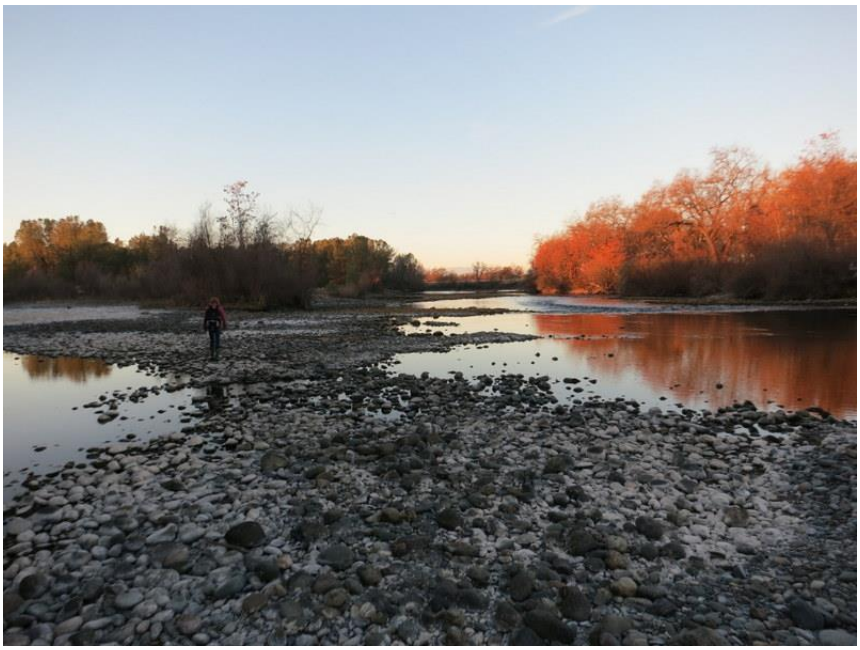
RECLAMATION

Managing Water in the West

Environmental Assessment

Upper Sacramento River Anadromous Fish Habitat Restoration Program



U.S. Department of the Interior
Bureau of Reclamation
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Mission Statements

The mission of the Department of the Interior is to protect and provide access to our Nation's natural and cultural heritage and honor our trust responsibilities to Indian Tribes and our commitments to island communities.

The mission of the Bureau of Reclamation is to manage, develop, and protect water and related resources in an environmentally and economically sound manner in the interest of the American public.

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List of Acronyms and Abbreviations

ACID	Anderson-Cottonwood Irrigation District
BA	Biological Assessment
BLM	Bureau of Land Management
BMP	Best Management Practices
CA	California
CAA	Clean Air Act
CAAQS	California Ambient Air Quality Standards
CAL-FIRE	California Department of Forestry and Fire Protection
CARB	California Air Resources Board
CCAA	California Clean Air Act
CDFW	California Department of Fish and Wildlife
CEQ	Council on Environmental Quality
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
cfs	cubic feet per second
CNDDB	California Natural Diversity Database
CO	Carbon monoxide
Corps	US Army Corps of Engineers
CRF	California Red-legged frog
CVFPB	Central Valley Flood Protection Board
CVPIA	Central Valley Project Improvement Act
CWA	Clean Water Act
dB	decibel
DPS	Distinct Population Segment
DWR	Department of Water Resources
EA	Environmental Assessment
EFH	Essential Fish Habitat
ESU	Evolutionarily Significant Unit
FWS	Fish and Wildlife Service
GCID	Glenn-Colusa Irrigation District
GHG	Greenhouse Gas
HCP	Habitat Conservation Plan
L_{eq}	Equivalent sound level
L_{max}	Maximum sound level
LOS	Level of Service
LWD	Large woody debris
MBTA	Migratory Bird Treaty Act
MDM	Mount Diablo Meridian
mph	Miles per hour
NAAQS	National Ambient Air Quality Standards
NCCP	Natural Community Conservation Planning
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NO_2	Nitrogen dioxide

NPPA	Native Plant Protection Act
NSVAB	Northern Sacramento Valley Air Basin
O_3	Ozone
OHWM	Ordinary High Water Mark
OSA	Open Space Area
OSHA	Occupational Safety and Health Administration
PCE	Primary Constituent Elements
PM	Particulate matter
Quad	Quadrangle
RBDD	Red Bluff Diversion Dam
Reclamation	Bureau of Reclamation
RM	River mile
RWQCB	Regional Water Quality Control Board
SCAQMD	Shasta County Air Quality Management District
SHPO	State Historic Preservation Officer
SIP	State Implementation Plan
SLC	State Lands Commission
SO_2	Sulfur dioxide
SPCCP	Spill Prevention Control and Countermeasures Plan
SRA	Shaded riverine aquatic
SRRT	Sacramento River Restoration Team
SWRCB	State Water Resources Control Board
TIA	Traffic Impact Analysis
tons/yr	Tons per year
USGS	US Geological Survey
VELB	Valley elderberry longhorn beetle
VOC	Volatile organic compound
WSRCD	Western Shasta Resource Conservation District
WYBC	Western Yellow-billed cuckoo

Section 1 Introduction

In conformance with the National Environmental Policy Act, 42 U.S.C. § 4431 et seq. (NEPA), as amended, the Bureau of Reclamation (Reclamation) has prepared this Environmental Assessment (EA) to evaluate and disclose potential environmental impacts associated with implementation of the Upper Sacramento River Anadromous Fish Habitat Restoration Program (Proposed Action).

This EA describes the existing environmental resources in the project area, evaluates the impacts of the No Action and Proposed Action alternatives on the resources, and proposes measures to avoid, minimize, or mitigate any adverse impacts. This EA was prepared in accordance with NEPA, Council on Environmental Quality (CEQ) regulations (40 Code of Federal Regulations (CFR) 1500-1508), and Department of the Interior Regulations (43 CFR Part 46).

1.1 Background

The Central Valley Project Improvement Act (CVPIA), section 3406 (b)(13) directs the Department of the Interior to develop and implement a continuing program for the purpose of restoring and replenishing, as needed, salmonid spawning gravel lost due to the construction and operation of Central Valley Project dams and other actions that have reduced the availability of spawning gravel and rearing habitat in the Sacramento River from Keswick Dam to Red Bluff Diversion Dam (RBDD)[1]. This CVPIA program may include preventive measures, such as re-establishment of meander belts and limitations on future bank protection activities, in order to avoid further losses of instream and riparian habitat.

In 2014, the National Marine Fisheries Service (NMFS) released the *Central Valley Salmon and Steelhead Recovery Plan*, which identifies two salmonid conservation principles: 1) recovery cannot be achieved without sufficient habitat; and 2) species with restricted spatial distribution are at a higher risk of extinction from catastrophic environmental events. The plan identifies lack of spawning gravel as one of the key threats below Keswick Dam and outlines a recovery action to develop a long-term gravel augmentation plan to increase and maintain spawning habitat.

Between 2002 and 2013, gravel has been placed on two sites in the upper Sacramento River[2]. The Keswick and Salt Creek injection sites are located on the right bank approximately 300 yards and 1.5 miles downstream from Keswick Dam, respectively. Gravel was placed on the edge of the channel and high flows

[1] Red Bluff Diversion Dam is no longer operational but is included in reference to the geographical location of the structure.
[2] Upper Sacramento River refers to the reach between Red Bluff and Shasta Dam.

have distributed the gravel within the river channel to be used for spawning and rearing. Since 1997, the CVPIA program has placed approximately 220,000 tons of gravel at these two sites. California Department of Fish and Wildlife (CDFW) aerial redd surveys and instream gravel locations show that Chinook Salmon are referentially using injected gravel that was placed at the Keswick Dam and Salt Creek sites.

In August 2013, North State Resources, Inc. prepared for Reclamation the *Sacramento River Spawning Gravel Restoration and Monitoring: Alternatives Information for Spawning Gravel Injection and Restoration Sites between Keswick Dam and Clear Creek*. The purpose of the report was to identify potential augmentation sites, particularly in depleted reaches of the upper Sacramento River. Potential restoration methods, quantities, site design and basis for selection in the report informed the development of this EA.

The CVPIA(b)(13) Sacramento River Restoration Team (SRRT) is an interagency group with members including Reclamation, Western Shasta Resource Conservation District (WSRCD), Department of Water Resources (DWR), U.S. Fish and Wildlife Service (USFWS), CDFW, and the State Water Resources Control Board (SWRCB). The SRRT was formed to provide technical support in the development of future spawning gravel projects in the Sacramento River. In January 2014, members of the SRRT completed preliminary surveys of several of the sites for design, wetland, biological and cultural considerations. City of Redding personnel toured several of the sites and gave input on feasibility, and the site list and footprints were subsequently refined. In September 2014, a larger group, including DWR engineering staff, visited several of the sites and refined the site design ideas.

1.2 Purpose and Need for the Project

The purpose of the Proposed Action is to increase and improve Chinook Salmon and steelhead spawning and rearing habitat by replenishing spawning gravel and establishing additional side-channel habitat. The need for the action derives from the declines of naturally spawned salmonid stocks due in part to loss of spawning and rearing habitat through curtailment of gravel recruitment due to blockage of the river channel by dams and the alteration in flow patterns.

Section 2 Alternatives Including the Proposed Action

This EA considers two possible alternatives: the No Action Alternative and the Proposed Action. The No Action Alternative reflects future conditions without the Proposed Action and serves as a basis of comparison for determining potential impacts to the human environment that would result from implementation of the Proposed Action.

Identification of the reasonable range of alternatives for this EA was based upon consideration of the need to increase and improve salmon and steelhead spawning and rearing habitat in the Sacramento River. Additional alternatives, including varied amounts of gravel, were considered but eliminated due to them being substantially similar in design and impacts as the Proposed Action (40 C.F.R. § 1502.14(a)).

2.1 No Action Alternative

Under the No Action Alternative, Reclamation would not place gravel in the Sacramento River below Keswick Dam, nor would side-channels be developed. Spawning and rearing habitat restoration would not occur in this reach of the river, leaving the reach in a deteriorated condition as spawning and rearing habitat for salmonids. Further declines in habitat quality would be likely.

2.2 Proposed Action Alternative

Reclamation proposes to create new side channels, modify existing side channels, and place gravel and instream habitat structure in the Sacramento River below Keswick Dam. Gravel would be placed to improve spawning at specific locations and to replenish spawning gravel downstream that is not replaced by upstream sources. Restoration actions included under the Proposed Action would occur through the year 2030.

Work would be conducted within a 59-mile reach of the river downstream of Keswick Dam to RBDD (project area). The actual gravel placement work would occur in smaller footprints at selected sites (Appendix A). A total of 13 sites have been identified to date in which one or more restoration activities would occur. Gravel placement at the currently identified sites would cover approximately 40 acres and currently identified side-channel establishment would result in approximately 37 acres of new or re-connected side-channel habitat.

Although 13 sites are currently identified for restoration, additional sites could be added using specific criteria developed for the environmental analyses provided in this EA. Restoration activities are anticipated to be completed at up to three sites per year through 2030.In addition to the 13 sites already identified, restoration activities at approximately 15 gravel augmentation sites (including riffle supplementation) and 15 side channel sites could be completed by 2030. Gravel placement could also occur annually at the Keswick Dam and Salt Creek sites identified below.

Instream work would be done at lower river flows (less than15,000 cubic feet per second (cfs) at Keswick Dam and Salt Creek sites and less than10,000 cfs at all other locations) and during time periods to minimize impacts on listed species. Work mobilizing gravel and equipment to the sites could occur outside of fish

timing windows; however, all in-water work would be confined to appropriate timing windows and suitable river flows.

All equipment used in or near the river would be properly cleaned to prevent any hazardous materials from entering the river, and spill containment materials would be on site in case of an accidental discharge. Reclamation personnel and field supervisors would regularly monitor equipment operations to insure environmental compliance. Instream work would be conducted during seasons of the year that are least likely to adversely impact listed fish species.

Designs would be prepared as needed for site specific work. Gravel augmentation would be completed without formal designs at some sites (e.g. Keswick). Sites that incorporate side channel work would include more formal designs. The specific design for each site would be prepared as funding becomes available to conduct the work each year. The fine scale design features would be coordinated with the SRRT. The SRRT may identify additional sites where similar restoration activities (i.e., similar types, size and construction methods) would be beneficial.

