have been incorporated into the CALFED plan. The goals generally are intended to enable USFWS, NMFS, and CDFG to make necessary findings and determinations under ESA, CESA, and NCCPA (CALFED 2000c). The white-

tailed kite is designated an "m" or "maintain" species. For this designation, the CALFED agencies will avoid, minimize, and compensate for any adverse effects to the species commensurate with the level of effect on the species (CALFED 2000c).

4.5.17 Osprey

The following information is described for the osprey: (1) Status in the Proposed Action Area; (2) Effects Assessment Methods; (3) Project Effects; (4) Conservation Measures; and (5) Contribution to Recovery.

4.5.17.1 Status in the Proposed Action Area

An active osprey nest was observed during June 2006 surveys within the Proposed Action Area along the dredging access road near the Big Chico Creek Sacramento River confluence.

4.5.17.2 Effects Assessment Methods

Section 4.4: Direct and Indirect Effects Assessment Methods discusses the assessment methods for terrestrial species evaluated in this ASIP. **Table 4-15** presents the effect indicators and technical evaluation guidelines used in the analysis of potential effects on osprey.

Table 4-15. Effect Indicators and Technical Evaluation Guidelines for Osprey.

Effect Indicators	Technical Evaluation Guidelines
Habitat Quantity and Suitability	Short-term reduction in quantity of habitat, and/or degradation of habitat suitability of sufficient magnitude and/or frequency, thereby potentially reducing long-term population levels of osprey.
Habitat Quantity and Suitability	Long-term reduction in quantity and/or suitability of habitat of sufficient magnitude and/or frequency to potentially reduce long-term population levels of osprey.

4.5.17.3 Project Effects

Effects of Longitudinal Stone Toe Revetment Construction

The Proposed Action has the potential to affect ospreys as a result of nesting and foraging habitat alteration or nest abandonment resulting from construction-related noise. There is one known, active nest (i.e., within the last 5 years) within the Proposed Action Area, on the M&T Chico Ranch property south of Big Chico Creek that could potentially be disturbed by construction-related activities. However, it is unlikely that construction activities associated with rock toe and tree revetment would affect the known osprey nest because construction would occur approximately 1,000 feet from the nest.

Additionally, potentially suitable riparian osprey nesting habitat on the west bank of the Sacramento River would be removed as a result of revetment activities. However, it is unlikely that construction activities would affect nesting osprey because the osprey nesting season occurs from March through August and construction would occur during October.

Additionally, as a precautionary measure, pre-construction raptor surveys would be conducted. Any nesting activities would be reported to CDFG and appropriate measures would be implemented.

Effects of Dredging

Dredging activities could potentially affect ospreys directly by removing riparian habitat and indirectly by disturbing nesting activities. There is one known, active nest (i.e., within the last 5 years) within the Proposed Action Area, on the M&T Chico Ranch property south of Big Chico Creek that could potentially be disturbed by construction-related activities.

Osprey nesting reportedly occurs from March through August and construction activities are anticipated to occur during October. Therefore, nest disturbance and resultant nest abandonment are unlikely to occur as a result of construction activities. Additionally, the temporary loss of nesting and foraging habitat also is unlikely to affect ospreys because the habitat removal would be temporary because riparian and grassland habitat would be restored after construction has been completed.

As a precautionary measure, pre-construction raptor surveys would be conducted. Any nesting activities would be reported to CDFG and appropriate remedial measures would be implemented.

Effects of Spoils Deposition

Potential effects on ospreys associated with spoils deposition would be similar to those identified for dredging activities. Specifically, noise-related nest abandonment could potentially occur. However, nest abandonment is unlikely because construction activities are anticipated to occur during October, outside the osprey nesting period (March through August).

As a precautionary measure, pre-construction raptor surveys would be conducted. Any nesting activities would be reported to CDFG and appropriate remedial measures would be implemented.

Habitat Alteration (Five-year Period)

Although ospreys could potentially be affected by a loss of nesting habitat, the effects would be temporary and discountable. Specifically, the disturbed nesting habitat would be replaced at a ratio of 2:1. Therefore, greater amounts of habitat would be available after restoration than were available prior to construction of the Proposed Action. Additionally, osprey foraging habitat would be temporarily disturbed during construction activities. However, permanent loss of valley riverine aquatic habitat would not occur as a result of implementation of the Proposed Action.

4.5.17.4 Conservation Measures

The Proposed Action has the potential to affect ospreys by disturbing nesting, and/or adversely modifying suitable nesting habitat. The following conservation measures provided by the MSCS will be incorporated into the Proposed Action to mitigate potential effects:

- Before implementing actions that could result in the loss or degradation of occupied nesting habitat, or disturbance of nesting pairs, surveys would be conducted in suitable nesting habitat within the Proposed Action Area to locate active nest sites.

- Avoid or minimize disturbances to nesting pairs that could be associated with implementing proposed project actions within 0.25 mile of active nest sites during the nesting period (March through August).

Avoid or minimize proposed project actions that could result in the loss of traditional nesting trees.

4.5.17.5 Contribution to Recovery

The MSCS outlines species conservation goals that have been incorporated into the CALFED plan. The goals generally are intended to enable USFWS, NMFS, and CDFG to make necessary findings and determinations under ESA, CESA, and NCCPA (CALFED 2000c). The osprey is designated an "m" or "maintain" species. For this designation, the CALFED agencies will avoid, minimize, and compensate for any adverse effects to the species commensurate with the level of effect on the species (CALFED 2000c).

4.5.18 Northwestern Pond Turtle

The following information is described for the northwestern pond turtle: (1) Status in the Proposed Action Area; (2) Effects Assessment Methods; (3) Project Effects; (4) Conservation Measures; and (5) Contribution to Recovery.

4.5.18.1 Status in the Proposed Action Area

Northwestern pond turtles have not been identified using the Sacramento River or Big Chico Creek within the Proposed Action Area. Additionally, no CNDDB occurrences of individuals have been reported within 10 miles of the Proposed Action Area. However, potentially suitable habitat exists within the Proposed Action Area.

4.5.18.2 Effects Assessment Methods

Section 4.4: Direct and Indirect Effects Assessment Methods discusses the assessment methods for terrestrial species evaluated in this ASIP. **Table 4-16** presents the effect indicators and technical evaluation guidelines used in the analysis of potential effects on northwestern pond turtle.

Table 4-16. Effect Indicators and Technical Evaluation Guidelines for northwestern pond turtle.

Effect Indicators	Technical Evaluation Guidelines
Habitat Quantity and Suitability	Short-term reduction in quantity of habitat, and/or degradation of habitat suitability of sufficient magnitude and/or frequency, thereby potentially reducing long-term population levels of northwestern pond turtle.
Habitat Quantity and Suitability	Long-term reduction in quantity and/or suitability of habitat of sufficient magnitude and/or frequency to potentially reduce long-term population levels of northwestern pond turtle.

4.5.18.3 Project Effects

Effects of Longitudinal Stone Toe Revetment Construction

Construction activities associate with the rock and brush revetment could potentially affect northwestern pond turtle *via* direct mortality if individuals are present and habitat modification. However, because the area on the west bank of the Sacramento River that could potentially be affected as a result of revetment activities provides limited habitat (i.e., the bank is characterized by a lack of suitable basking and estivation sites, and velocities) it is unlikely that revetment activities would affect northwestern pond turtle.

Effects of Dredging

In-stream and streamside gravel removal activities could potentially affect northwestern pond turtle *via* direct mortality if individuals are present and habitat modification. Direct mortality could potentially occur by crushing active or estivating individuals. However, construction would occur during October, which typically is prior to the onset of overwintering estivation ("hibernation"). Therefore, it is unlikely that estivation burrows would be affected by construction activities. Additionally, pre-construction surveys for special status species, including northwestern pond turtle are incorporated in the Proposed Action as avoidance and minimization measures. Therefore, it is unlikely that direct northwestern pond turtle mortality associated with dredging would occur.

Indirect effects on northwestern pond turtle associated with dredging activities also could occur as a result of short-term habitat alteration. The northwestern pond turtle utilizes slow-moving aquatic habitats and adjacent riparian areas. These operations could potentially alter the pattern of water flow, which could disrupt normal behavior patterns or displace individuals (Holland 1991). Additionally, removing basking sites (e.g., logs, snags, and rocks) could potentially affect northwestern pond turtle because loss of basking sites could alter thermoregulatory behavior and reduce available foraging habitat, short-term cover sites, and longer-term refugia ("hibernation" sites). However, effect avoidance and minimization measures incorporated into the Proposed Action would minimize the affected area and result in a short duration of these impacts. Specifically, the amount of riparian habitat removed is the minimal amount possible that would meet the project goals. Additionally, removed riparian habitat would be revegetated at the site where it was removed to the extent possible, and riparian habitat would be restored on the M&T Chico Ranch property adjacent to Big Chico Creek and at a site to be identified prior to the onset of construction at a ratio of 2:1 (i.e., two acres of riparian habitat would be restored for every acre effected).