Gravel augmentation sites, such as end dump talus cones and lateral berms, would be no more than 20,000 yd^3 and 0.5 acres per site. Riffle supplementation sites would be no more than 12,000 yd^3 in gravel and 12 acres in size. Side channel creation and modification would involve no more than four acres of excavation and no more than four channels per site. The approximate duration of side channel work would be two to six weeks per site. Instream habitat structure would place no more than 30 boulder clusters, 100 log structures, and be no more than four acres in size. The approximate duration of habitat structure placement would be three to eight weeks per site.

Construction could occur at up to three sites per year under the Proposed Action, adding up to approximately 20,000 cubic yards (30,000 tons) of gravel at each site. Floodplain and side channel habitat enhancements may occur at up to two sites per year. Gravel augmentation and habitat structure placement could occur annually, as needed.

Gravel Placement

There are nine specific gravel augmentation projects identified in the Proposed Action, with a combined total area of up to approximately 40 acres. Gravel augmentation projects have occurred at several of these same sites in previous years. In addition to specifically identified restoration projects, the Proposed Action includes potential implementation of similar gravel augmentation activities (i.e., similar types, size, and construction methods) at currently unspecified locations between Keswick Dam and RBDD. Gravel augmentation would not necessarily occur at all sites every year and some sites may not be implemented at all, depending on evaluation of monitoring data and the judgment of the SRRT. Some sites may be implemented as needed up to once a year (e.g., recurring gravel injection at Keswick Dam), and other sites would be implemented only

once (e.g., Tobiasson Island West Side Channel). In a given year, up to three project sites would be implemented with up to 20,000 cubic yards of gravel placed at any one location and up to a total of 60,000 cubic yards for all three sites within the project area. Following an adaptive management approach, the SRRT would select sites for a given year based on the results of ongoing monitoring within the Upper Sacramento River.

Some augmentation sites may also include floodplain modification and recontouring of the channel. Up to approximately 25,000 cubic yards of material at each site may need to be excavated, sorted, and redeposited in the nearby channel. Where additional instream grading of gravel is required, an excavator or bulldozer would be used. Existing access routes would be used whenever possible, but some additional clearing or grading may be necessary to provide equipment access to the gravel augmentation sites.

The gravel placed would be uncrushed, rounded "natural river rock" with no sharp edges. It would be a reasonably well-graded mix made using an approximately ¼" screen. The D_{50} (median diameter of sample) of the mix would be around 1 inch to 1-1/2 inch. The gravel would be processed as needed prior to delivery to the sites to remove excessive fine materials and minimize introduction of fine sediments into the river. The gravel would also be free of oils, clay, debris, and organic material. Materials excavated from side-channel work could be used for onsite gravel placement, in accordance with specified criteria.

Gravel would be sized using general criteria recommended in a letter to CDFW and DWR by the Anadromous Fish Restoration Program (Table 1)(U.S. Fish and Wildlife Service, 2006). The following are the criteria recommended in that letter for targeting Chinook Salmon spawning:

Table 1 - Gravel size criteria

Particle Size (inches)	Percent Passing	Percent Retained
4" or 5"	95%-100%	0%-5%
2"	75%-85%	15%-30%
1"	40%-50%	50%-60%
3/4"	25%-35%	60%-75%
1/2"	10%-20%	85%-90%
1/4"	0%-5%	95%-100%

The size criteria would be refined from these recommendations as needed based on monitoring results. Gravel sizing would vary from these specifications as needed to meet specific project goals such as for stability of material in the river and to provide better habitat for spawning of smaller sized fish such as steelhead or to encourage or discourage spawning in specific areas. Variations from Table 1

would be coordinated with SRRT and resource agencies to provide the greatest benefit to salmonids.

Stockpile areas would be located within the project site boundaries. Existing improved and unimproved roads would be used by transport trucks to deliver gravel to stockpile areas. Stockpile areas adjacent to the river generally would be about one half acre or less and would be placed in existing clearings where ground disturbance would be minimized.

For purposes of this analysis, tandem transfer trucks (trucks pulling a trailer that can be telescoped into the truck bed) capable of carrying 24 tons would be used for transporting gravel to project sites. Single bed off road trucks capable of carrying approximately 50 tons would be used for transporting gravel within project work sites off of public roads.

Gravel would be placed in the river using dump trucks and front end loaders. Front end loaders would be wheeled to minimize impacts. At some sites the substrate would be graded with a bulldozer prior to gravel additions to remove armoring (surface layer of larger rock) or to meet topographic design specifications.

For the riffle supplementation, front end loaders would pick up a bucket of gravel from the stockpile and drive from the stockpile into the river and carefully dump the gravel in a manner as to distribute it across the river bottom according to design parameters. Placement would proceed starting from the river access site and working out into the river from there. This would allow the loaders to drive on the newly placed gravel, thereby avoiding driving in overly deep water and distributing fines from the existing substrate. The loaders would distribute the gravel along the river bottom to create the hydraulic conditions necessary for salmonid spawning. This work would use two or three front end loaders for about one month each year. A tracked bulldozer or excavator would be used for grading the existing substrate and placed gravel as needed.

For end dump talus cone and lateral berm sites, gravel would be dumped directly into the river from dump trucks or dumped using front end loaders. The trucks would originate from a stockpile area or an off-site processing plant. A front end loader would be used as needed to distribute the gravel further into the river.

Floodplain and Side Channel Habitat Enhancements

Floodplain and side channel habitats serve as important refuge and rearing areas for salmonids and these habitats likely contribute substantially to the productive capacity and life history diversity of Chinook Salmon (Sellheim et.al 2015, Lindley et al. 2009, Yoshiyama et al. 1998; Martens and Connolly 2014). However, the number and quality of these habitats have been reduced in the upper Sacramento River as a result of activities such as channel modifications and levee construction (Lindley et al. 2009). There are six specific floodplain and side

channel enhancement projects identified in the Proposed Action resulting in up to approximately 37 acres of new or re-established floodplain and side channel habitat. In addition to specifically identified restoration projects, the Proposed Action includes potential implementation of similar habitat restoration activities (i.e., similar types, sizes, and construction methods) at currently unspecified locations between Keswick Dam and RBDD.

Floodplain and side channel habitat enhancements may consist of new or reconnected side channels and floodplain modifications that are designed to function under flows within the main channel above 3,250 cfs. Physical characteristics would be variable with average water velocities ranging between 1.5 fps to 4.0 fps, water depths averaging between one to three feet deep, and channel widths ranging between 12 to 50 feet wide for new channels and potentially larger for existing channels. Water velocities would be designed to be variable and range up to about five feet per second at design flows. Floodplain and side channel habitats would be created, reconnected, or modified by excavation using heavy equipment (i.e., bulldozer, front end loader, excavator). Where the excavated material is of the appropriate size distribution it would be sorted and placed into side channel or main channel areas to enhance habitat features. The fines would be distributed over the floodplain to assist in revegetating the area. Gravel placed into the main channel may be used to help back water up into side channels. Low elevation gently sloping benches would be created along channels in opportune areas to provide juvenile rearing habitat through a range of flows.

Depending on surveys, some side channel sites will require additional investigations of subsurface materials to determine the depth and volume of gravel material and the location of a potential bedrock layer. This would be accomplished by digging test pits in the dry areas of the site during the design phase. Test pits would be filled back in the same day with the material that was excavated from the pit.

Up to 5 acres of floodplain and side channel enhancements may occur at individual sites each year with up to a combined total of 10 acres within the project action area annually. Enhancement activities would require heavy construction equipment (e.g., front end loaders, bulldozers, and excavators), as well as hand tools. During the majority of construction, a gravel berm would be left at both the upstream and downstream ends of each site to isolate the project area from the main channel.

Up to approximately 30,000 cubic yards of material may need to be excavated, sorted, and re-deposited in the channel at these sites. Gravel in excess of what would be needed for creating or modifying the floodplain and side channel to their design specifications may be placed in mid-channel or river bank areas within the vicinity of the excavation and contoured into the site.

Instream Habitat Structures

Large woody debris (LWD) contributes to habitat diversity and creates and maintains foraging, cover, and resting habitat for both adult and juvenile anadromous fish. In order to improve conditions within the upper Sacramento River, instream habitat structures consisting of logs, rootwads, and boulders would be placed into the active channel of the upper Sacramento River using construction equipment (e.g., front end loaders, excavators) and/or hand tools. Placement of instream habitat structures in the active main channel and/or side channels is expected to create instantly available juvenile salmonid rearing habitat. Structures that create quiet water or debris accumulation at the stream margins are beneficial for salmonid fry survival following emergence. Coupled with gravel augmentation, both woody material and boulder clusters help to sort augmented gravels that become mobilized during high flows, and help to direct flows that hydraulically scour and maintain pools. The enhancement or creation of large, deep pools with abundant cover can improve rearing habitat for juvenile salmonids.

Instream habitat structure would be placed, as needed, within gravel augmentation and side channel enhancement sites within the upper Sacramento River. Using an adaptive management approach, the SRRT would identify potential placement sites based on the results of ongoing anadromous fisheries monitoring within the area. Access to placement sites would use existing roads, when feasible, to minimize impacts on vegetation or other sensitive biological or cultural resources. Up to 30 boulder clusters and 100 log structures would be placed within the upper Sacramento River in a given year. The designs for instream habitat structures would be consistent with guidance provided in the *California Salmonid Stream Habitat Restoration Manual, 4th Edition* (CDFG 2010).

Boulder Clusters

Boulder structures would be placed in the active channel and along river or side channel banks to diversify flows in a particular stream reach, to provide in-stream cover for juvenile salmonids and spawning adults, or to retain spawning gravel. It is desirable to create a variety of flow velocities, because juvenile salmonids select different velocities depending on whether they are feeding or resting. Different water velocities also help sort gravel and create diversity in the substrate. Boulders are well-suited for diversifying flows because they are resistant to being displaced by high flows. Because of this, they can be placed mid-channel without constructing a full-channel spanning structure. The interstices within boulder clusters and between large boulders can provide escape cover for juvenile and adult salmonids.

The range of flows to which a particular structure, or series of structures, may be subjected would dictate the size of boulders to be used. Generally, clusters are located in straight, stable, moderately to well-confined, low gradient riffles (0.5 to 1 percent slope) for habitat enhancement. At least three- to five-foot diameter boulders are recommended. To be effective in creating scour pockets and habitat niches around individual boulders, the correct distance between adjacent boulders

and the configuration of the boulder clusters must be determined. In general, adjacent boulders would be 0.5 to 1-foot apart.

The proposed design includes a triangle cluster of three boulders that are independent (i.e., not cabled together). Several of these clusters may be aggregated together in a particular location to increase scour area and create greater habitat complexity. Heavy equipment (i.e., dump trucks, excavators, loaders, and/or bulldozers) would be required for transporting and positioning boulders.

Woody Material

Woody material placement would consist of digger logs and/or spider logs. Digger logs would be placed with one end buried or anchored in the bank and the other end plunging into the bottom of a pool. The primary use of digger logs is to enhance rearing habitat by creating diverse cover for rearing juveniles as well as for migrating adults. They are also used to scour the channel, creating or expanding pool habitat. Logs with rootwads intact would be positioned with the rootwad end extending down into the pool to create complexity for increasing rearing habitat and maximizing scour.

Digger logs would typically be partially buried for stability during high water. The material may also be set in a trench dug into the streambank using heavy equipment. At least one-third of the length of the log would be placed in the streambank. This buried portion of the log would be covered with boulders to anchor the structure. Digger logs would usually be positioned to point downstream, although there may be some situations where pointing them upstream would be appropriate (e.g., where the intention of the log placement is to create scour). The vertical angle of the log is variable, usually 10 to 45 degrees to the bank.

Spider logs are several logs placed at angles to provide cover for juvenile rearing and adult spawning and collect woody debris to increase diversity. These structures would be constructed of several logs placed across each other, in the shape of a triangle, to imitate natural debris or log jam. Each of the logs would be partially buried in the bank or channel or secured to bedrock or large boulders in the channel or to other logs or trees.

Work Windows

Due to the nearly year-round presence of at least one freshwater life stage of one or more listed fish species in the action area, the use of zones and in-river work windows to entirely avoid and prevent injury or mortality to listed anadromous salmonids is not possible. However, the least mobile life stages, incubating eggs and pre-emergent fry, are the life stages most likely to experience direct injury and mortality from construction activities. Therefore, in-river work would be restricted to specific windows in specific locations, developed with consideration

of the spatial and temporal distribution of spawning winter-run and spring-run Chinook Salmon, steelhead, and Green Sturgeon (Table 2).