In addition to habitat removal, northwestern pond turtle could potentially be affected by increased sedimentation and turbidity associated with dredging activities. The gravel removal operations would avoid in-channel work, by removing only the inside portion of the gravel bar, leaving a gravel berm around the outside of the bar that would be removed during subsequent high winter flows. Increased sedimentation could potentially result when the berm is captured by winter flows. However, high winter flows generally carry high background levels of suspended sediment. The contribution of the added sediments from the excavated portion of the bar would be temporary and small, relative to the total in-river suspended sediment load. It also is expected that removal of the berm during high flows also will temporarily reduce backwater habitat present at the confluence of Big Chico Creek and the Sacramento River by increasing velocities in a location that currently is relatively protected from the influence of the Sacramento River. While short-term increases in turbidity and suspended sediment could potentially disrupt northwestern pond turtle feeding activities or result in temporary displacement from preferred habitats, and temporary loss of backwater habitat could occur, effects on northwestern pond turtle are not expected because of the timing and magnitude of the high flows required to mobilize berm gravels. Specifically, northwestern pond turtle are reported to utilize slow-moving water and often estivate away from water during the winter months (CDFG Website 2006a). Therefore, northwestern pond turtle would not be expected to be utilizing the Sacramento River during the time when high flows are mobilizing the gravel berm.

Toxic substances used at construction sites, including gasoline, lubricants, and other petroleum-based products, could enter the Sacramento River or Big Chico Creek as a result of spills or leaks from machinery. These substances can kill aquatic organisms through exposure to lethal concentrations or exposure to non-lethal levels that cause physiological stress and increased susceptibility to other sources of mortality. Petroleum products also tend to form oily films on the water surface that can reduce dissolved oxygen levels available to aquatic organisms. However, the implementation of *standard construction best management practices* would avoid or minimize impacts associated with chemical spills.

Effects of Spoils Deposition

Construction activities associated with spoils deposition could potentially cause direct mortality of northwestern pond turtle, especially gravid (pregnant) or postpartum females on the primary access roads adjacent to backwater habitats located in the Proposed Action Area. However, the Proposed Action construction period (October 1 through October 31) does not coincide with the northwestern pond turtle nesting period, when females lay their eggs in upland habitats up to 400 meters away from aquatic habitats during April through August (CDFG Website 2006a). Most hatchlings reportedly overwinter in the nest and move to water during the subsequent March through April (Reese and Welsh 1997). Therefore, it is unlikely that activities associated with spoils deposition would affect northwestern pond turtle.

Effects of Gravel Bar Access

Construction vehicle traffic along access roads, potential access road improvement, and provision of access to the gravel bar across Big Chico Creek also could potentially affect northwestern pond turtle *via* direct mortality and short-term habitat alteration. However, implementation of impact avoidance and minimization measures included in the Proposed Action, including pre-construction surveys and use of BMPs would reduce or eliminate potential

effects on northwestern pond turtle associated with site access.

Additional potential effects associated with provision of access to the gravel bar on the east bank of the Sacramento River include high concentrations of suspended sediment that could potentially bury stream substrates, which provide habitat for arthropods (i.e., insect larvae and crayfish) that are an important food source for northwestern pond turtle. Consequently, northwestern pond turtle growth rates turtles could be reduced if suspended sediment and turbidity levels substantially exceeded ambient levels for prolonged periods. However potential effects on aquatic macroinvertebrates would be minimized by the project design (i.e., employing the use of culverts and gravel to cross Big Chico Creek) and the use of construction BMPs. Additionally, potential effects would be temporary because subsequent to gravel bar dredging, the temporary stream crossing over Big Chico Creek would be removed, the original shoreline contours restored, and some gravel would be left in the creek after removing the culverts. Addition of gravel to the lower portion of Big Chico Creek would be expected to provide improved substrate conditions for juvenile fish foraging due to increased opportunity for aquatic macroinvertebrate colonization.

4.5.18.4 Conservation Measures

The Proposed Action has the potential to affect northwestern pond turtles by disturbing and/or adversely modifying suitable habitat. The following conservation measures provided by the MSCS will be incorporated into the Proposed Action to mitigate potential effects:

- Before implementing proposed project actions that could result in the loss or degradation of occupied aquatic habitat, conduct surveys to locate turtles.

- Where proposed project actions would adversely affect occupied habitat, enhance or restore suitable habitat near affected areas for a restoration ratio of 1:1 for every acre of occupied habitat affected.

- To the extent practicable, capture individuals from habitat that would be affected by proposed project actions, and relocate them to nearby suitable existing, restored, or enhanced habitat.

4.5.18.5 Contribution to Recovery

The MSCS outlines species conservation goals that have been incorporated into the CALFED plan. The goals generally are intended to enable USFWS, NMFS, and CDFG to make necessary findings and determinations under ESA, CESA, and NCCPA (CALFED 2000c). The northwestern pond turtle is designated an "m" or "maintain" species. For this designation, the CALFED agencies will avoid, minimize, and compensate for any adverse effects to the species commensurate with the level of effect on the species (CALFED 2000c).

4.5.19 NCCP Habitats

Land use in the immediate Proposed Action Area is primarily agricultural which has routinely been disked and plowed for seasonal crops with a mature riparian inclusion supporting mature

valley oak (*Quercus lobata*), California sycamore (*Platanus racemosa*) and Fremont cottonwood (*Populus fremontii*) and under-story vegetation providing habitat for a variety of wildlife species.

Potential effects associated with construction of the longitudinal stone toe revetment and gravel removal on NCCP habitat types were evaluated. The evaluation was based on consideration of (1) construction activities and the area anticipated being disturbed, and (2) habitat conditions currently existing in the Proposed Action Area. Please see **Table 4-17** for a quantitative effects summary on NCCP habitat-types, and **Figure 4-1** for a location of impacted habitats.

Table 4-17. Effects on NCCP habitat types

Habitat-Type	Acres in Proposed Action Area	Acres Potentially Affected	Acres to be Restored	Linear Feet to be Impacted	Linear Feet to be Restored
Valley Riverine Aquatic	65.17	6.86	n/a	1,520	1,520
Valley/Foothill Riparian	29.06	1.73	3.46	n/a	n/a
Upland Cropland	23.92	0.00	0.00	n/a	n/a
Grassland	34.34	1.75	1.75	n/a	n/a
Disturbed	12.38	1.00	0.00	n/a	n/a

Potential effects of Proposed Action activities on NCCP habitat-types were identified based on the provided information regarding habitat conditions, and the activities associated with channel alignment maintenance construction within the Proposed Action Area. The analysis included identifying and evaluating potential mechanisms that would disturb habitat conditions above existing baseline conditions. The analysis approach was then used to evaluate potential project effects on each of the identified NCCP habitats related to dredging and bank revetment. The Proposed Action will provide for the conservation of NCCP habitat-types. Conservation measures for each of the habitat types analyzed are described below.

4.5.19.1 Valley Riverine Aquatic

Status in the Proposed Action Area

Construction would occur primarily within Valley Riverine Aquatic habitat. Construction of the longitudinal stone toe would occur on the west bank of the Sacramento River at RM 192.5. The bank, which is comprised primarily of sand, gravel, and sandy-silt loam is continuing to erode as a result of natural river meander. Gravel removal would occur across the river on the east side of the channel in relatively shallow water.

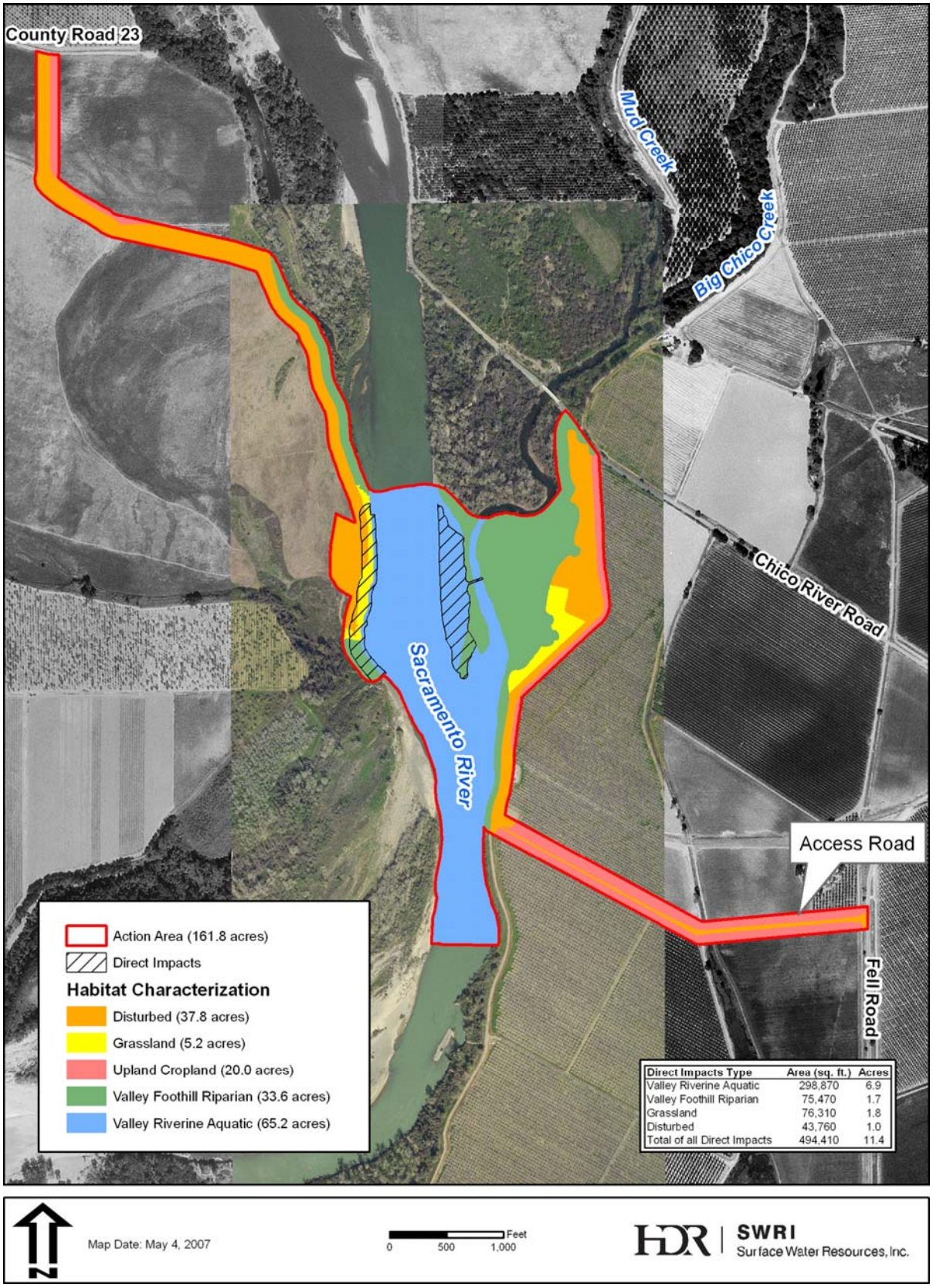

Figure 4-1 Impacts to Habitats

Both of these Valley Riverine Aquatic habitats contain large and small woody debris (contributed by the adjacent Valley/Foothill Riparian), which serve as cover and flow refugia for fish species utilizing this reach of the river. These areas also serve as deepwater pools for larger fish, or schools of fish, holding unseen from terrestrial predators, while migrating to spawning grounds in higher reaches of the watershed, as well as temporary rearing habitat for out-migrating juveniles.

The distribution and extent of this habitat type in the Pine, Rock, and Big Chico creeks Ecological Management Unit in the early 1990's was estimated at 600 acres (CALFED 2000c). There are 65.21 acres of this habitat-type in the Proposed Action Area.

Project Effects

Because the majority of the discussions presented for Sacramento River winter-run Chinook salmon are habitat-based analyses, these discussions also are applicable for evaluation of effects on Valley Riverine Aquatic Habitat.

Conservation Measures

The following measures are consistent with conservation measures provided in the MSCS and NCCP Determination:

- Avoid or minimize disturbance to existing shaded riverine aquatic overhead cover.

- As a sub-component of Valley Riverine Aquatic habitat, 1,520 linear feet of SRA habitat will be restored or enhanced, all of which will be mitigated through the incorporation of tree and live native plantings including willows, alders, and cottonwoods in the design of the stone toe and tree revetment.

- The M&T Chico Ranch/Llano Seco Rancho and the Sacramento River National Wildlife Refuge will work cooperatively to develop a plan of planting, maintaining, and managing the SRA restoration area. Restoration of SRA will include tree clusters incorporated into the revetment, as well as plantings of cottonwood, alder, willows, and other native riparian vegetation. To accomplish restoration goals (i.e., 2:1 ratio of riparian habitat and 1,520 linear feet of SRA), species would be actively maintained and monitored for three years. Over time, habitat management and natural processes would control the species composition and overall structure of the plant communities.

- To the extent practicable, include project design features that allow for onsite reestablishment and long-term maintenance of SRA overhead cover following project construction.

- Avoid or minimize implementing actions during the periods evaluated species are present and could be affected by the actions.

To the extent practicable, remove or exclude evaluated amphibian and reptile species from construction corridors before construction is initiated.

4.5.19.2 Valley/Foothill Riparian

Status in the Proposed Action Area

Valley/Foothill Riparian habitat includes all successional stages of woody vegetation, commonly dominated by willow, Fremont cottonwood, valley oak, or sycamore, within the active and historical floodplains of low-gradient reaches of streams and rivers generally below an elevation of 300 feet.

Valley/Foothill Riparian vegetation at the site is composed of mature native and nonnative trees occurring as an isolated patch between agricultural fields and the river's edge. This vegetation is located along the adjacent bank of the proposed longitudinal stone toe and tree revetment. About 250 linear feet of remnant riparian vegetation occurs along the most highly eroded area. This stand of riparian vegetation is located on the top of a nearly vertical bank approximately 12 to 15 feet from surface water.

Riparian vegetation helps reduce water temperatures by providing SRA cover. Large and small woody debris are also deposited into the river as this bank continues to erode, and flows undercut this existing stand of vegetation. Woody debris creates cover for fish species and serves as habitat for many riverine invertebrates and organisms. This section of riverbank will be most affected by the construction of the longitudinal toe revetment.

Riparian forest in the Proposed Action Area has a tall overstory of deciduous broadleaf trees comprised primarily of valley oak. Other native riparian forest species include Fremont cottonwood, box elder (*Acer negundo*), Oregon ash (*Fraxinus latifolia)*, and western sycamore (*Platanus racemosa*).

Understory species in the riparian forest community include poison oak (*Toxicodendron diversilobum*), wild blackberry (*Rubus ursinus*), Himilayan blackberry (*Rubus discolor*), wild grape (*Vitis californica*), elderberry (*Sambucus mexicana*) and saplings of tree species. Valley/Foothill Riparian habitats provide food, water, migration and dispersal corridors, and escape, nesting, and thermal cover for an abundance of wildlife. At least 50 species of amphibians and reptiles are reported to occur in lowland riparian systems. Many riparian species are permanent residents while others are transient visitors (Mayer and Laudenslayer 1988). In one study conducted on the Sacramento River, 147 bird species were recorded as nesters or winter visitants (Mayer and Laudenslayer 1988). Additionally, 55 species of mammals are known to use California's Central Valley riparian communities (Mayer and Laudenslayer 1988).

The distribution and extent of this habitat-type in the Pine, Rock, and Big Chico Creeks Ecological Management Unit in the early 1990's was 900 acres (CALFED 2000c). There are 33.64 acres of this habitat-type in the Proposed Action Area.

Project Effects

The Project would potentially remove 1.73 acres of Valley/Foothill Riparian habitat. In addition to temporarily removing riparian nesting habitat from revetment construction, the removal of riparian habitat would temporarily discontinue recruitment of IWM and SRA, which contribute

to EFH. Brush revetment and riparian restoration would offset these effects by increasing the IWM to greater than pre-project levels and mitigating temporary loss of SRA.

Conservation Measures

The following measures are consistent with conservation measures provided in the MSCS and NCCP Determination:

- Avoid or minimize disturbance to existing riparian habitat.

- Restore or enhance 3.46 acres of Valley/Foothill Riparian habitat for a restoration ratio of 2:1. Restoration would be conducted at along the river bank where construction disturbance occurred between the bank and the revetment itself, in an area to be determined prior to the onset of construction activities, and in the riparian habitat on the M&T Chico Ranch property south of Big Chico Creek.

- The M&T Chico Ranch/Llano Seco Rancho and the Sacramento River National Wildlife Refuge will work cooperatively to develop a plan of planting, maintenance, and management of the Valley/Foothill Riparian restoration area. Restoration of Valley/Foothill Riparian habitat will include plantings of valley oak, cottonwood, sycamore, alder, ash, California grape, buttonbush, and various species of willows, as well as other appropriate native species. To accomplish restoration, species would be actively maintained and monitored for three years. Over time, habitat management and natural processes would control the species composition and overall structure of the plant communities.

- To the extent practicable, include project design features that allow for onsite reestablishment and long-term maintenance of riparian vegetation following project construction.

- Avoid or minimize construction activities during the breeding period of evaluated species that could be affected by these actions.

- Avoid or minimize direct disturbance to populations and individuals of evaluated plant species.

- Establish and protect additional populations of evaluated plant species in suitable nearby habitat areas before implementing construction activities that could affect existing populations or individuals.

- To the extent practicable, remove or exclude evaluated amphibian and reptile species from construction corridors before construction is initiated.

4.5.19.3 Upland Cropland

Status in the Proposed Action Area

Upland cropland habitat includes agricultural lands farmed for grain, field, truck, and other crops for profit that are not seasonally flooded.

Upland Cropland borders the work area, staging and storage area, and access roads. Much of this area is presently being taken out of agricultural production and being transferred into a USFWS refuge status.

The distribution and extent of this habitat type in the Pine, Rock, and Big Chico creeks Ecological Management Unit in the early 1990's was 6,100 acres (CALFED 2000c). There are 19.96 acres of this habitat-type in the Proposed Action Area.

Project Effects

The Proposed Action would not widen or improve existing access roads through upland/cropland habitat. Therefore, it is unlikely that upland cropland habitat will be affected. However, if this habitat-type is affected by the project the conservation measures outlined below should be incorporated into the project.

Conservation Measures

The following measures are consistent with conservation measures provided in the MSCS and NCCP Determination:

- To the extent practicable, restore aquatic, wetland, riparian, and grassland habitats on agricultural lands that have relatively low forage value (e.g., orchards and vineyards).

- Restore or enhance 3 acres of suitable natural foraging habitat near affected lands for every acre of affected habitat regularly used by evaluated species and waterfowl to replace forage values of converted agricultural lands before or when project impacts are incurred.

- Increase suitable forage availability and/or quantity on 5 acres of agricultural lands near affected lands for every acre of affected habitat regularly used by evaluated species or waterfowl to replace forage values of converted agricultural lands before or when project impacts are incurred.

- Avoid or minimize construction activities in habitat when evaluated species are present and could be affected by proposed actions.

4.5.19.4 Grassland

Status in the Proposed Action Area

Grassland habitat includes upland vegetation communities dominated by introduced and native annual and perennial grasses and forbs, including non-irrigated and irrigated pasturelands. Grassland borders the work area, staging and storage area, and a portion of the access roads.