Table 2 – In-River Work Zones and Windows		
Zone	**Location**	**In-River Work Window**
Zone 1	Keswick Dam (RM 302) to approximately 1.5 miles downstream	Year-round (anytime flows are less than 15,000 cfs)
Zone 2	Approximately 1.5 mile downstream of Keswick Dam (RM 300.5) to Cow Creek (RM 280)	October 1 to May 15* (anytime flows are less than 10,000 cfs; pre-construction salmonid redd surveys conducted)
Zone 3	Cow Creek (RM 280) to Red Bluff Diversion Dam (RM 243)	October 1 to March 1* (anytime flows are less than 10,000 cfs; pre-construction salmonid redd surveys conducted)

*Construction windows are for in-river work.

These work zone locations and windows, along with pre-construction salmonid redd surveys in Zones 2 and 3, are designed to avoid or minimize harm to incubating salmonid eggs and pre-emergent fry. No pre-construction surveys for Green Sturgeon spawning adults are necessary since zone locations and in-river work windows have been designed to avoid construction activities when Green Sturgeon are spawning or eggs may be present.

Additional work windows may be necessary for terrestrial species. To avoid impacts to the nesting of migratory birds, vegetation removal would not occur between March 1 and August 31st. Pre-construction surveys would also be conducted before any vegetation removal. Construction at sites with known bald eagle nests (Turtle Bay) would be limited to September through December to avoid impacts to courtship and nesting activities.

Site Selection

Reclamation has identified the need to combine several restoration actions into one project that would allow for the flexibility to make minor modifications or reprioritize restoration actions based on monitoring results and environmental changes. Spawning and rearing habitat restoration efforts require the flexibility to adopt alternative approaches, as needed, to ensure the success of restoration efforts. This adaptive management approach will enable Reclamation to meet the goals and objectives established by the CVPIA. The focus of the project would be to opportunistically design adaptive strategies to promote dynamic habitat.

The criteria used to evaluate site selection and design, along with possible constraints include: site suitability and access, engineering and design, environmental compliance and permitting, gravel availability and transportation, and cost-benefit. Sites were selected throughout the entire project area that could provide access and maintain flexibility for juvenile salmonid rearing habitat enhancement through long-term gravel replenishment, in-channel gravel

placements, and engineered side-channels to meet the needs and goals of the CVPIA program. Additional sites may be selected using the considerations and criteria identified in this EA.

Prior to implementation of restoration activities at each site, Reclamation would ensure the appropriate level of design is developed through modeling, monitoring, and surveying. Reclamation and the SRRT would guide implementation of an adaptive management program to monitor the physical and biological results to ensure the restoration program achieves the goals of CVPIA. Hydrologic models and biological surveys would be completed before formal design considerations. Sites would be selected and designed to meet the above listed criteria. A site plan document would be developed that includes site specific designs, maps, and figures. The site plan would also include results of surveys and monitoring, and describe how the site meets the established criteria and avoids additional impacts to the resources.

Modeling

Topographic site surveys would be conducted before, during, and following implementation of restoration activities at the more complex project sites (e.g. side channels). The extent of each project site would be surveyed and X, Y, Z real world coordinates would be provided in sufficient density and extent to enable design and two dimensional hydraulic modeling of project sites to occur. The modeling will enable designs to meet target water depths and velocities to maximize habitat suitability for the target species. Sediment mobility would be estimated to help determine which project features are likely to persist and which areas are likely to experience sediment transport at the modeled flows.

Depending on surveys, some sites may require additional investigations of subsurface materials to determine the depth and volume of gravel material and the location of a hard bedrock layer. This would be accomplished by digging temporary test pits in dry areas prior to final design and implementation. Grade checks would be provided during project implementation to assist project personnel in meeting designed elevations. At the completion of project implementation, an as-built survey would be conducted to provide a visual comparison of site elevations to the designed elevations.

Designs would be completed through an iterative process with input from the interagency coordination group to refine project features based on modeling results. The designs would consist of a topographic surface displayed in hard copy design drawings and provided electronically in AutoCAD or ArcGIS. Design drawings would include a project overview displayed on existing topography and/or aerial photography, an overview of the site showing depth of cut and fill, and an overview of the site showing completed elevations. Drawings would include on-the-ground staking to aid in orienting field activities to the design surface. Survey staking would be placed on the ground in coordination with implementation personnel in a configuration to aid in completing the design.

Monitoring

Biological and physical monitoring would be conducted pre- and post-project to evaluate the effectiveness of the restoration activities at meeting the needs of the targeted species and to validate the design parameters. Monitoring could include spawning surveys, juvenile habitat use surveys, benthic macroinvertebrate surveys, gravel movement surveys, and gravel quality surveys at project sites and at suitable control sites to compare species response before and after completion of each project. Monitoring would be conducted throughout the duration of the project. Monitoring objectives would be refined annually through coordination with the SRRT interagency group.

Land Ownership

Several sites are located on, or are accessed through, private land. These sites would need continued coordination with landowners. Work at these sites is contingent on landowners allowing appropriate access.

2.2.1. Site 1, Keswick Dam – RM 302

Site 1-Keswick is located at river mile (RM) 302.0 on the west bank of the Sacramento River just downstream of Keswick Dam (Figure A-2). This site would involve long-term gravel augmentation via end-dumping, which has been implemented at this site numerous times since 1989 for spawning habitat improvements. In a given year, up to approximately 20,000 cubic yards of gravel would be end-dumped from a 100-foot high bank resulting in an approximately one-half acre Talus Cone shaped pile (up to 200 feet long by 100 feet wide by 100 feet high) along the west (right) river bank. Most of the material would initially be retained on the river bank outside of the wetted channel (about 75 percent) as indicated by Figure A-3. Gravel would remain in this configuration until periodic winter flows greater than about 25,000 cfs at Keswick, expected to occur approximately every other year, mobilize it downstream. Although annual gravel placement along the river bank is not expected to create immediate benefits to fish, it would provide long-term benefits to Chinook Salmon and steelhead as gravel washes downstream under high flow events where it would create and maintain spawning habitat.

The property and existing facilities are owned by Reclamation which allows direct access to the site throughout the year. Site modifications to allow gravel placement are not necessary. Access would be through Iron Mountain Road and Keswick Dam Road from the west. Loaded dump trucks would not cross Keswick Dam.

The approximate location of this site is 122° 26'46.8161" W 40° 36'32.5579" N (Section 21, T32N, R5W Mount Diablo Meridian [MDM]) in the US Geological Survey [USGS] 7.5 Minute Redding Quadrangle (Quad).

2.2.2. Site 2, Salt Creek – RM 300.7

Site 2-Salt Creek is located at RM 300.7 on the west bank of the river channel approximately 500 feet downstream from where Salt Creek enters the Sacramento River (Figure A-4). This site would involve long-term gravel augmentation via end-dumping, which, similar to Site 1-Keswick, has been done at this site numerous times since 1989 for spawning habitat improvements. In a given year, up to approximately 20,000 cubic yards of gravel would be dumped from an approximately ten foot high terrace resulting in an approximately one-half acre pile along the right bank of the river (up to 200 feet long by 100 feet wide). Similar to Site 1-Keswick, most of the material would initially be retained in the pile until periodic high winter flows greater than about 25,000 cfs, expected to occur about every other year, mobilize it downstream. Although annual gravel placement along the river bank is not expected to create immediate benefits to fish, it would provide long-term benefits to Chinook Salmon and steelhead as gravel washes downstream under high flow events where it would create and maintain spawning habitat.

The property is managed by the City of Redding and Bureau of Land Management (BLM). Access would be through an existing unpaved trail that runs parallel to the Sacramento River Trail. Trucks would enter the trail by crossing a portion of the Shasta Rail Trail via Middle Creek Road. Damage to existing paved trails would be minimized by using unpaved trails and limiting the area that trucks cross to a single intersection. A temporary crossing of Salt Creek (an intermittent stream) would be necessary and would be accomplished by placing spawning gravel across this channel where an existing Trail, created by vehicle traffic, crosses. At the completion of work each season, the gravel in this temporary crossing would be graded so that stream flow is not impeded.

The approximate location of this site is 122° 26'1.25" W 40° 35'38.73" N (Section 33 T32N, R5W MDM) in the USGS 7.5 Minute Redding Quad.

2.2.3. Site 3, Market Street South – RM 298.3

Site 3-Market Street is located at RM 298.32 on the west bank of the Sacramento River (Figures A-5 to A-7). The site is located just downstream of the Anderson-Cottonwood Irrigation District (ACID) Diversion Dam to avoid impacts to existing infrastructure. This location involves gravel placement using front end loaders. Gravel has not previously been added at this site; however, field reconnaissance indicates that river conditions are conducive to gravel placement and may support long-term gravel augmentation activities. In a given year, up to approximately 15,000 cubic yards of gravel would be placed within the river during low river flow conditions (i.e., less than 10,000 cfs). Gravel would be placed along the bank and spread as far as is feasible into the channel using front end loaders under the flow conditions occurring during construction. Approximately 3.5 acres (510 feet long x 300 feet wide) of improved spawning habitat could be directly used by salmonids. Additionally, a portion of the gravel

would be mobilized under high flows and transported downstream to areas where it can also provide fisheries benefits.

The upland property adjacent to the channel and associated facilities are owned by ACID. Access would be on an existing City of Redding gated road and then through ACID's Diversion Dam and fish screen facility. The low river bank in the area would allow easy access to the river so that front end loaders can transport and place gravel into the river channel. River access points would be through gaps in vegetation and would be selected to avoid the removal of, or disturbances to, large mature riparian trees and any sensitive plant species or habitats (e.g., elderberry, wetlands). Due to the project's proximity to ACID 's existing facilities, site development would be limited to clearing access points to the river and vehicle staging and gravel stockpile areas would be located near these facilities in previously disturbed areas devoid of vegetation.

The approximate location of this site is 122° 23'34.0933" W 40° 35'30.6504" N (Section 35 and 36, T32N, R5W MDM) in the USGS 7.5 Minute Redding Quad.

2.2.4. Site 4, Turtle Bay Island– RM 297

Site 4-Turtle Bay Island is located at RM 297.0 on an island at a bend in the river known as Turtle Bay (Figure A-8). This site was historically part of a large gravel quarry where aggregate was removed for Shasta Dam construction in the 1940s. More recently, a side channel spawning habitat rehabilitation project was completed in 1988 along the western edge of the Turtle Bay area, which converted the historic floodplain bar into a year-round island. The rehabilitated side channel has provided suitable spawning and rearing habitat over a broad range of river flows. This location involves constructing up to four additional perennial side channels on the island with associated placement of instream habitat structures to provide juvenile salmonid rearing and spawning habitat.

Up to four perennial side channels would be created on the island through excavation and grading. Each would be constructed up to 1,000 feet long and each channel would be designed to have variable widths (up to 50 feet wide), depths (up to 16 feet deep), and velocities (up to about five feet per second) to provide habitat complexity. Variably inundated floodplain benches would be created along the channel margins to provide juvenile salmonid rearing habitat over a range of river flows. Channel substrates would be graded below existing elevations by approximately 4-6 feet at the upstream end and 13-16 feet at the downstream end. Instream habitat structures (e.g., woody material such as, trees, trunks, rootwads, and willows; and variable sized large rocks) would be incorporated into the newly created side channels to enhance habitat quality and channel persistence. Woody material would be incorporated by partially burying pieces in the channel bed and adjacent banks to provide some stability under higher flows.

The property is owned by the City of Redding and the California State Lands Commission (SLC). Access would be through City of Redding property at Turtle Bay and would be coordinated with the City of Redding. A temporary crossing may need to be created by pushing gravel across the upper end of the existing side channel to create a temporary driving surface for equipment. The crossing would be removed by grading into the surrounding terrain at the completion of the work. Gravel excavated to create each channel would be processed (i.e., sorted according to size) and redistributed on the island and surrounding river. If the underlying channel's substrate composition is not appropriately sized for spawning, appropriately sized gravel that was processed from nearby excavation areas (or transported from a local gravel distributor) may be added; however, it is unlikely that gravel additions would be necessary since field reconnaissance indicates that suitable material is likely present.

The approximate location of this site is 122° 22'7.9095" W 40° 35'25.0966" N (Section 31, T32N, R4W MDM) in the USGS 7.5 Minute Enterprise Quad.

2.2.5. Site 5, Kutras Lake – RM 296

Site 5-Kutras Lake is located at RM 296 (Figure A-9) on the west (right) side of the river. Kutras Lake is approximately 40 acres and remains connected to the Sacramento River year-round. Juvenile salmonids may use this area for rearing; however, existing rearing habitat is limited by low levels of cover. This location would initially serve as a small-scale pilot project involving placement of instream habitat (i.e., large woody material) in the area. The woody material would be held in place by driving piles and attaching clusters of woody material to the piles. Based on results of the pilot project (i.e., observed fish usage), additional instream habitat structure may be added at the site or may be placed in other habitats within the project reach.

The property is owned by a private landowner. Access would be through Park Marina Drive and the Kutras boat ramp, pending approval by landowner.

The approximate location of this site is 122° 22'2.03" W 40° 34'39.81" N (Section 36, T32N, R5W MDM) in the USGS 7.5 Minute Enterprise Quad.

2.2.6. Site 6, Cypress Avenue Bridge North – RM 295

Site 6- Cypress Avenue Bridge North is located at RM 295 just upstream of the Cypress Avenue Bridge along the east (left) river bank (Figure A-9). This location involves reconnecting two partially functional side channels (northern and southern) to the main channel to increase juvenile salmonid rearing habitat.

Under existing conditions, the upstream half of the northern side channel is disconnected from the main channel at low flows while the downstream half currently functions as a backwater slough due to its continued connectivity with the main channel at all flows. To provide a functional side channel under main channel flow conditions greater than 3,250 cfs, excavation would occur at the

upstream portion of the northern channels and would encompass an approximately three acre area. Some grading within the remainder of the side channel may be done to improve habitat. The total length of the reconnected side channels would be approximately 1,000 feet.

The southern channel is currently disconnected at the downstream end at low flows. To provide a functional side channel under main channel flow conditions greater than3,250 cfs. Excavation would include widening a small opening at the upstream side of an existing pond, which would encompass an approximately one-half acre area. A downstream outlet would be created through excavation in approximately a one acre area. Some grading within the remainder of the side channel may be done to improve the habitat. The total length of the downstream reconnected side channel would be approximately 800 feet.

The property is owned by Shasta Enterprises. Access to the site would be coordinated with Shasta Enterprises and the City of Redding. Existing unpaved trails would provide a route covering the length of the project area. Trucks would likely access the trails by crossing under the Cypress Avenue Bridge from the south.

The approximate location of this site is 122° 22'10.21" W 40° 34'25.13" N (Section 6, T31N, R4W MDM) in the USGS 7.5 Minute Enterprise Quad.

2.2.7. Site 7, Cypress Avenue Bridge South – RM 295

Site 7-Cypress Avenue Bridge South is located at RM 295 immediately downstream of the Cypress Avenue Bridge (Figure A-9). This location involves creation of a side channel complex through the Henderson Open Space Area (OSA) and gravel augmentation within the main river channel.

Side Channel Creation
Under existing conditions, the Henderson OSA includes several existing ponds that are disconnected from the main channel. These ponds would be connected to provide a constant flow through to provide habitat for cold water species and reduce habitat quality for invasive fish species. Excavation would encompass up to approximately three acres and would be roughly balanced by fill of ponded areas currently occupied by invasive species. The total length of the new side channel would be approximately 3,000 feet long and there would be multiple connections with the main channel.

The property is owned by the City of Redding and includes the Henderson OSA, which is a recreational area that is maintained in a relatively natural state (Figure A-12) with some unpaved pedestrian trails and disc golf course. Access is likely to occur over existing unpaved pedestrian trails and may require temporary closure of some portions of the Henderson OSA for up to 5 weeks, which would be coordinated with the City of Redding.

Gravel Augmentation
The river bed substrate is coarse and armored in this area so gravel would be added across the main channel. Although gravel augmentation aimed at creating spawning habitat has not previously been applied at this site, spawning sized gravel was recently placed within the river channel during Cypress Avenue Bridge construction activities to function as temporary construction platforms and was left in place to provide long-term habitat benefits. In a given year, up to 15,000 cubic yards of gravel would be placed within the river during low flow conditions (i.e., less than about 7,000 cfs). Gravel would be placed along the bank and spread as far as is feasible into the channel using under the flow conditions occurring during construction. The site would provide up to approximately 8 acres (600 feet long x 400 feet wide) of spawning habitat that can be directly used by salmonids. A portion of augmented gravels would be mobilized under high flows and transported downstream to areas where they can also provide fisheries benefits.

The approximate location of this site is 122° 22'29.5486" W 40° 34'18.1779" N (Section 1, T31N, R5W and Section 6, T31N, R4W MDM) in the USGS 7.5 Minute Enterprise Quad.

2.2.8. Site 8, Tobiasson Island and Side-channel – RM 291.6

Site 8-Tobiasson Island is located at RM 291.6 at Tobiasson Island and includes adjacent main and side channels (Figure A-14). The island is about 26 acres, forming a triangular shape measuring about 1,500 feet long by 1,500 feet wide at its widest point. This site involves constructing up to three perennial side channels on the island and implementing gravel improvements in the west (right) side channel and also within the main river channel along the east (left) bank. The creation of perennially flowing channels on the island is expected to increase juvenile salmonid rearing and adult spawning habitat at this site. Although the western side channel provides suitable depths and velocities for salmon to spawn at most flows up to about 15,000 cfs, much of the substrate is too coarse for spawning so gravel placement or grading of the channel substrate would provide substrate more conducive to spawning.

Side Channel Creation
Up to three perennial side channels would be constructed on Tobiasson Island (Figure A-14) to increase juvenile salmonid rearing and adult spawning habitat. The channels would be up to 1,500 feet long and would be designed to have variable widths (up to 50 feet wide), with variable depths and velocities to provide habitat complexity. The channels would be created by grading the existing material on the island to provide the appropriate depths and velocities to improve juvenile salmonid habitat potential. Variably inundated floodplain benches would be created along the channels to provide vegetated juvenile habitat at a range of river flows. Excavated materials would be sorted and larger materials placed in the active main river channel near the upstream end of the island to provide control of flow splits between the different channels. Spawning sized materials

would be placed in the existing west side channel and/or the main river channel along the east bank as a source of spawning gravel.

Gravel Augmentation
The substrate of the existing side channel is largely armored with cobble too large for Chinook Salmon spawning. Portions of the surface of the side channel would be graded and/or spawning sized material added to provide habitat more conducive to spawning for Chinook Salmon and steelhead. Up to 1.5 acres (610 feet long x 110 feet wide) of this substrate would be graded and/or spawning sized gravel (up to 6,000 cubic yards) added to provide habitat more conducive for Chinook Salmon and steelhead spawning.

Gravel would be placed along the east (left) bank of the main river channel across from the downstream end of the island (Figure A-16). In a given year, up to 12,000 cubic yards of gravel would be placed within the river. Gravel would be spread as far as is feasible into the channel using front end loaders and other heavy equipment under the flow conditions occurring during construction. Gravel placement would provide up to approximately 6 acres (1,100 feet long x 250 feet wide) of spawning habitat that can be directly used by salmonids. A portion of the gravel would be mobilized under high flows and transported downstream to areas where it can also provide fisheries benefits.

Access from the west would be provided from South Bonnyview Road via South Wixon Lane. The land on the west bank of the side-channel is privately owned. There is approximately 1,000 feet of existing gravel road that would be used with permission of the private landowner. The island would be accessed by crossing the side channel with the heavy equipment. A base layer of spawning gravel would be added to provide a driving surface if needed and minor cuts and fills would be made to facilitate access by equipment. Access for gravel placement in the main channel would be from the east over private land. A section of low bank would be utilized to access the river where minimal improvement would be needed. This location could serve as a long-term gravel placement site depending on how rapidly material is mobilized from the placement area. Work at this site is pending approval of landowner access.

The approximate location of this site is 122° 21'24.0196" W 40° 31'59.3017" N (Section 19, T31N, R4W MDM) in the USGS 7.5 Minute Enterprise Quad.

2.2.9. Site 9, Shea Island and Levee – RM 289.6

Site 9-Shea Island is located at RM 289.6 just upstream of the Clear Creek confluence to the Sacramento River and along the Shea Levee adjacent to the Shea Sand and Gravel Company (Figure A-17). This location involves gravel augmentation along the east (left) bank and side channel habitat reconnection along the west (right) bank of the river. The east bank area is owned by a private landowner and CDFW, while the west bank area is owned by the City of Redding.

Side Channel Connectivity
An existing side channel complex contains good salmonid spawning and rearing habitat at flows greater than about 5,000 cfs. At lower flows, the side channels become disconnected from the main channel (Figure A-19). When the channels are disconnected, juvenile salmonids are often left in isolated pools until higher flows return or until they perish. When redds are present, they can become dewatered and the eggs can perish if higher flows are not available for emergence. Excavation would include lowering the elevations at each upstream connection of the side channels with the main channel so that connectivity is maintained at flows as low as 3,250 cfs.

Gravel Augmentation
The gravel augmentation would consist of placing gravel along approximately 1,600 feet of the east bank and extending into the channel as far as is feasible under the flow conditions occurring during construction. Up to approximately 12,000 cubic yards of gravel would be placed at the site and cover up to approximately 12 acres. The river bank is primarily open ground so minimal vegetation disturbance would occur. Although gravel placement only along the river bank is not expected to create immediate benefits, it would provide long-term benefits to Chinook Salmon and steelhead as it washes downstream under high flow events where it would create and maintain spawning habitat.

Access would occur from the end of Knighton Road, via an existing dirt road that runs along the top of Shea Levee. Equipment would be staged on pre-disturbed areas away from the river, as necessary. Access to the side channel complex on the west side of the river is through City of Redding property adjacent to Cascade Park.

The approximate location of this site is 122° 21'41.2068" W 40° 30'37.1494" N (Section 30, T31N, R4W MDM) in the USGS 7.5 Minute Enterprise Quad.

2.2.10. Site 10, South Shea Levee – RM 289

Site 10-South Shea Levee is located at RM 289 approximately half a mile downstream of Shea Island (Figure A-20). This location involves placement using front end loaders. Up to approximately 10,000 cubic yards of gravel would be placed within the river. Gravel would be placed along the bank and spread as far as is feasible into the channel using front end loaders under the flow conditions occurring during construction. Approximately 3.3 acres (600 feet long x 100 feet wide) of spawning habitat that can be directly used by salmonids would be improved. Additionally, a portion of augmented gravel would be mobilized under high flows and transported downstream to areas where it can also provide fisheries benefits.

The adjacent river bank is owned by a private landowner. Access, pending landowner approval, would occur from the end of Knighton Road, via an existing dirt road that runs along the top of Shea Levee.

The approximate location of this site is 122° 21'34.62" W 40° 30'0.51" N (Section 31, T31N, R4W MDM) in the USGS 7.5 Minute Enterprise Quad.

2.2.11. Site 11, Kapusta Island – RM 288

Site 11-Kapusta Island is located at RM 288 at Kapusta Island and includes an area downstream in the main channel and on the west side of the river (Figure A-21). This location involves constructing up to one and enhancing up to three existing perennial side channels and augmenting spawning gravel downstream of the island on the south (right) side of the river.

Side Channel Creation

Although existing channels on the island provide spawning and rearing habitat, there are opportunities to enhance habitat complexity within them and add additional side channel habitat. An additional perennial side channel complex can be created on the island to the south of the existing channels. This side channel complex would be created on the island through excavation and grading. The interconnecting channels would be up to approximately 1.4 acres (2,000 feet long x 30 feet wide). The side channels would have variable widths (up to 50 feet wide), depths (up to 10 feet deep), and velocities (up to five feet per second) throughout to provide habitat complexity. Variably inundated nearshore benches would be created along the channels to provide vegetated juvenile habitat at a range of river flows.

An approximately 1,300 foot long side channel would be created along the right bank of the river downstream of the island, adjacent to the gravel placement area. The channel would be designed to flow down to a river flow of 3,250 cfs include variable width and depth throughout for habitat complexity.