The distribution and extent of this habitat type in the Pine, Rock, and Big Chico creeks Ecological Management Unit in the early 1990s was 37,600 acres (CALFED 2000c). There are 5.23 acres of this habitat-type in the Proposed Action Area.

Project Effects

The Project would potentially remove 1.75 acres of Grassland where it occurs adjacent to and within a proposed staging area, and within the rock to revetment area. The temporary loss of grassland to provide access/staging for heavy machinery for bank revetment would temporarily reduce habitat value within the site. However, removed grassland would be restored at a ratio of 1:1 at an area within the Capay Unit of the Sacramento River National Wildlife Refuge.

Conservation Measures

The following measures are consistent with conservation measures provided in the MSCS and NCCP Determination:

- Restore or enhance 1.75 acres of Grassland habitat for a mitigation ratio of 1:1.
- The M&T Chico Ranch/Llano Seco Rancho and the Sacramento River National Wildlife Refuge will work cooperatively to develop a plan for restoring grassland habitat. To accomplish restoration, native species would be planted and actively maintained and monitored for 3 years. Over time, habitat management and natural processes would control the species composition and overall structure of the plant communities.
- Avoid or minimize construction activities during the breeding period of evaluated species that could be affected by these actions.
- Avoid or minimize direct disturbance to populations and individuals of evaluated plant species.
- Establish and protect additional populations of evaluated plant species in suitable nearby habitat before implementing construction activities that could affect existing populations or individuals.
- Restore area with native grasses after construction is completed in the fall.

4.6 ASSESSMENT OF INTERRELATED AND INTERDEPENDENT ACTIONS

Direct and indirect effects also include the effects of interrelated actions (actions that are part of the larger proposed action and depend on the larger action for their justification) and interdependent actions (actions having no independent utility apart from the proposed action). Interrelated and interdependent actions are described below.

4.6.1 USFWS Sacramento River National Wildlife Refuge

The Sacramento River National Wildlife Refuge is one of five wildlife refuges in the USFWS Sacramento National Wildlife Refuge Complex. The Complex consists of a land management and habitat restoration program that covers about 35,500 acres. Additional acres held in easements expand the Complex to 59,000 acres in the Sacramento Valley. In 1989, Congress authorized the Sacramento River National Wildlife Refuge as part of this Complex. To date, USFWS has acquired slightly more than 11,000 of the 18,000 initially approved. The remaining lands will be purchased from willing sellers as funds are appropriated. The USFWS owns lands within and adjacent to the study area that are included the Sacramento River National Wildlife Refuge. The Service completed a Comprehensive Conservation Plan for the Sacramento River National Wildlife Refuge in 2005 (USFWS 2005).

The M&T Chico Ranch/Llano Seco Rancho pumping facility, which will be kept in compliance with NMFS and CDFG screening compliance by the Proposed Action, is located on the M&T Chico Ranch. The M&T Chico Ranch/Llano Seco Rancho pumping facility provides a reliable water supply to about 15,000 acres of farmland and refuge land, including over 4,000-acres of wetlands owned or managed by USFWS and CDFG that provides key wetland habitat for waterfowl and other wetland species.

4.7 ASSESSMENT OF CUMULATIVE EFFECTS

"Cumulative effects are those effects of future State or private activities, not involving Federal activities, that are reasonably certain to occur within the Proposed Action Area of the Federal action subject to consultation" (50 CFR 402.02). *"Future Federal actions requiring separate consultation (unrelated to the proposed action) are not considered in the cumulative effects section"* (NMFS and USFWS 1998).

4.7.1 The Nature Conservancy, Sacramento River Project

The long-term goal for The Nature Conservancy Sacramento River Project is to establish and sustain a healthy floodplain ecosystem with functioning natural, political, social and economic processes to support the diversity of natural communities and native species along the Sacramento River. Over the past decade, The Nature Conservancy and its partners have secured over 15,000 acres for conservation within the 100-year floodplain of the Sacramento River and restored 2,200 of those acres to native riparian vegetation. The Nature Conservancy has been funded by the CBDA to implement the "Sacramento River – Chico Landing Subreach Habitat Restoration Project" (CALFED and The Nature Conservancy 2005). Part of this project will involve the restoration of about 576 acres (including 80 acres of elderberry savannah) within the Capay Unit of the Sacramento River National Wildlife Refuge.

The Proposed Action is not expected to contribute to environmental impacts that may result from The Nature Conservancy, Sacramento River Project, as the Proposed Action will not exacerbate, nor incrementally contribute to, any impacts resulting from these activities. More importantly, The Nature Conservancy, Sacramento River Project is expected to have an overall beneficial effect on the environment. The Nature Conservancy, Sacramento River Project would require separate environmental analyses in which potential effects would be evaluated.

5.0 CONCLUSIONS AND DETERMINATIONS

5.1 SPECIES AFFORDED PROTECTION UNDER THE FEDERAL ENDANGERED SPECIES ACT AND THE MAGNUSON-STEVENS FISHERIES CONSERVATION AND MANAGEMENT ACT

The following analysis specifically pertains to: (1) species listed under the federal ESA; (2) designated critical habitat; and (3) EFH. Federally-listed species discussed in this chapter include: (1) Sacramento River winter-run Chinook salmon; (2) Central Valley spring-run Chinook salmon; (3) Central Valley steelhead; (4) the southern DPS of green sturgeon; (6) VELB; and (7) Bald Eagle.

This section is subdivided into two subsections, *Section 5.1.1*, addressing fish species, and *Section 5.1.2* addressing terrestrial species.

5.1.1 Fish Species

The following discussion provides conclusions and determinations concerning whether the Proposed Action is likely to adversely affect the listed fish species and protected habitat. Under ESA Section 7, and the implementing regulations promulgated by NMFS and the USFWS, formal consultation between a Federal Agency and NMFS and/or USFWS is required if a proposed action *"may affect listed species or designated critical habitat,"* unless the Federal Agency determines with NMFS' written concurrence, *"…that the proposed action is not likely to adversely affect any listed species or critical habitat."* (50 CFR 402.14(a)-(b)(1)).

The Proposed Action will improve conditions in the Proposed Action Area for anadromous salmonids and other non-listed species by removing sediment to increase sweeping velocities across the M&T Chico Ranch/Llano Seco Rancho intake screens, thereby rendering continued compliance of the fish screens with NMFS and CDFG screening criteria. The NMFS and CDFG screening criteria minimize effects associated with impingement and entrainment of anadromous salmonids, and it is expected to reduce impingement and entrainment of many non-salmonid species. In addition, the Proposed Action is expected to increase highly valued bank slope habitat along the bank of the Sacramento River, provide flow breaks, hydraulic roughness, and velocity refugia elements important to anadromous salmonid as shelter and feeding stations, increase the amount of habitat suitable for aquatic macroinvertebrate colonization, and rehabilitate and increase IWM cover and SRA habitat. Hence, the Proposed Action would contribute to achieving the overall goal of the ERP, which is to improve aquatic and terrestrial habitats to support stable, self-sustaining populations of diverse and valuable plant and animal species through an adaptive management process.

While the Proposed Action generally would have beneficial effects on aquatic species covered in this ASIP, particularly anadromous salmonids, there may be incidental take primarily resulting from temporary removal of SRA habitat during construction. The Proposed Action would involve construction near, and in, the Sacramento River in the Proposed Action Area. The Proposed Action consists of: (1) providing access to the gravel bar across Big Chico Creek; (2) dredging of the gravel bar; (3) disposing of the spoils; and (4) placing 1,520 linear feet of rock toe and tree revetment on the west bank of the Sacramento River. However, potential effects resulting from construction activities on the listed aquatic species covered in this ASIP will be minimized. Subsequent to gravel bar dredging activities, the temporary stream crossing over Big Chico Creek would be removed, the original shoreline contours restored, and some gravel would

be left in the creek after removing the culverts. Addition of gravel to the lower portion of Big Chico Creek would be expected to provide improved substrate conditions for juvenile fish foraging due to increased opportunity for aquatic macroinvertebrate colonization. In addition, the Proposed Action includes a tree and/or brush component of the proposed revetment that consists of several tree and/or brush clusters. This placement results in approximately 1,322 total linear feet of IWM along the 1,520 linear feet of the Sacramento River's west bank within the Proposed Action. A net increase of approximately 1,072 linear feet of IWM is expected immediately following revetment construction.

5.1.1.1 Sacramento River Winter-Run Chinook Salmon

The Proposed Action "*is likely to adversely affect*" Sacramento River winter-run Chinook salmon. This conclusion is the appropriate finding in the event the overall effect of a proposed action is beneficial to the listed species, but also is likely to cause some adverse effects. If incidental take is anticipated to occur as a result of a proposed action, a "*is likely to adversely affect*" determination should be made. A *"is likely to adversely affect"* determination requires the initiation of formal section 7 consultation (NMFS and USFWS 1998).

As discussed above, the Proposed Action will improve conditions in the Proposed Action Area for listed aquatic species covered in this ASIP, including Sacramento River winter-run Chinook salmon. However, the potential for harm[4] of juvenile Sacramento River winter-run Chinook salmon associated with the temporary removal of SRA habitat, and the potential for take associated with the direct mortality resulting from placement of rock within the Sacramento River also are recognized. Although specific conservation measures to minimize the effects of SRA removal would include restoring the riparian community, including the SRA habitat component and enhancing IWM, the potential still exists for take of juvenile Sacramento River winter-run Chinook salmon. Thus, *"is likely to adversely affect"* is the appropriate finding regarding the Proposed Action potential effects on juvenile Sacramento River winter-run Chinook salmon.