Gravel Augmentation

In a given year, up to 12,000 cubic yards of gravel would be placed within the river. Gravel would be spread as far across the channel as is feasible under the flow conditions occurring during construction. Up to approximately four acres (600 feet long x 300 feet wide) of spawning habitat that can be directly used by salmonids would be provided. A portion of the gravel would be mobilized under high flows and transported downstream to areas where it can also provide fisheries benefits.

The island is owned by the State of California**.** Access to the island would be through City of Redding property located on the south (right) bank of the river via a county road from Highway 273. In order for equipment to access the island, a temporary river crossing river would be created by grading the existing river rock or adding spawning sized material into a drivable path, which would be re-graded into the surrounding terrain at the completion of the project. The property adjacent to the south (right) side of the main river downstream of the island is owned by the City of Redding. Access to the island would occur from the south

(right) bank. Gravel would be placed into the river as far as is feasible from the bank under the flow conditions occurring during implementation.

The gravel source would be the uplands, which are all City of Redding property. The existing material would be sorted onsite to separate the spawning sized material from other material. The oversized material would be used in areas as needed to provide increased longevity to the site. Fines would be used in areas to be revegetated.

The approximate location of this site is 122° 20'29.44" W 40° 29'51.07" N (Section 32, T31N, R4W MDM) in the USGS 7.5 Minute Cottonwood Quad.

2.2.12. Site 12, Anderson River Park – RM 282

Site 12-Anderson River Park is located at RM 282 within the naturally maintained area of Anderson River Park (Figure A-22). This location involves reconnecting a partially functional side channel to the main channel and providing additional perennial side channel habitat to increase juvenile salmonid rearing habitat.

Under existing conditions, the upper 30 percent of the side channel is disconnected from the main channel at flows less than about 15,000 cfs, while the lower 60 percent is currently connected to the river year- round and consists of a stagnant backwater area with good habitat for warm-water invasive species. The existing channel has a well-established riparian area that could provide immediate juvenile rearing habitat if appropriate flows were provided through the channel. To provide a connected functional side channel under main channel flow conditions down to 3,250 cfs, excavation would occur at the upstream end of the side channel. Additional new interconnected channels may also be created across the large gravel bar between the existing side channel and the main river channel. Excavation would encompass an approximately 11.5 acre (5,000 feet long x 100 feet wide) area. Variably inundated floodplain benches would be created along the side channel margins to provide juvenile salmonid rearing habitat over a range of river flows. The total length of the reconnected side channel would be approximately 5,000 foot long.

The property is owned by the State of California and maintained by the City of Anderson. Access would be through the Anderson River Park area on existing roads and drivable trails.

The approximate location of this site is 122° 15'37.76" W 40° 27'54.12" N (Sections 12 and 13 T30N, R4W MDM) in the USGS 7.5 Minute Cottonwood Quad

2.2.13. Site 13, Reading Island – RM 275

Site 13-Reading Island is located at RM 275 along the west (right) bank of the river (Figure A-23). This location involves reconnecting a partially functional side channel to the main channel to increase juvenile salmonid rearing habitat

opportunities. Historically, a 12,000 foot side-channel of the Sacramento River joined Anderson Creek creating Reading Island. A 4,000 foot stretch of the upper side channel is no longer connected to the main channel but the lower 8,000 feet receives flows from Anderson Creek resulting in year-round connectivity of the lower portion with the Sacramento River. Due to the lack of connectivity with the main channel at the upper end of the side channel and the low flows provided by Anderson Creek at the lower end, the existing side channel currently functions as a stagnant backwater area with good habitat for invasive warm water species.

Excavation would include grading the 4,000 foot upper section of the historic side channel so that it functions under flows within the main channel above 3,250 cfs. Excavation would encompass up to an approximately 7.4 acre (4,000 feet long x 80 feet wide) area. The total length of the reconnected side channel would be approximately 12,000 feet long.

The northern portion of the island is privately owned, while the southern end is owned by the BLM. Access would be through BLM property, but coordination with private landowners would also be necessary to connect the upstream end of the channel.

The approximate location of this site is 122° 12'1.52" W 40° 24'16.56" N (Section 33 and 34 T30N, R3W and Sections 3 and 4 T29N, R3W MDM) in the USGS 7.5 Minute Balls Ferry Quad.

Section 3 Affected Environment and Environmental Consequences

This section describes the affected environment and evaluates the environmental consequences that may occur with implementation of the Proposed Action and the No Action Alternative.

Potential impacts on several environmental resources were examined and found to be minimal or nonexistent. These resources include aesthetics, agriculture and forestry resources, land use and planning, mineral resources, population and housing, public services greenhouse gas emissions, utilities and service systems, Indian trust assets, Indian Sacred Sites, and environmental justice, as noted below.

Aesthetics: Aesthetic resources refer to scenic vistas or views. A series of public parks provide access to the river and its scenic views. The nearest scenic highway is located near Shasta Dam. In the City of Redding portions of highways 44, 299 and 5 are eligible for state scenic designation. There would be no impact to scenic resources within a state scenic highway in or near the project area.

Agriculture and Forestry Resources: The Farmland Mapping and Monitoring Program of the California Resources Agency's California Important Farmland Finder shows no Prime Farmland, Unique Farmland, or Farmland of Statewide Importance in the project area. The project area is not located in existing zoning for agricultural use or a Williamson Act contract. The project area is not located in an existing zone of forest land, thus the Proposed Action would not cause rezoning of forest land, timberland, or timberland zoned Timberland Production. The Proposed Action would not result in the conversion of forest land to non-forest use.

Land Use and Planning: The Proposed Action would not physically divide an established community land use plan, policy, regulations, or ordinances developed to avoid or mitigate environmental impacts such as Habitat Conservation Plans or Natural Community Conservation Planning programs.

Mineral Resources: The Shasta County General Plan (2004) includes Chapter 6.3 "Minerals," which listed the Sacramento River as one of the primary identified locations for alluvial sand and gravel resources for Portland cement concrete grade aggregate. Gravel excavated from the sites would be redistributed in the Sacramento River system to develop side-channels and riffle supplementation.

Population and Housing: The Proposed Action would not propose or remove homes, businesses, roads, or other infrastructure; thus it would not induce population growth or cause impacts on population or housing.

Public Services: Access to several of the project sites would be through public parks, however there would be no physical impacts associated with the need for new or physically altered governmental facilities in order to maintain acceptable public services.

Greenhouse Gas Emissions: Greenhouse gas (GHG) impacts are considered to be cumulative impacts since any increase in GHG emissions would add to the existing inventory of gases that could contribute to climate change. The California Air Resources Board (CARB) has not adopted a definition for a significant impact or GHG emission limits and emission reduction measures. Since there is no specific definition for a significant impact, the new guidelines on GHG emissions do not establish any specific thresholds for determining whether those emissions are significant and has left it to lead agencies to use their best efforts to investigate and disclose a project's environmental impacts. Temporary Project construction emissions would be minimal and the release of GHGs when compared to the scope of the current anthropogenic release of GHGs would be negligible. The Proposed Action would have no discernible impact on GHG.

Utilities and Service Systems: Gravel excavated from the project sites would be redistributed in the Sacramento River system to develop side-channels and riffle supplementation. The Proposed Action would not alter water supplies, water treatment, or storm water drainage facilities.

Indian Trust Assets (ITAs): ITAs are legal interests in assets that are held in trust by the U.S. for federally recognized Indian tribes or individuals. There are no Indian reservations, Rancherias or allotments in the project area. The nearest ITA is the Redding Rancheria on Clear Creek, near the confluence with the Sacramento River and 1 mile west of Site 6, Shea. The Proposed Action does not have a potential to affect ITAs.

Indian Sacred Sites: Sacred sites are defined in Executive Order 13007 (May 24, 1996) as "any specific, discrete, narrowly delineated location on Federal land that is identified by an Indian tribe, or Indian individual determined to be an appropriately authoritative representative of an Indian religion, as sacred by virtue of its established religious significance to, or ceremonial use by, and Indian religion; provided that the tribe or appropriately authoritative representative of an Indian religion has informed the agency of the existence of such a site." There are no identified Indian Sacred Sites within the Proposed Action area; therefore this project would not inhibit use or access to any Indian Sacred Sites.

Environmental Justice: Executive Order 12898 requires each Federal agency to identify and address disproportionately high and adverse human health or environmental impacts, including social and economic effects of its program, policies, and activities on minority populations and low-income populations. During site development a transient population was present at Site 6, Cypress Ave

Bridge North. The Proposed Action would coordinate with landowners, city officials and law enforcement to ensure appropriate engagement with displaced populations and not result in any adverse human health or environmental impacts to minority or low-income populations.

3.1 Air Quality

Section 176 (c) of the Clean Air Act (CAA) (42 USC 7506 (c)) requires that any entity of the Federal government must conform to the applicable State Implementation Plan (SIP) required under Section 110 (a) of the CAA (42 USC 7401 (a)) before an action is otherwise approved. The action must be consistent with a SIP's purpose of eliminating or reducing the severity and number of violations of the National Ambient Air Quality Standards (NAAQS) and achieving expeditious attainment of those standards.

3.1.1 Affected Environment

The Proposed Action is located within the Shasta County Air Quality Management District (SCAQMD), which is part of the Northern Sacramento Valley Air Basin (NSVAB). The SCAQMD is responsible for implementing emissions standards and other requirements of federal and state laws. Under the California Clean Air Act of 1988 (CCAA), air management districts are responsible for attaining and maintaining state ambient air quality standards.

Criteria air pollutants are prevalent pollutants in the air that are known to be deleterious to human health. Criteria air pollutants are designated as nonattainment, attainment, and unclassified and include ozone (O_3), carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), particulate matter (PM_{10} and $PM_{2.5}$), and lead.

The SCAQMD is in attainment for all NAAQS for criteria pollutants of concern. Under California Ambient Air Quality Standards (CAAQS) the SCAQMD is in attainment for all for criteria pollutants of concern except for ozone (O_3) (moderate nonattainment) and inhalable particulate matter between 2.5 and 10 microns in diameter (PM_{10}) (CARB 2012). As a result, the emissions of most concern are O_3 (which includes precursors such as volatile organic compounds [VOC] and nitrogen oxides [NO_x]), and PM_{10}.

Ozone is a colorless gas with a strong odor and is a major component of smog. Precursor emissions such as hydrocarbons and nitrogen oxides react in the atmosphere to form ozone. Summer is generally the peak ozone season, due to low wind and warm temperatures providing optimum conditions for ozone to form. In the Project area air basin, ozone problems typically occur between the months of May through October (SVAQEEP 2013). California ozone standards are .07 parts-per-million (ppm) for an 8-hour average and .09 ppm for a 1-hour average. National standards for ozone are .075 ppm for an 8-hour average. Because of the relative intractability of the PM_{10} and $PM_{2.5}$, the CCAA excludes particulate matter from planning requirements.

3.1.2 Environmental Consequences

No Action Alternative

Under the No Action Alternative, there would be no impacts to air quality since no construction would take place. Therefore, no impacts on air quality would occur.

Proposed Action

The Proposed Action would involve minor ground disturbance, the use of construction equipment, and worker commutes that would result in temporary emissions.

For the purpose of this analysis, it was assumed up to approximately 20,000 cubic yards (30,000 tons) would be transported each year. Hauling of gravel outside of the project sites would be limited to Monday through Friday, except holidays, from 7 am to 5 pm for approximately one month per site (22 working days). Delivery of gravel to any site would not be done at the same time as delivery to another site. Using 24-ton trucks to transport the gravel to the staging area, each site would create approximately 57 trips (one-way) per day. Additional traffic would occur from daily worker trips to the site. Gravel would be transported to one augmentation site at a time and there would be no overlap between the transportation phases. Gravel extraction and onsite work could occur simultaneously. Stockpile areas adjacent to the river would be within the Area of Potential Effects (APE). Not all equipment would be used at all times, nor would it all be used at each site. Estimates are provided as bookends to incorporate the maximum. Project emissions in Table 3 are annual estimates.

Construction emissions would vary from day to day and by activity, timing and intensity, and wind speed and direction. Generally, air quality impacts from the Proposed Action would be temporary and localized in nature.

Short-term air quality impacts would be associated with construction, and would generally arise from dust generation (fugitive dust), operation of construction equipment, and worker vehicle trips. Fugitive dust results from land clearing, grading, excavation, and vehicle traffic on paved and unpaved roads. Fugitive dust is a source of airborne particulates, including PM_{10} and $PM_{2.5}$. Large earth-moving equipment, trucks, and other mobile sources powered by diesel or gasoline are also sources of combustion emissions, including NO_x, CO, VOC, SO_2, and small amounts of air toxics.

Calculated emissions from the Proposed Action were estimated using the 2013 CalEEMOD software (version 2013.2.2), which incorporates emission factors for reactive organic gases (ROG), NO_x, CO, SO_2, and both fugitive and exhaust PM_{10}, and $PM_{2.5}$. Table 3 below provides a summary of the estimated emissions during construction against federal and local emission thresholds in tons per year.

Estimates were developed assuming 22 working days per site, up to three sites per year.

Table 3 – Equipment Assumptions for CalEEMod

Phase Type	Equipment Types	Amount	Hours/Day	HP	Factor
Gravel Augmentation	Off-Highway Trucks	1	8	400	0.38
	Other - 50-ton truck	2	8	600	0.34
	Rubber Tired Dozer	1	8	255	0.4
	Tractors/Loaders/Backhoe	3	8	200	0.37
Gravel Processing	Excavators	1	8	162	0.37
	Other - Gravel sorter	2	8	255	0.4
	Other - Water truck	1	8	260	0.34
	Pumps - Water pumps	2	8	84	0.74
	Rubber Tired Dozer	1	8	255	0.4
	Tractors/Loaders/Backhoe	1	8	200	0.37
Excavation	Excavators	1	8	162	0.38
	Rubber Tired Dozer	1	8	255	0.4
	Tractors/Loaders/Backhoe	3	8	200	0.37
	Off-Highway Trucks	1	8	400	0.38
	Other - 50-ton truck	2	8	600	0.34

Table 4 – Estimated Project Emissions Per Year

Pollutant	Attainment Status[1]	Thresholds for Federal Conformity Determinations[2]	Local Significance Thresholds[3]		Estimated Project Emissions[4]
ROG (as an ozone precursor)	Moderate Non-Attainment (ozone)	50 tons/year	25 lbs/day	137 lbs/day	.6055
NO_x (as an ozone precursor)	Moderate Non-Attainment (ozone)	100 tons/year	25 lbs/day	137 lbs/day	6.5807
PM_{10}	Non-Attainment (CAAQS)	100 tons/year	80 lbs/day	137 lbs/day	28.9596

[1] SCAQMD
[2] 40 CFR 93.153
[3] SCAQMD Level A and Level B thresholds
[4] Construction emissions in tons per year, estimated with CalEEMod (2015)

The SCAQMD established two levels of thresholds for ROG, NO_x, and PM_{10} emissions. If Level A thresholds are exceeded, standard mitigation measures must be applied, however if Level B thresholds are exceeded, best available mitigation measures must be applied.

Level A thresholds for ROG and NO_x would be approximately 4.56 tons per year (25 pounds per day). ROG Level A thresholds would not be exceeded. NO_x Level A thresholds would be exceeded. Level B thresholds for ROG, NO_x, and PM_{10} would be approximately 25 tons per year (137 pounds per day). Level B thresholds for PM_{10} would be exceeded in the Proposed Action based on CalEEMod estimates.

Mitigation measures to reduce fugitive dust could include watering the roads and exposed areas and limiting vehicle speeds on unpaved roads to 15 miles per hour (mph). The estimated emissions for PM_{10} with fugitive dust suppression measures would be 27.9684 tons/year (3.42% reduction) and $PM_{2.5}$ would be 3.3506 tons/year (11.72% reduction).

The Proposed Action would also include applicable and feasible standard and best available mitigation measures to reduce emissions, in accordance with the City of Redding 2000-2020 General Plan (2000). Dirt roads would be watered at least twice each day when being used by gravel trucks and other project-related vehicles. All disturbed soils within the project site would be stabilized to reduce erosion potential both during and following construction. Planting, seeding with native species, and mulching would be used to reestablish ground cover. Where suitable vegetation cannot reasonably be expected to become established non-erodible material would be used for such stabilization.

Ozone can be determined by adding the precursor ROG and NO_x emissions. For the Proposed Action, ozone would be approximately 7.1862 tons/year (ROG [.6055] + NO_x [6.5807]). The Proposed Action would emit approximately 509 metric tons of carbon dioxide equivalents (CO_2e) per year. Because it is believed that global warming is being caused by human activities on the entire planet it would be highly speculative to conclude that this would have a direct adverse impact on global climate. Temporary project construction emissions would be minimal and the release of GHGs when compared to the scope of the current anthropogenic release of GHGs would be negligible.

The Proposed Action would involve temporary minor emissions from worker trips made to the site and back. Implementation of the Proposed Action would not result in an increase of long-term emissions from mobile, stationary, or area sources. Total emissions would be temporary, would not exceed the federal general conformity or state *de minimis* thresholds, and would not result in a cumulatively considerable net increase.

The Proposed Action would result in diesel exhaust emissions from on-site construction equipment. The diesel exhaust emissions would be intermittent and temporary and would dissipate rapidly from the source with an increase in distance.

Odors from equipment emissions may occur and although offensive odors rarely cause any physical harm, they still can be very unpleasant. The occurrence and severity of odor impacts depend on numerous factors, including the nature, frequency, and intensity of the source; wind speed and direction; and the presence of sensitive receptor. The project would not include the long-term operation of any new sources of odor. Thus, the Proposed Action would not create objectionable odors affecting a substantial number of people.

Best Management Practices

- Basic Air Quality Control Measures would be implemented at the project site, including, but not limited to, watering dirt roads and construction areas and limiting vehicle speeds on unpaved roads to 15 mph.
- Hauling of gravel outside of the project sites would be limited to Monday through Friday, except holidays, from 7 am to 5 pm.

3.2 Biological Resources

3.2.1 Affected Environment

The project area is located along the urban and rural areas of the City of Redding and City of Anderson, primarily in riparian and floodplain communities of the Sacramento River. Habitat consists of predominantly willows (*Salix sp*.), cottonwoods (*Populus fremontii*), and valley oaks (*Quercus lobata*). Typical understory plants include blackberry (*Rubus sp.*), poison oak (*Toxicodendron diversilobum*), elderberry (*Sambucus mexicana*), and rushes.

Typical wildlife species associated with the riparian and floodplain communities include mammals such as striped skunk, raccoon, and gray fox. Riparian bird species include red-shouldered hawk, wood duck, great blue heron, black-crowned night heron. Amphibians and reptiles include Pacific tree frog, Pacific gopher snake, garter snake, and western pond turtle. Special status species that associate with riparian and floodplain habitats include federally listed western yellow-billed cuckoo and valley elderberry longhorn beetle.

The banks along the Sacramento River immediately below Keswick Dam are mostly steep-sided bedrock, which precludes the development of extensive riparian vegetation. The river corridor from Redding to Red Bluff once supported extensive areas of riparian vegetation. Agricultural and residential development has permanently removed much of the native and natural habitat. Although riparian woodlands along the upper Sacramento River typically occur in narrow or discontinuous patches, they provide value for wildlife and support both

common and special status species of birds, mammals, reptiles, amphibians, and invertebrates.

Release of flows from Shasta Dam changed the pre-dam flow patterns from high flows in the mid-spring during snow melt to high flows in the summer months. Consequently, in most years, the current flow regime precludes or substantially reduces opportunities for establishment of cottonwoods and willows; and the structure and composition of riparian vegetation has undergone change (Roberts et al. 2002).

Special Status Species

Special-status species addressed in this section include plants and animals that are legally protected or are otherwise considered sensitive by Federal, State, or local resource conservation agencies and organizations. These include species that are State listed and/or Federally listed as rare, threatened, or endangered; those considered as candidates or proposed for listing as threatened or endangered; and plants considered by the California Native Plant Society (CNPS) to be rare, threatened, or endangered.

California Native Plant Protection Act

The Native Plant Protection Act (NPPA) of 1977 protects rare and endangered plants in California and prohibits take of endangered or rare native plants. Based on a review of California Natural Diversity Database (CNDDB) and CNPS database searches for rare and endangered plant species was conducted for the surrounding USGS Quads (2015), federally threatened and state endangered Slender Orcutt grass and state endangered Boggs Lake hedge-hyssop returned occurrences. Under the California Rare Plant Rank they are listed as 1B (Plants Rare, Threatened, or Endangered in California or Elsewhere). CNPS further designates the level of endangerment with a Threat Rank, with .1 meaning a plant is seriously threatened, a rank of .2 means fairly threatened, and a rank of .3 means not very threatened in California.

Impacts to existing vegetation will be avoided to the extent practicable. Disturbed riparian areas, not intended for future road access or gravel placement, would be revegetated with native plant species and mulched with certified weed-free hay following the completion of construction activities. The loss of riparian vegetation is an indirect effect of creating and maintaining access points to the river, and covering vegetation with gravel. Riparian vegetation provides overhead cover and a substrate for food production for juvenile salmonids and Green Sturgeon. The loss of riparian vegetation can therefore increase predation rates and reduce feeding rates for juveniles. Most riparian loss will be replanted and impacts will be temporary (approximately 1-2 growing seasons to be replaced); only a few areas may not be replanted in order to maintain road access. Loss of riparian vegetation is unlikely at lateral berms due to the placement in cobbled or graveled portions of the channel that contain little soil for the production of riparian vegetation. Riffle supplementation and end-dump talus cone gravel augmentation methods and the construction of instream habitat structures would impact little, if

any, of the riparian vegetation surrounding the site. Some vegetation may be temporarily or permanently removed at floodplain and side channel sites. Overall, the amount of riparian vegetation that would be lost is extremely small.

Threatened or Endangered Species

The USFWS and NMFS have jurisdiction over federally listed threatened and endangered species. An endangered species is defined as "…any species which is in danger of extinction throughout all or a significant portion of its range." A threatened species is defined as "…any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range" (16 USC Section 1532). Section 9 of the Endangered Species Act of 1973 (ESA) makes it illegal to "take" (defined as to "harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect or attempt to engage in such conduct") endangered and threatened species (16 USC 1538).

A special-status species list was generated from the Service Information for Planning and Conservation (IPaC) website for the surrounding area on August 4, 2015 (USFWS 2015). The following Table 4 includes those federally listed species with recorded occurrences within the surrounding USGS 7.5-minute Quads based on the CNDDB (2015). The table also includes the species' status, determination of impacts from the Proposed Action, and a summary of the rationale supporting the determination.

Migratory Bird Treaty Act

A list of bird species with recorded occurrences within the surrounding quads was also obtained from the CNDDB (2015). The list was compared to the Service's list of protected species under the Migratory Bird Treaty Act (MBTA) of 1918 (2015a). Protected migratory bird species with recorded occurrences in the Proposed Action project area are included in Table 4.