Although the Proposed Action may adversely affect Sacramento River winter-run Chinook salmon, the Proposed Action is not "*likely to jeopardize the continued existence of Sacramento River winter-run Chinook salmon."* The Proposed Action is not expected to directly or indirectly appreciably reduce the likelihood of both the survival and recovery of Sacramento River winter-run Chinook salmon in the wild by reducing their reproduction, numbers or distribution.

For additional conservation measures for Sacramento River winter-run Chinook salmon associated with the Proposed Action, please refer to *Section 4.5.3: Sacramento River Winter-Run Chinook Salmon*.

5.1.1.2 Sacramento River Winter-Run Chinook Salmon Critical Habitat

The Proposed Action "*may adversely affect*" critical habitat for Sacramento River winter-run Chinook salmon. As discussed above, The Proposed Action will improve conditions in the

[4] For habitat modification and/or degradation, take is expected to occur in the form of harm, thus, these terms are used interchangeably throughout the ASIP.

Proposed Action Area for listed aquatic species covered in this ASIP, including conditions in the critical habitat designated for Sacramento River winter-run Chinook salmon. However, temporary removal of SRA habitat in the Proposed Action Area would have the potential to result in short-term reduction of habitat availability or suitability for Sacramento River winter-run Chinook salmon. Specific conservation measures to minimize the effects of SRA removal would include restoring the riparian community, including the SRA habitat component, and enhancing IWM.

Although the Proposed Action "*may adversely affect*" critical habitat for Sacramento River winter-run Chinook salmon, the Proposed Action would not result in the destruction or adverse modification of Sacramento River winter-run Chinook salmon designated critical habitat at the ESU level. The Proposed Action will not adversely affect the critical habitat constituent elements or their management in a manner likely to appreciably diminish or preclude the role of that habitat in the recovery of the Sacramento River winter-run Chinook salmon. If an action affects critical habitat, but does not appreciably diminish the value of constituents essential to the species conservation, the adverse modification threshold is not exceeded (NMFS and USFWS 1998).

5.1.1.3 Central Valley Spring-Run Chinook Salmon

The Proposed Action "*is likely to adversely affect*" Central Valley spring-run Chinook salmon. As discussed above, the Proposed Action will improve conditions in the Proposed Action Area for listed aquatic species covered in this ASIP, including Central Valley spring-run Chinook salmon. However, the potential for harm of juvenile Central Valley spring-run Chinook salmon associated with the temporary removal of SRA habitat, and the potential for take associated with the direct mortality resulting from placement of rock within the Sacramento River also is recognized. Although specific conservation measures to minimize the effects of SRA removal would include restoring the riparian community, including the SRA habitat component, and enhancing IWM, the potential still exists for take to juvenile Sacramento River winter-run Chinook salmon.

Although the Proposed Action *"may adversely affect"* Central Valley spring-run Chinook salmon, the Proposed Action is not "*likely to jeopardize the continued existence of Central Valley spring-run Chinook salmon."* The Proposed Action is not expected to directly or indirectly appreciably reduce the likelihood of both the survival and recovery of Central Valley spring-run Chinook salmon in the wild by reducing their reproduction, numbers or distribution.

For additional conservation measures applicable to Central Valley Spring-run Chinook salmon associated with the Proposed Action, please refer to *Section 4.5.4: Central Valley Spring-run Chinook Salmon*.

5.1.1.4 Central Valley Spring-Run Chinook Salmon Critical Habitat

The Proposed Action "*may adversely affect*" critical habitat for Central Valley spring-run Chinook salmon. As discussed above, the Proposed Action will improve conditions in the Proposed Action Area for listed aquatic species covered in this ASIP, including conditions in the critical habitat for Central Valley spring-run Chinook salmon. However, removal of SRA habitat in the Proposed Action Area would have the potential to result in the short-term habitat

availability or suitability for Central Valley spring-run Chinook salmon. Specific conservation measures to minimize the effects of SRA removal would include restoring the riparian community, including the SRA habitat component, and enhancing IWM.

Although the Proposed Action *"may adversely affect"* critical habitat for Central Valley spring-run Chinook salmon, the Proposed Action would not result in the destruction or adverse modification of Central Valley spring-run Chinook salmon critical habitat at the ESU level. The Proposed Action will not adversely affect the critical habitat constituent elements or their management in a manner likely to appreciably diminish or preclude the role of that habitat in the recovery of the Central Valley spring-run Chinook salmon. If an action affects critical habitat, but does not appreciably diminish the value of constituents essential to the species conservation, the adverse modification threshold is not exceeded (NMFS and USFWS 1998).

5.1.1.5 Central Valley Steelhead

The Proposed Action "*is likely to adversely affect*" Central Valley steelhead. The Proposed Action will improve conditions in the Proposed Action Area for listed aquatic species covered in this ASIP, including Central Valley steelhead. However, the potential for harm to juvenile Central Valley steelhead associated with the temporary removal of SRA habitat also is recognized. Although specific conservation measures to minimize the effects of SRA removal would include restoring the riparian community, including the SRA habitat component, and enhancing IWM, the potential still exists for harm to juvenile Central Valley steelhead resulting from SRA habitat removal.

Although the Proposed Action may adversely affect Central Valley steelhead, the Proposed Action is not "*likely to jeopardize the continued existence of Central Valley steelhead."* The Proposed Action is not expected to directly or indirectly appreciably reduce the likelihood of both the survival and recovery of Central Valley steelhead in the wild by reducing their reproduction, numbers or distribution.

For additional conservation measures applicable to Central Valley steelhead associated with the Proposed Action, please refer to *Section 4.5.5: Central Valley Steelhead*.

5.1.1.6 Central Valley Steelhead Critical Habitat

The Proposed Action "*may adversely affect*" critical habitat for Central Valley steelhead. As discussed above, the Proposed Action will improve conditions in the Proposed Action Area for listed aquatic species covered in this ASIP, including conditions in the critical habitat for Central Valley steelhead. However, the temporary removal of SRA habitat in the Proposed Action Area would have the potential to result in short-term reductions of habitat availability or suitability for Central Valley steelhead.

Although the Proposed Action *"may adversely affect"* critical habitat for Central Valley steelhead, the Proposed Action would not result in the destruction or adverse modification of Central Valley steelhead critical habitat at the ESU level. The Proposed Action will not adversely affect the critical habitat constituent elements or their management in a manner likely to appreciably diminish or preclude the role of that habitat in the recovery of the Central Valley steelhead.

5.1.1.7 Southern Distinct Population Segment of Green Sturgeon

The Proposed Action "is likely to adversely affect" the southern DPS of green sturgeon. The Proposed Action will improve conditions in the Proposed Action Area for aquatic species, including the southern DPS of green sturgeon. However, the potential exists for direct mortality resulting from placement of rock within the Sacramento River.

Although the Proposed Action *"may adversely affect"* the southern DPS of green sturgeon, the Proposed Action is not "*likely to jeopardize the continued existence of the southern DPS of Green Sturgeon."* The Proposed Action is not expected to directly or indirectly appreciably reduce the likelihood of both the survival and recovery of the southern DPS of green sturgeon in the wild by reducing their reproduction, numbers or distribution.

For additional conservation measures applicable to Central Valley Spring-run Chinook salmon associated with the Proposed Action, please refer to *Section 4.5.6: Southern DPS of Green Sturgeon*

5.1.1.8 Chinook Salmon Essential Fish Habitat

The Proposed Action "*is not likely to adversely affect*" EFH for Chinook salmon. EFH is defined as those waters and substrate necessary to fish for spawning, breeding, feeding and growth to maturity. EFH designations occur only in aquatic areas necessary to support federally managed marine and anadromous fish. Unlike critical habitat, upland areas, riparian buffer zones and other terrestrial areas adjacent to river and coasts cannot be designated as EFH (NMFS 2002a).

The Proposed Action will improve conditions in the Proposed Action Area for listed aquatic species covered in this ASIP, including EFH conditions. Temporary removal of SRA habitat would be the only habitat-based consideration associated with the Proposed Action with the potential to reduce anadromous salmonid habitat availability or suitability. However, according to the definition of EFH, removal of SRA habitat should not factor in the evaluation of potential effects on EFH.

5.1.2 Terrestrial Species

The following discussion provides the conclusions and determinations concerning whether the Proposed Action is likely to adversely affect the terrestrial species covered in this ASIP. Under ESA Section 7, and the implementing regulations promulgated by the USFWS, formal consultation between a the Federal Agency and the USFWS is required if a proposed action *"may affect listed species or designated critical habitat,"* unless the Federal Agency determines with USFWS written concurrence, *"…that the proposed action is not likely to adversely affect any listed species or critical habitat."* (50 CFR 402.14(a)-(b)(1)). No federally listed terrestrial species would be affected by the Proposed Action.

5.1.2.1 Valley Elderberry Longhorn Beetle (VELB)

The Proposed Action "*may affect, but is not likely to adversely affect*" VELB. Although the potential exists for elderberry shrubs to be directly and indirectly affected by construction-related activities, the conservation measured implemented as part of the Proposed Action would render potential impacts insignificant and discountable. Specifically, elderberry shrubs within the Proposed Action Area would be identified and exclusionary fencing would be placed 100 feet from the shrub drip line where practicable. Where it is infeasible to conduct construction activities 100 feet from a shrub's drip line, the USFWS will be consulted and exclusionary fencing will be placed a minimum of 20 feet from the shrub drip line. Additionally, three elderberry shrubs that are anticipated to be directly impacted by construction activities if still present in the Proposed Action Area would be transplanted under the supervision of USFWS representatives to an area within the Capay Unit of the Sacramento River National Wildlife Refuge or removed under the Refuge's existing incidental take permit. Incorporation of exclusionary boundaries around elderberry shrubs that could potentially be affected and transplanting elderberry shrubs that would otherwise be removed by construction activities would result in the no take of VELB. Thus, "*may affect, but is not likely to adversely affect*" is the appropriate finding regarding potential effects of the Proposed Action on VELB.

For additional conservation measures for VELB associated with the Proposed Action, please refer to *Section 4.5.10: Valley Elderberry Longhorn Beetle*.

5.1.2.2 Bald Eagle

The Proposed Action "*is not likely to adversely affect"* the bald eagle. Based on the reported bald eagle habitat requirements and general habitat utilization the riparian habitat in the Proposed Action Area is not considered high quality nesting and wintering habitat (USFWS 2004). In fact, it is likely that the riparian habitat within the Proposed Action Area contains only low quality habitat. Additionally, revetment activities and associated noise-related potential effects would be temporary.

Because the bald eagle breeding season extends from February through July in California with northward migration occurring prior to September (USFWS 2004), construction-related effects on nesting bald eagles associated with revetment, dredging and spoils deposition activities likely would not occur because the anticipated construction schedule for the Proposed Action would occurs from October 1 through October 31. Although revetment, dredging and spoils deposition-related activities are not expected to affect nesting bald eagles, pre-construction surveys are incorporated into the Proposed Action along with a commitment to consult with USFWS prior to the onset of construction activities if nesting eagles are observed. As part of the avoidance measures incorporated into the Proposed Action, construction activities will not occur within 0.5 miles of an active bald eagle nest or winter roosting site. If this distance is not able to be maintained, construction activities will be halted and USFWS will be consulted to identify appropriate avoidance measures.

For additional conservation measures applicable to bald eagle associated with the Proposed Action, please refer to *Section 4.5.12 Bald Eagle.*

5.2 SPECIES AFFORDED PROTECTION UNDER THE STATE ENDANGERED SPECIES ACT

The following discussion provides the conclusions and determinations concerning whether the Proposed Action is likely to adversely affect terrestrial species protected under the CESA. CESA prohibits *"take"* of species listed as endangered or threatened under it (California Fish and Game Code § 2080). California Fish and Game Code Section 86 defines *"take"* as *"…hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch, capture, or kill."* CDFG can authorize takes of endangered and threatened species listed under CESA when such takes are incidental to lawful activities (California Fish and Game Code § 2080.1, 2081). Unlike the federal ESA, *"take,"* as defined under California Fish and Game Code Section 2080 does not include habitat alteration, but only includes direct effects on individuals of a species. Therefore, potential effects associated with habitat modification alone are not considered *"take"* on species listed as endangered or threatened under CESA.

State-listed species discussed in this chapter include: (1) Western yellow-billed cuckoo; (2) Bank Swallow; and (3) Swainson's Hawk.

5.2.1.1 Western yellow-billed cuckoo

The Proposed Action would not be expected to result in take of western yellow-billed cuckoo. The habitat requirements of the western yellow-billed cuckoo are not met at the Proposed Action Area revetment location; hence, the removal of riparian vegetation in this area is not expected to affect the western yellow-billed cuckoo. Additionally, revetment, dredging and spoils deposition related activities would occur when the species is not present. Although riparian vegetation would be removed as part of the Proposed Action, this type of vegetation would be restored following construction.

Because the definition of "take" under the State ESA applies only to individual members of a listed species, no "take" of western yellow-billed cuckoo would occur as a result of habitat loss.

For additional conservation measures for western yellow-billed cuckoo associated with the Proposed Action, please refer to *Section 4.5.13: Western yellow-billed cuckoo.*

5.2.1.2 Bank Swallow

The Proposed Action would not be expected to result in take of Bank Swallow. Because the construction of the Proposed Action would occur during October, outside the reported bank swallow nesting period, potential noise-related effects on bank swallows would be avoided.

Implementation of the Proposed Action would remove approximately 1,520 feet of known and potential bank swallow habitat from the Proposed Action Area. Results (1999 through 2005) from the Annual Bank Swallow Survey for the bank showed estimates ranging from 50 (in 2002) to 340 (in 2001) nesting pairs.

The Project Proponents shall mitigate for the loss of bank swallow habitat through the acquisition of fee title or a conservation easement on riverfront property. The specific mitigation site or sites, and the entity holding title or easement shall be approved by the CDFG. Such sites shall not be on existing lands owned by, or under easement to the CDFG.

Mitigation shall occur as close as is reasonably possible to the project site, and may be applied through the protection of existing bank swallow habitat, through restoration of habitat (including removal of rock at historic sites), or through a combination of these measures. Mitigation shall be based on an assessment of the quality of the habitat being lost (including its potential to support nesting bank swallows over time) and the quality of the proposed mitigation site or sites, and shall be at a minimum of 2:1. The Project Proponents shall prepare a detailed Mitigation Plan, to be approved by the CDFG. Such plan shall include, at a minimum, the following:

- The specific location of the mitigation site or sites;
- A description of the existing habitat values at the site(s) and of the values that will be protected and/or restored;
- A detailed description of the proposed conservation/restoration activities to be carried out on the site(s);
- A detailed description of ongoing management activities to be carried out to ensure that bank swallow habitat is maintained over time.

Prior to the onset of construction activities, Project Proponents shall secure both the rights to the specified mitigation property, and the funding necessary to complete the acquisition of the property.

Because the definition of "take" under the California ESA applies only to individual members of a listed species, no "take" of Bank Swallows would occur as a result of habitat loss.

For additional conservation measures for bank swallow associated with the Proposed Action, please refer to *Section 4.5.14: Bank Swallow*.

5.2.1.3 Swainson's Hawk

The Proposed Action would not be expected to result in take of Swainson's hawk. Although revetment activities associated with the Proposed Action are outside of the Swainson's hawk nesting period, the potential exists for the species to take up year-round residency. Thus, a temporary loss of foraging habitat could potentially affect the species. No suitable foraging habitat would be removed during dredging activities. Moreover, dredging activities would result in only a small amount of relative young willows being removed, and would occur outside the Swainson's hawk nesting season. Spoils deposition activities also would occur outside of the Swainson's hawk nesting season. As a precautionary measure, pre-construction raptor surveys would be conducted. Any nesting activities would be reported to CDFG and appropriate measures would be implemented.

Although year-round resident Swainson's hawks could potentially be affected by a loss of habitat, the effects would be temporary and discountable. The disturbed habitat would be replaced at a ratio of 1:1 for disturbed grassland habitat and 2:1 for disturbed riparian habitat; therefore, greater amounts of habitat would be available after restoration than were available prior to construction of the Proposed Action.

Because the definition of "take" under the California ESA applies only to individual members of a listed species, no "take" of Swainson's hawk would occur as a result of habitat loss.

For additional conservation measures for Swainson's hawk associated with the Proposed Action, please refer to *Section 4.5.15: Swainson's Hawk.*

5.3 OTHER EVALUATED SPECIES

The following analysis pertains to species that are not currently listed under the federal ESA. Because take is a consideration specific to species protected under the federal ESA, other considerations, which are less stringent than ESA regulations have been used to reach the identified determinations (refer to the technical evaluation guidelines presented for this species in *Chapter 4: Effects of the Proposed Action and Development of Conservation Measures*.

5.3.1 Fish Species

The species analyzed in *Section 5.3.1* include Central Valley fall-run/late fall-run Chinook salmon, Sacramento splittail, hardhead, and river lamprey.

5.3.1.1 Central Valley Fall-Run/Late Fall-Run Chinook Salmon

The Proposed Action would not be expected to result in reduced long-term population levels of Central Valley fall-run/late fall-run Chinook salmon. Central Valley fall-run/late fall-run Chinook salmon that are present in the Proposed Action Area will benefit from the increased effectiveness of the M&T Ranch/Llano Seco Rancho intakes and the increase in highly valued bank slope habitat along the bank of the Sacramento River. In addition, the Proposed Action will provide flow breaks, hydraulic roughness, and velocity refugia elements important to anadromous salmonid as shelter and feeding stations, increase the amount of habitat suitable for aquatic macroinvertebrate colonization, and rehabilitate and increase IWM cover and SRA habitat.

5.3.1.2 Sacramento Splittail

The Proposed Action would not be expected to result in reduced long-term population levels of Sacramento splittail. Juvenile Sacramento splittail are not believed to use the Sacramento River or its tributaries for rearing to great extent. Moreover, the Sacramento splittail that are present in the Proposed Action Area will benefit from reduced entrainment associated with maintaining the M&T Ranch/Llano Seco Rancho screened intake in compliance with the NMFS and CDFG screening criteria. In addition, restoration of riparian vegetation would result in increased amounts of SRA as the riparian vegetation matures over time, which would be anticipated to potentially benefit downstream moving juvenile splittail. Implementation of the Proposed Action is expected to result in a lower gradient bank slope (i.e., a greater range of water depth and velocity), a more heterogeneous substrate size composition, and increased amounts of water velocity refugia, all of which would be expected to provide more suitable conditions for adult splittail upstream migration.