Table 3 – Special Status Species List

Common Name	Scientific Name	Status[1]	Effect[2]	Summary of Effects Determination[3]
Plants				
Slender Orcutt grass	*Orcuttia tenius*	FT, SE 1B.1	NE	Occurences[4] and Critical Habitat outside of the Action Area. Occurs in vernal pools habitat. Unlikely to occur due to lack of suitable habitat.
Boggs Lake hedge-hyssop	*Gratiola heterosepala*	SE 1B.2	NE	
Invertebrates				
Conservancy fairy shrimp	*Branchinecta conservatio*	FE	NE	Occurences[4] and Critical Habitat outside of the Action Area. Occurs only in vernal pools and swales. Unlikely to occur due to lack of suitable habitat.
Vernal pool fairy shrimp	*Branchinecta lynchi*	FT, X	NE	
Vernal pool tadpole shrimp	*Lepidurus packardii*	FE, X	NE	
Valley elderberry longhorn beetle	*Desmocerus californicus*	FT	NLAA	Elderberry shrubs are present along the river corridor. No elderberry

	dimorphus			shrubs would be disturbed.
Birds				
Northern spotted owl	*Strix occidentalis caurina*	FT, X MBTA	NE	Occurs in old-growth forests. Critical Habitat units located in higher elevations.
Tricolored blackbird	*Agelaius tricolor*	SE MBTA	NE	Impact would not be substantial based on abundance of suitable foraging habitat and pre-construction surveys.
Osprey	*Pandion haliaetus*	MBTA	NE	Impact would not be substantial based on abundance of suitable foraging habitat and pre-construction surveys.
Bank swallow	*Riparia riparia*	MBTA	NE	No vertical bluffs with fine/sandy soils would be impacted.
Bald eagle	*Haliaeetus leucocephalus*	SE MBTA	NLAA	Federally delisted. Bald & Golden Eagle Protection Act. Proposed Action would utilize USFWS buffers for known eagle nests.
Swainson's hawk	*Buteo swainsoni*	ST, MBTA	NE	Impact would not be substantial based on abundance of suitable foraging habitat and pre-construction surveys.
Least Bell's vireo	*Viereo belliii pusillus*	FE, SE	NE	Historically, the northern end of distribution included Red Bluff. Currently distribution is limited to southern California (USFWS 1998).
Western yellow-billed cuckoo	*Coccyzus americanus occidentalis*	FT, SE MBTA	NLAA	Proposed Critical Habitat is south of Red Bluff. No suitable breeding habitat.
Mammals				
Townsend's big-eared bat	*Corynorhinus townsendii*	SC	NE	No cave or cave analogues would be impacted.
Amphibians				
California red-legged frog	*Rana draytonii*	FT	NLAA	Surveys would be conducted in accordance with USFWS guidance at sites with deep-water pools with dense emergent vegetation.
Fish				
Delta smelt	*Hypomesus transpacificus*	FT	NE	No habitat present.
Central Valley steelhead	*Oncorhynchus mykiss*	FT, X	LAA	May affect, likely to adversely affect. Biological Assessment sent to NMFS.
Central Valley spring-run Chinook Salmon	*Oncorhynchus tshawytscha*	FT, X	LAA	May affect, likely to adversely affect. Biological Assessment sent to NMFS.
Winter-run Chinook Salmon	*Oncorhynchus tshawytscha*	FE, X	LAA	May affect, likely to adversely affect. Biological Assessment sent to NMFS.
Green sturgeon	*Acipenser medirostris*	FT	NLAA	May affect, likely to adversely affect. Biological Assessment sent to NMFS.

[1] Status: Federal Listing (**FE**: Endangered; **FT**: Threatened; **X**: Critical Habitat)
State Listing (**SE**: Endangered; **ST**: Threatened; **SC**: Candidate)
MBTA: Migratory Bird Treaty Act
[2] Effects determination
NE: No Effect to federally listed species anticipated from the Proposed Action.
NLAA: Not Likely to Adversely Affect with Environmental Protection Measures
LAA: May Affect, and Likely to Adversely Affect
[3] Summary of rationale supporting determination
[4] California Natural Diversity Database 2015 recorded occurrences in selected Quads (Redding, Enterprise, Cottonwood, Balls Ferry, Bend, Red Bluff East) and surrounding 18 Quads.

Vernal Pool Species

Vernal pools are ephemeral wetlands that fill during the rainy season and disappear during the dry season. During the time water is present they provide unique habitat for species like vernal pool fairy shrimp, vernal pool tadpole shrimp, Sacramento Orcutt grass, and Boggs Lake hedge-hyssop. Revised critical habitat for vernal pool crustaceans was designated on August 11, 2005 (70 FR 46923).

Valley Elderberry Longhorn Beetle (*Desmocerus californicus dimorphus*)

Valley Elderberry Longhorn Beetle (VELB) is listed as threatened under the ESA (45 FR 52803). On October 2, 2006, USFWS, in their 5-year review, recommended for the species to be removed from the endangered species list. USFWS withdrew the proposed rule to remove VELB from the endangered species list on September 17, 2014. Best available science indicated that threats to the species and its habitat have not been reduced to the point of delisting (79 FR 55879). The CALFED Bay-Delta Ecosystem Restoration Program Plan's *Multi-Species Conservation Strategy* designates the valley elderberry longhorn beetle as a Recovery species (CALFED Bay-Delta Program 2000), which establishes a goal to recover the species.

The CNDDB reports one occurrence of VELB along the Sacramento River, located at East Turtle Bay Park approximately ¼ mile downstream of Turtle Bay Island on the opposite bank (2015). Initial site visits by Reclamation staff in January 2014 indicated elderberry shrubs in areas adjacent to sites identified in the Proposed Action. Site designs were subsequently altered to avoid known elderberry shrubs.

Distribution of VELB is typically based on the occurrence of elderberry shrubs (*Sambucus* spp.), an obligate host plant, which are known to occur along riparian corridors on the Sacramento River. Much of the typical floodplain habitat has been developed, or converted through the construction of dams and levees. The greatest historical threat to the valley elderberry longhorn beetle has been the elimination, loss, or modification of its habitat by urban, agricultural, or industrial development and other activities that reduce or eliminate its host plants. Invasive insects have been identified as potential threats to VELB through predation and competition. Invasive plant species may have significant indirect impacts by

affecting elderberry shrub vigor and recruitment, impairing elderberry germination or establishment, or elevating fire risk.

In 1999, the USFWS developed the *Conservation Guidelines for the Valley Elderberry Longhorn Beetle* to mitigate development-related impacts on VELB.

Bank swallow (*Riparia riparia*)
Bank swallows require vertical earthen banks and cliffs with fine-textured sandy soils near water to dig nesting holes. On the Sacramento River, bank swallows generally arrive in late March and migrate south by late August (CDFG 1992). Under the California Endangered Species Act, the bank swallow is listed as threatened.

Bald eagle (*Haliaeetus leucocephalus*)
Although the bald eagle was federally delisted in 2007, the Bald and Golden Eagle Protection Act (16 USC 668-668c) continues prohibitions on take including disturbance, such as injury, decreasing productivity, or substantially interfering with normal breeding, feeding, or sheltering, or nest abandonment. Under California Endangered Species Act, the bald eagle is listed as endangered and is designated as Fully Protected by CDFW.

The bald eagle is a large bird of prey that winters throughout California. They forage opportunistically on fish and waterfowl but also prey on other small animals and eat carrion. Bald eagles winter along rivers, lakes, or reservoirs that support adequate fish or water bird prey and have mature trees or large snags available for perch sites. A bald eagle nest is located in a cottonwood tree on the north side of Highway 44 just east of Exit 1 on river right.

Western Yellow-billed cuckoo (*Coccyzus americanus*)
Western Yellow-billed cuckoo (WYBC) require large dense canopy of willow and cottonwoods for nesting habitat and rarely nests at sites less than 50 acres (Laymon and Halterman 1989). The optimal size for nesting habitat is greater than 200 acres and anything less than 37 acres is considered unsuitable. Stopover and foraging sites are found in small groves or strips of trees sometimes less than 10 acres and may lack understory. Adults typically arrive in California around June and depart the breeding grounds by mid-September. The young have one of the shortest nesting cycles of any bird species, fledging in as little as 17 days from the times the eggs are laid.

Critical Habitat for the WYBC was proposed by USFWS on August 15, 2014. The northern most unit of proposed critical habitat in the Central Valley is unit CA-2 (USFWS 2014). The unit is a 69-mile long continuous segment of the Sacramento River beginning 5 miles southeast of the city of Red Bluff, California.

California Red-Legged Frog (*Rana aurora draytonii*)
California red-legged frog (CRF) habitat consists of pools, slow-moving streams, and stock ponds with fairly dense bank cover. In addition to aquatic habitat, CRF

require riparian and upland habitat types. Preferred habitat includes deep-water pools with dense emergent vegetation. The project area provides several backwater areas within existing side-channels and ponds created by former side-channels. The Sacramento River itself does not provide breeding habitat. The nearest CNDDB occurrence of the CRF is southwest of the city of Red Bluff.

CRF typically breed from mid-December through early April (Barry and Fellers 2013). Breeding habitat occurs along margins and shallow parts of sunlit natural and manmade pools. Habitat also includes slow moving streams, overflow basins, and sloughs in Central Valley, as well as channels, canals, farm ponds, and rice fields.

Historically, high winter and spring flows in Central Valley rivers flooded large sections. The high and fluctuating flows and low water temperatures limited breeding habitat in the Central Valley. Extensive natural winter and spring flooding precludes breeding activity and water declines in the early summer precludes tadpole survival to metamorphosis.

The nearest Critical Habitat Unit as of March 17, 2010 is unit BUT-1, located in Butte County, approximately 50 miles southeast of the city of Red Bluff, California (75 FR 12816 12959).

Fisheries

Impact on fisheries with implementation of the Proposed Action would be limited to fish in the upper Sacramento River from Keswick Dam (RM 302) downstream to RBDD at RM 243. The reach is habitat for four species of management concern: Central Valley spring-run Chinook Salmon Evolutionarily Significant Units (ESU) *(Oncorhynchus tshawytscha),* Sacramento River winter-run Chinook Salmon ESU *(Oncorhynchus tshawytscha),* Central Valley steelhead DPS *(Oncorhynchus mykiss)* and North American Green Sturgeon Southern DPS (*Acipenser medirostris*).

Sacramento River Winter-run Chinook Salmon ESU (Oncorhynchus tshawytscha)

NMFS designated winter-run Chinook Salmon federally endangered June 28, (NMFS 2005a). Critical habitat for winter-run Chinook Salmon was designated on June 16, 1993 and includes the Sacramento River from Keswick Dam to Chipps Island (RM 0).

The Sacramento River winter-run Chinook Salmon ESU consists of one population confined to the Upper Sacramento River. At present, the freshwater life stages of winter-run Chinook Salmon are found only in the Sacramento River below Keswick Dam, thus all winter-run production occurs in the Sacramento River. Access to approximately 58 percent of the original winter-run Chinook Salmon habitat has been blocked by dam construction (CDFG 2003).

Adult Sacramento River winter-run Chinook Salmon migrate upstream past the RBDD beginning in mid-December and continuing into early August. The majority of the run passes RBDD between January and May, with the peak in mid-March (Hallock and Fisher 1985). Winter-run Chinook Salmon only spawn in the Sacramento River and a majority (99 percent) spawn upstream of Balls Ferry (RM 276) based on aerial redd survey data collected since passage improvements were made at the ACID diversion dam. Although some adults migrate upstream through August, spawning typically occurs May through July with the peak in late June.

Between 44 and 81 percent of winter-run juveniles used areas downstream of RBDD for nursery habitat and the relative use above and below RBDD appeared to be influenced by river discharge during fry emergence (Martin et al. 2001). Juvenile emigration past RBDD (RM 243) may begin in late July, generally peaks in September, and can continue until mid-March in drier years (Vogel and Marine 1991). Juveniles are found upstream of the Deer Creek confluence with the Sacramento River from July through September and spread downstream to Princeton (RM 164) between October and March (Johnson et al. 1992).

Central Valley Spring-run Chinook Salmon ESU (Oncorhynchus tshawytscha)

Central Valley spring-run Chinook Salmon were listed as threatened on September 16, 1999 (NMFS 1999a). This ESU consists of all spring-run Chinook Salmon occurring in the Sacramento River basin. Critical habitat was designated for Central Valley spring-run Chinook Salmon on September 2, 2005 and includes the Sacramento River (NMFS 2005b).

The Central Valley spring-run Chinook Salmon ESU is comprised mainly of three self-sustaining wild populations (Mill, Deer and Butte Creeks) (Lindley et al. 2007), which are outside of the action area. These three populations have been experiencing positive growth rates since the low abundance levels of the late 1980s.

Recent estimates indicate roughly 2,000 miles of salmon spawning and rearing habitat were available before dam construction and mining, but 82 percent of that habitat is unavailable or inaccessible today (Yoshiyama et al. 1996).

Spring-run Chinook Salmon may spawn in the Sacramento River between RBDD and Keswick Dam, but most spawning (99 percent) occurs upstream of Jellys Ferry Bridge (RM 265.9) , based on aerial redd survey data collected from 2001–2004. Spring-run spawning is not as concentrated in the upstream area immediately above and below ACID Dam as is the winter-run spawning distribution.

Sacramento River mainstem spring-run abundance has declined sharply since the mid-1980s. The criteria for run classification at RBDD have changed; therefore

reliable conclusions cannot be reached about spring-run abundance changes in the Sacramento River. The variable abundance estimates may be an artifact of the counting methods used in different years and categorization of fish between runs. The 5-year geometric mean abundance reported by NMFS (1999a) was 435 fish. There is evidence that the spring-run that pass RBDD are spring-run/fall-run hybrids. Historically, the onset of fall-run spawning occurred well after spring-run had completed spawning. The increasing overlap in spring-run and fall-run spawning periods is evidence that introgression is occurring. Because spring-run and fall-run Chinook Salmon now use the same spawning riffles, fall-run spawners may reduce survival of eggs in the spring-run redds. This redd displacement is called superimposition. The criteria used to distinguish spring-run from fall-run between 1970 and 1988 (timing) probably resulted in many fall-run fish being classified as spring-run (CDFG 2003), so the increasing overlap may be simply an artifact of the variable run classification.