5.3.1.3 Hardhead

The Proposed Action would not be expected to result in reduced long-term population levels of hardhead. The hardhead that are present in the Proposed Action Area will benefit from reduced entrainment associated with maintaining the M&T Ranch/Llano Seco Rancho screened intake in compliance with the NMFS and CDFG screening criteria. The provision of gravels may provide additional substrate for macroinvertebrates, which serve as a food base for hardhead juveniles and adults. Restoration of riparian vegetation would result in increased amounts of SRA as the riparian vegetation matures over time, which would be anticipated to potentially benefit juvenile hardhead. The Proposed Action is expected to result in a lower gradient bank slope, a more heterogeneous substrate size composition, and increased amounts of water velocity refugia, all of which would be expected to provide more suitable conditions for juvenile hardhead. These factors, in addition to increased instream object and overhead cover and, therefore, reduced predation potential, would be expected to provide more suitable conditions for juvenile hardhead.

5.3.1.4 River Lamprey

The Proposed Action would not be expected to result in reduced long-term population levels of river lamprey. River lamprey are unlikely to be present in the Proposed Action Area. In the unlikely event that river lamprey are present in the Proposed Action Area, they will benefit from reduced entrainment associated with maintaining the M&T Ranch/Llano Seco Rancho screened intake in compliance with the NMFS and CDFG screening criteria. Implementation of the Proposed Action is not expected to change the amount of gravely riffle habitat in the Proposed Action Area. In addition, the dredged area will be altered by transforming a previously inundated gravel bar into a more flowing section of the river, neither of which is likely river lamprey spawning habitat. Transformation of the gravel bar (via dredging) will not affect the amount of suitable ammocete habitat due to resultant similar amounts of stream edge with suitable substrate.

5.3.2 Terrestrial Species

The species analyzed in *Section 5.3.2* include: (1) white tailed kites; (2) osprey; and (3) northwestern pond turtle.

5.3.2.1 White-tailed kites

The Proposed Action would not be expected to result in reduced long-term population levels of white-tailed kites. There are no known, active nests within the Proposed Action Area, and construction, dredging and spoils deposition related activities would not affect known nesting individuals or remove known nest trees. Moreover, revetment, dredging and spoils deposition related activities would occur outside the white-tailed kite nesting period. Additionally, the temporary loss of nesting and foraging habitat also is unlikely to affect long-term population levels of white-tailed kites because the habitat removal would be temporary. Riparian and grassland habitat would be restored after construction has been completed. As a precautionary measure, pre-construction raptor surveys would be conducted. Any nesting activities would be reported to CDFG and appropriate measures would be implemented.

Although riparian and grassland habitat would be removed with implementation of the Proposed Action, greater amounts of habitat would be available after restoration activities associated with the Proposed Action than available prior to construction activities

5.3.2.2 Osprey

The Proposed Action would not be expected to result in reduced long-term population levels of osprey. It is unlikely that construction activities associated with revetment, dredging and spoils disposal would affect the one known osprey nest in the Proposed Action Area because these activities would occur approximately 1,000 feet from the nest. Additionally, although potentially suitable riparian osprey nesting habitat on the west bank of the Sacramento River would be removed as a result of revetment activities, these activities would occur outside of the osprey nesting season. Finally, the temporary loss of nesting and foraging habitat also is unlikely to affect ospreys because the habitat removal would be temporary. Riparian and grassland habitat would be restored after construction has been completed. Greater amounts of habitat would be available after restoration than were available prior to construction of the Proposed Action.

5.3.2.3 Northwestern Pond Turtle

The Proposed Action would not be expected to result in reduced long-term population levels of northwestern pond turtle. The area on the west bank of the Sacramento River that could potentially be affected as a result of revetment activities provides limited habitat for northwestern pond turtle (i.e., the bank is characterized by a lack of suitable basking and estivation sites, and velocities). Moreover, construction would occur during October, which typically is prior to the onset of overwintering estivation of northwestern pond turtle, and outside of the nesting period for northwestern pond turtle. Therefore, it is unlikely that estivation burrows would be affected by construction activities.

Construction-related activities could potentially alter the pattern of water flow, which could potentially disrupt normal behavior patterns or displace individuals (Holland 1991). Additionally, removing basking sites (e.g., logs, snags, and rocks) could potentially affect northwestern pond turtles because loss of basking sites could alter thermoregulatory behavior and reduce available foraging habitat, short-term cover sites, and longer-term refugia ("hibernation" sites). However, effect avoidance and minimization measures incorporated into the Proposed Action would minimize the affected area and result in a short duration of these impacts. Specifically, the amount of riparian habitat removed is the minimal amount possible that would meet the project goals. Removed riparian habitat would be revegetated at the site where it was removed to the extent possible, and riparian habitat would be restored on the M&T Chico Ranch property adjacent to Big Chico Creek and at a site to be determined prior to the onset of construction activity at a ratio of 2:1 (i.e., two acres of riparian habitat would be restored for every acre effected).

While short-term increases in turbidity and suspended sediment could potentially disrupt northwestern pond turtle feeding activities or result in temporary displacement from preferred habitats, and temporary loss of backwater habitat could occur, the northwestern pond turtle would not be expected to be utilizing the Sacramento River during the time when high flows would be mobilizing the gravel berm.

Potential effects associated with turbidity on aquatic macroinvertebrates would be minimized by the project design (i.e., employing the use of culverts and gravel to cross Big Chico Creek) and the use of construction BMPs. Potential effects would be temporary because subsequent to gravel bar dredging, the temporary stream crossing over Big Chico Creek would be removed, the original shoreline contours restored, and some gravel would be left in the creek after removing the culverts. Addition of gravel to the lower portion of Big Chico Creek would be expected to provide increased opportunity for aquatic macroinvertebrate colonization and foraging fish, which will in turn, increase foraging opportunities for the northwestern pond turtle.

Implementation of impact avoidance and minimization measures included in the Proposed Action, including pre-construction surveys and use of BMPs would reduce or eliminate potential effects on northwestern pond turtle associated with site access. In addition, the implementation of *standard construction BMPs* would avoid or minimize effects associated with chemical spills.

5.4 NCCP HABITATS

Please refer to *Section 4.5.19 NCCP Habitats* for potential effects associated with the Proposed Action on Valley Riverine Aquatic, Valley/Foothill Riparian, Upland Cropland and Grassland habitats.

6.0 DESCRIPTION OF THE MONITORING AND ADAPTIVE MANAGEMENT PLAN

The inspection, monitoring, and maintenance regime developed for the maintenance of channel alignment project will serve as the Monitoring and Adaptive Management Plan (MAMP) for the Proposed Action (see Table 6-1). The MAMP summarizes primary mitigation measures as described in both the EA/IS and this ASIP for the Proposed Action that are related to biological resources. The MAMP indicates the resource impacted, the type of impact on the resource, the mitigation measure, the monitoring agency, and an area for sign-off indicating compliance. Because the MAMP summarizes the mitigation and conservation measures contained within both the EA/IS and ASIP, the specific mitigation and conservation measure numbers are not included, rather the chapter numbers wherein each mitigation/conservation measure is fully described are included in **Table 6-1**.

The MAMP would ensure that project implementation would be within previously agreed parameters for the 5-year duration of the Proposed Action. The regime proposed includes the following:

- Following construction of the stone toe and tree revetment, the performance of the revetment will be monitored and evaluated annually after each winter-spring high flow period during the 5-year project period. If there has been significant damage to the revetment, or the high flows have eroded the upstream bank to the point where it poses a threat to the integrity of the existing revetment, the revetment damage will be repaired. The M&T Chico Ranch/Llano Seco Rancho will be responsible for performing the regular maintenance of the revetment, as necessary.

- Annual inspections may occur prior to initiating maintenance, even under circumstances such as flooding during the winter months.

Table 6-1. Mitigation and Monitoring Plan for the Interim Maintenance of Channel Alignment

Impact(s)	Before Mitigation	Mitigation Measure(s)	Responsible Agency	Completed	After Mitigation
Biological Resources: Valley Riverine Aquatic (ASIP 4.3)					
Loss or alteration of 6.86 acres	Potentially Significant	Avoid or minimize disturbance to existing shaded riverine aquatic overhead cover.	Construction contractor/project proponent, project site monitor, and USFWS		Less than Significant
		As a sub-component of Valley Riverine Aquatic habitat, 1,520 linear feet of SRA habitat will be restored or enhanced through the incorporation of tree and live native plantings in the design of the rock toe and tree revetment. Live plantings also will be placed between the bank and the rock toe revetment. Restoration activities associated with live plantings will occur within 1 year of construction activities.	Construction contractor/project proponent, project site monitor, and USFWS		
Biological Resources: Valley Riverine Aquatic (ASIP 4.3)					
Long-term loss of Large Woody Debris.		The M&T Chico Ranch/Llano Seco Rancho and the Sacramento River National Wildlife Refuge will work cooperatively to develop a plan of planting, maintenance, and management of the SRA restoration area. Restoration of SRA will include plantings of cottonwood, alder and willows and other appropriate native plantings and materials. Live plantings also will be placed between the bank and the rock toe revetment. To accomplish restoration, species would be actively maintained for 3 years. Over time, habitat management and natural processes would control the species composition and overall structure of the plant communities.	Construction contractor/project proponent, project site monitor, and USFWS		Less than Significant
		To the extent practicable, include project design features that allow for onsite reestablishment and long-term maintenance of SRA overhead cover following project construction.	Construction contractor/project proponent, project site monitor, and USFWS		
Biological Resources: Valley/Foothill Riparian (ASIP 4.3)					
Loss or alteration of 1.73 acres.	Potentially Significant	Restore or enhance 2 acres of additional in-kind habitat for every acre of affected habitat near where impacts are incurred. For this project 3.46 acres of habitat will be restored or enhanced at the location of habitat removal, along the the west bank of the Sacramento River between the bank and the revetment, and at an additional location to be determined prior to the onset of construction activities.	Construction contractor/project proponent, project site monitor, and USFWS		Less than Significant
		The M&T Chico Ranch/Llano Seco Rancho and the Sacramento River National Wildlife Refuge will work cooperatively to develop a plan of planting, maintenance, and management of the Valley/Foothill Riparian restoration areas. Restoration of Valley/Foothill Riparian will include plantings of valley oak, cottonwood, alder and willows and other appropriate native plantings and materials. To accomplish restoration, species would be actively maintained for 5 years.	Construction contractor/project proponent, project site monitor, and USFWS		

Impact(s)	Before Mitigation	Mitigation Measure(s)	Responsible Agency	Completed	After Mitigation
Biological Resources: Grassland (ASIP 4.3)					
Loss or alteration of 1.75 acres.	Potentially Significant	Restore or enhance a minimum of 1.75 acres of grassland for a mitigation ratio of 1:1.	Construction contractor/project proponent, project site monitor, and USFWS		Less than Significant
		The M&T Chico Ranch/Llano Seco Rancho and the Sacramento River National Wildlife Refuge will work cooperatively to develop a plan of planting, maintenance, and management of the Grassland restoration areas. Restoration of Grasslands will include plantings of appropriate native plantings and materials. To accomplish restoration, species would be actively maintained for 3 years.	Construction contractor/project proponent, project site monitor, and USFWS		
Biological Resources: Salmonids and Non-Salmonids (ASIP 3.1 and 3.2)					
Increased turbidity levels and/or suspended sediments within the mainstem Sacramento River	Potentially Significant	The construction contractor/project proponent shall place sediment curtains around affected areas in conjunction with twice daily monitoring of turbidity when construction is likely to create turbid conditions	Construction contractor/project proponent, project site monitor, RWQCB, and USFWS		Less than Significant
		Develop and implement a Storm Water Pollution Prevention Plan (SWPPP)	Construction contractor/project proponent, project site monitor, RWQCB, and USFWS		
Accidental discharge of petroleum products into surface waters	Potentially Significant	Comply with RWQCB Section 401 Permit conditions	Construction contractor/project proponent, project site monitor, RWQCB, and USFWS		Less than Significant
		Place staging and maintenance areas outside of drainage to water courses.	Construction contractor/project proponent, project site monitor, RWQCB, and USFWS		
Biological Resources: Valley Elderberry Longhorn Beetle (ASIP 3.3)					
Three Elderberry Shrubs, E04, E05 and E07 will be directly affected	Potentially Significant	Transplant E05, E07, and E08 as permitted by USFWS under their authority granted within the programmatic Section 7 consultation #1-1-98-F-13 and implement the USFWS guidelines for mitigating project effects on the valley elderberry longhorn beetle to compensate for proposed project impacts on the species.	USFWS		Less than Significant
Other elderberry shrubs within the project area may be impacted by trucks, dust, or accidental removal.	Potentially Significant	Implement the USFWS's 1999 guidelines for avoiding, reducing and mitigating project effects on VELB to compensate for proposed project impacts on the species. Implement all protective measures as prescribed in the Biological Opinion issued by the USFWS.	Construction contractor, USFWS		Less than Significant

Impact(s)	Before Mitigation	Mitigation Measure(s)	Responsible Agency	Completed	After Mitigation
Biological Resources: Bald Eagle (ASIP 3.4)					
Construction related noise and activities have the potential to result in loss of nesting sites and abandonment of nesting/wintering sites	Potentially Significant	Avoid or minimize construction-related disturbances that could be associated with proposed project actions within 0.5 mile of active nest sites (February – July) and winter roosting sites (November–February)	Construction contractor/project proponent and USFWS		Less than Significant
		Avoid or minimize disturbance to existing nesting habitat	Construction contractor/project proponent and USFWS		
Biological Resources: Western Yellow-billed Cuckoo (ASIP 3.5)					
	Potentially Significant	Conduct pre-construction surveys in suitable habitat to determine the presence and distribution of the species.	Construction contractor/project proponent and USFWS		Less than Significant
		Avoid and minimize actions that could degrade or result in the loss of suitable nesting habitat within the species current and historical range. Habitat will be restored as part of the Valley Foothill Riparian habitat restoration efforts.	Construction contractor/project proponent and USFWS		
Biological Resources: Western Yellow-billed Cuckoo (ASIP 3.5) Continued					
		Avoid proposed project actions near active nest sites that could result in disturbance during the breeding period (May – August).	Construction contractor/project proponent and USFWS		
Biological Resources: Bank Swallow (ASIP 3.6)					
Long-term alteration of 1,520 feet of known and potential bank swallow habitat	Potentially Significant	Restore, enhance, or conserve in perpetuity 2 linear feet of habitat for every linear foot of affected habitat near where impacts are incurred.	CDFG		Less than Significant
		Coordinate protection and restoration of channel meander belts and existing bank swallow colonies with other federal and state programs in the affected reach	CDFG		Less than Significant
Biological Resources: Swainson's Hawk (ASIP 3.7)					
Alteration of foraging habitat	Potentially Significant	As part of the mitigation measure for compensating loss of Grassland habitat, restore 1.75 acres of temporarily affected grassland within the Proposed Action Area at a mitigation ratio of 1:1 with native plantings.	USFWS and CDFG		Less than Significant
Biological Resources: Northwestern Pond Turtle (ASIP 3.10)					
Disturbance and/or adversely modifying suitable aquatic habitat (approximately 0.21 acres of VRA)	Potentially Significant	As part of the mitigation measure for compensating loss of Valley Riverine Aquatic habitat, which includes 1,322 linear feet of IWM to be installed in the Proposed Action Area the loss of basking sites would be mitigated as part of the Proposed Action (i.e., tree clusters)..	USFWS and CDFG		Less than Significant
		Construction BMPs will be implemented to minimize potential effects associated with chemical spills.	Construction contractor/project proponent, USFWS, and CDFG		Less than Significant

7.0 FUNDING COMMITMENT

Funding for measures to be implemented for the duration of the Proposed Action will be included in the overall project budget. For measures related to inspection, monitoring, and maintenance, the action proponent shall annually include funding in its operations budget to accomplish all required tasks. This operations budget shall be made available to the USFWS, NMFS, and CDFG, upon request, for their review. The budget for the mitigation commitments provided in this ASIP is included in Appendix D, *Vegetation Restoration Plan*.

8.0 LIST OF PREPARERS

The names and area of participation of the lead and resource agency representatives who were primarily responsible for providing input to the Draft ASIP are identified in **Table 8-1**. The names, qualifications, and area of participation of the persons who primarily responsible for preparing the Draft ASIP, as well as those persons who provided substantive supporting information or analyses are included in **Table 8-2**.

Table 8-1. List of Representatives Who Contributed to the Preparation of the Draft ASIP

Name	Area of Participation
California Department of Fish and Game	**Lead Agency**
Tracy McReynolds	Agency representative; document review
United States Fish and Wildlife Service	**Lead Agency**
Kevin Foerster	Agency representative; document review
Kelly Moroney	Agency representative
Mark Littlefield	Agency representative
National Marine Fisheries Service	**Resource Agency**
Howard Brown	Agency representative
Madelyn Martinez	Agency representative
M&T Chico Ranch/Llano Seco	**Project Proponent**
Les Heringer	Owner; project description; document review

Table 8-2. List of Persons Primarily Responsible for the Preparation of the Draft ASIP

Name	Qualifications	Participation
HDR|Surface Water Resources, Inc.		
Paul Bratovich	24 years fishery consulting experience	Vice President/Principal Fisheries Biologist/Project Manager – fisheries resources, ESA consultation, guidance and document review
Patti Idlof	18 years experience in environmental consulting	Senior Environmental Planner – document review
Adrian Pitts	8 years experience in environmental consulting	Project Manager/Associate Environmental Scientist – overall document preparation and project oversight, ESA consultation, document review
Janice Piñero	8 years experience in environmental consulting	Senior Environmental Scientist – document review and ESA consultation
Amanda O'Connell	4 years experience in environmental consulting	Associate Environmental Planner – resource topic development, CEQA/NEPA compliance
Carolyn Bragg	6 months experience in environmental consulting	Environmental Planner – document preparation and production
Heather Bowen	1 month experience in environmental consulting	Student Intern – research and reference development
Brandon Lee	1 year experience in environmental consulting	GIS Analyst
Linda Standlee	20 years experience as an administrative assistant	Administrative Assistant – administrative support
Gallaway Consultants, Inc.		
Jody Gallaway	8 years experience as environmental consultant lead	President – 2006 document lead
Jamison Watts	12 years experience as a special-status surveyor	Sensitive species surveys
Brooks Taylor	12 years experience as a special-status surveyor	Sensitive species surveys
Ryan Brown	7 years experience in environmental sciences	Sensitive species surveys
Elena Alfieri	B.S. in Botany	Botanical surveys

Name	Qualifications	Participation
Somach Simmons and Dunn		
Sandra Dunn (Legal Counsel) Daniel Kelly (Legal Counsel)		

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