Emigration timing is highly variable. Pulse flows that occur during precipitation events tend to stimulate downstream movement along the Sacramento River. Spring-run juveniles that remain in the Sacramento River over the summer are confined to approximately 100 miles of the upper mainstem, where cool water temperatures are maintained by dam releases.

California Central Valley Steelhead DPS (Oncorhynchus mykiss)

Central Valley steelhead were listed as threatened under the ESA on January 5, 2006 (71 FR 834) and include all naturally spawned populations of steelhead in the Sacramento and San Joaquin rivers and their tributaries, excluding steelhead from San Francisco and San Pablo bays and their tributaries and two artificial propagation programs: the Coleman National Fish Hatchery and Feather River Fish Hatchery steelhead hatchery programs. Critical habitat was designated for Central Valley steelhead on September 2, 2005, and includes the Sacramento River (NMFS 2005c).

Populations of naturally spawned Central Valley steelhead are at lower levels than were found historically and are composed predominantly of hatchery fish (McEwan 2001). In general, the majority of Central Valley steelhead are confined to non-historical spawning and rearing habitat below impassable dams, but the existing spawning and rearing habitat can sustain steelhead at current population levels. In addition, monitoring data indicates that much of the anadromous form of the species is hatchery supported. There is also a strong resident component to the population (referred to as rainbow trout) that interacts with and produces both resident and anadromous offspring. Rotary screw trap data at RBDD indicate that most juvenile steelhead observed there are resident forms, based on timing and size (ICF 2012).

Recent steelhead monitoring data are scarce for the Upper Sacramento River system. Hallock (1989) reported that steelhead have declined drastically above the mouth of the Feather River. In the 1950s, the average estimated spawning

population size above the mouth of the Feather River was 20,540 fish (SAIC 2007). In 1991–1992, the annual run size for the total Sacramento River system was likely less than 10,000 adult fish (SAIC 2007). From 1967 to 1993, the estimated number of steelhead passing RBDD ranged from a low of 470 to a high of 19,615 (CHSRG 2012). Based on otolith sampling of *O. mykiss* in the Upper Sacramento River system, Zimmerman et al. (2009) found that less than 50 percent of age 0 to 4 fish sampled were progeny of an anadromous (steelhead) mother.

North American Green Sturgeon Southern DPS (Acipenser medirostris)

The Southern DPS of North American Green Sturgeon (Green Sturgeon) includes all Green Sturgeon populations south of the Eel River, with the main spawning population in the Sacramento River and some of its tributaries. The Southern DPS of North American Green Sturgeon was listed as threatened on April 7, 2006 (71 FR 17757), and is designated as a California species of special concern. The Green Sturgeon Southern DPS presently contains only a single spawning population within the Sacramento River basin, which primarily spawns in the mainstem Sacramento River downstream of Keswick Dam (RM 302), but spawning has also been documented in the Feather River downstream of Oroville Dam (NMFS 2005c) and potentially in the Yuba River where adults exhibiting spawning behavior have been observed (AFRP 2011). Critical habitat was designated for the Southern population North American Green Sturgeon DPS on October 9, 2009 (74 FR 52300).

The Sacramento River provides spawning, adult holding, foraging, and juvenile rearing habitat for Green Sturgeon. Although the upstream extent of historical Green Sturgeon spawning in the Sacramento River is unknown, the observed distribution of sturgeon eggs, larvae, and juveniles indicates that spawning occurs from Hamilton City (RM 200) to as far upstream as Ink's Creek confluence (RM 281) and possibly up to the Cow Creek confluence (RM 280)(Brown 2007; Poytress et al. 2013). Peak spawning is believed to occur between April and June. Optimal spawning temperatures and spawning substrate exist for sturgeon in the Sacramento River well above and well below RBDD (Reclamation 2008).

Spawning migrations and spawning by Green Sturgeon in the upper Sacramento River mainstem have been well documented over the last 15 years (Beamesderfer et al. 2004). Anglers fishing for white sturgeon or salmon commonly report catches of Green Sturgeon from the Sacramento River at least as far upstream as Hamilton City (Beamesderfer et al. 2004). Eggs, larvae, and post larval Green Sturgeon are now commonly reported in sampling directed at Green Sturgeon and other species (Beamesderfer et al. 2004, Brown 2007). Young-of-the-year (YOY) Green Sturgeon have been observed annually since the late 1980s in fish sampling efforts at RBDD and the Glenn-Colusa Canal (Beamesderfer et al. 2004). Acoustically tagged Green Sturgeon were detected upstream of RBDD in 2004–2006 (Heublein et al. 2009).

Green Sturgeon from the Sacramento River are genetically distinct from their northern counterparts indicating a spawning fidelity to their natal rivers (Israel et al. 2004). Larval Green Sturgeon were regularly captured during their dispersal stage at about two weeks of age (24–34 mm fork length) in rotary screw traps at RBDD (CDFG 2002; USFWS 2002). Larval Green Sturgeon are regularly captured during their dispersal stage at about three weeks old when captured at the Glen-Colusa facility at RM 205.5 (CDFG, unpublished data; Van Eenennaam et al. 2001).

Young Green Sturgeon appear to rear for the first one to two months in the Sacramento River upstream of Hamilton City (CDFG 2002). Rearing habitat condition and function may be affected by variation in annual and seasonal flow and temperature characteristics. Empirical estimates of Green Sturgeon abundance are not available for the Sacramento River population or any west coast population (Reclamation 2008) and the current population status of Southern DPS Green Sturgeon is unknown (Beamesderfer et al. 2007, Adams et al. 2007). A genetic analysis of Green Sturgeon larvae captured in the Sacramento River estimated that the number of adult spawning pairs upstream of RBDD ranged from 32 to 124 between 2002 and 2006 (Israel 2006). NMFS (2009) noted that the restriction of spawning habitat for the Southern DPS Green Sturgeon to one reach of the Sacramento River increases the vulnerability of this spawning population to catastrophic events.

Critical Habitat

The federal ESA requires that USFWS and NMFS designate critical habitat for species listed as federally endangered or threatened. “Critical habitat” is defined in ESA as: (1) specific areas within the geographical area occupied by the species at the time of listing, if they contain physical or biological features essential to a species’ conservation, and those features may require special management considerations or protection; and (2) specific areas outside the geographical area occupied by the species if the agency determines that the area itself is essential for conservation (16 USC 1531 et seq).

Critical habitat has been designated for two ESUs and two distinct population segments (DPS) located within the project area

- Central Valley Spring-run Chinook Salmon ESU
- Sacramento River Winter-run Chinook Salmon ESU
- California Central Valley Steelhead DPS
- North American Green Sturgeon Southern DPS

Primary Constituent Elements of Critical Habitat

Anadromous Salmonids

Primary constituent elements (PCEs) of anadromous salmonid critical habitat are similar and are essential for supporting one or more life stages of each ESU or

DPS (spawning, rearing, migration, and foraging). On September 2, 2005, NMFS released the designated critical habitat for seven ESUs of salmon in California (50 CFR 226.211) The specific PCEs included in that designation were: (1) freshwater spawning sites with conditions and substrate that support spawning, incubation, and larval development; (2) freshwater rearing areas with sufficient water quantity and floodplain connectivity to create and maintain suitable habitat conditions supporting juvenile growth and mobility, water quality and food to support growth and development, and natural cover components (e.g., large wood, shade, large substrate) to escape high flows and predation; (3) unobstructed freshwater migration corridors with sufficient cover and water quantity and quality suitable for juvenile and adult movement and survival; (4) suitable estuarine habitat with natural cover (e.g., aquatic vegetation, large wood, side channels), food, and sufficient water quantity and quality to support growth, movements, and physiological changes (e.g., smoltification) of juvenile and adult fish; (5) nearshore marine areas with sufficient cover, food, and water quantity and quality; and (6) offshore marine areas with sufficient food and water quality to support growth and maturation.

Green Sturgeon

On October 9, 2009, NMFS designated critical habitat for the Southern DPS of Green Sturgeon (50 CFR 226.219). In that designation, the specific PCEs essential for the conservation Green Sturgeon in freshwater riverine systems were: 1) food resources; 2) substrate type or size (i.e. structural features of substrates); 3) water flow; 4) water quality; 5) migratory corridor; 6) depth; 7) sediment quality.

Essential Fish Habitat

The Magnuson-Stevens Fishery Conservation and Management Act, as amended by the Sustainable Fisheries Act (Public Law 104 to 297), mandates all federal agencies consult with NMFS on any activities or proposed activities authorized, funded, or conducted by that agency that may adversely impact essential fish habitat (EFH) of commercially managed marine and anadromous fish species (Section 305(b)(2). These regulations require that federal action agencies provide NMFS with a written assessment of the effects of their action on EFH (50 CFR Section 600.920). EFH includes specifically identified waters and substrate necessary for fish spawning, breeding, feeding, or growing to maturity. Important components of EFH for spawning, rearing, and migration include suitable substrate composition; water quality (e.g., dissolved oxygen, nutrients, temperature); water quantity, depth and velocity; channel gradient and stability; food; cover and habitat complexity (e.g., large woody debris, pools, channel complexity, aquatic vegetation); space; access and passage; and floodplain and habitat connectivity (Pacific Fishery Management Council 2003). EFH also includes all habitats necessary for the production of commercially valuable aquatic species, to support a long-term sustainable fishery, and contribute to a healthy ecosystem (16 USC 1802[10]). The Sacramento River is designated as EFH for Chinook Salmon.

Fish and Wildlife Coordination Act

The Fish and Wildlife Coordination Act, as amended in 1964, was enacted to protect fish and wildlife when Federal actions result in the control or modification of a natural stream or body of water. The statute requires Federal agencies to take into consideration the effect that water-related projects would have on fish and wildlife resources. Consultation and coordination with USFWS and State fish and game agencies are required to address ways to prevent loss of and damage to fish and wildlife resources and to further develop and improve these resources.

3.2.2 Environmental Consequences

No Action Alternative

Under the No Action Alternative, Reclamation would not place gravel in the Sacramento River below Keswick Dam, nor would side-channels be developed. The reach would remain in a deteriorated condition as spawning and rearing habitat for salmonids. Further declines in habitat quality would be likely.

Proposed Action

Pre-construction surveys would be conducted for rare, threatened, and endangered species as described below. Preliminary surveys have been completed for the selected sites and additional pre-construction surveys would be completed two to three weeks before construction begins.

Migratory Songbirds and Raptors

Surveys for nesting activity of raptors would occur within a 250-foot radius of the construction site and concentrate on mature trees. Surveys for migratory birds, including bald eagles, would be conducted by a qualified biologist within a 50-foot radius of the construction site two weeks prior to construction. If any active nests are observed, these nests and nest trees would be protected (while occupied) during project activities, using buffer zones, monitoring or delaying activities. The general nesting season for songbirds and raptors in the project area is approximately March 1 – August 31. To avoid impacts, vegetation removal shall occur outside the nesting season.

Vernal Pools

There is no vernal pool habit within the project area. Vernal pools are generally not present within the active floodplain. The nearest Critical Habitat unit is located approximately 1.5 miles east of Site 7, Kapusta near the Redding Municipal Airport. The unit is the largest intact vernal pool habitat in the Sacramento Valley and represents the northern range for vernal pools in California (USFWS 2005a).

Valley Elderberry Longhorn Beetle (*Desmocerus californicus dimorphus*)

Elderberry shrubs, the host plant for the VELB, were found during initial surveys of the project area; however, site specific designs were altered to avoid elderberry shrubs. USFWS guidelines for VELB require complete avoidance within 100 feet

around elderberry plants containing stems measuring 1.0 inch or greater in diameter at ground level (USFWS 1999).

Gravel trucks would generate dust which may harm elderberry plants. Dust is listed in the species recovery plan as a threat to the VELB. To avoid affecting the VELB, dirt roads would be watered at least twice each day when being used by gravel trucks and other project-related vehicles. Construction would occur outside of the valley elderberry longhorn beetle's spring emergent period and vehicles would not come in contact with any elderberry shrubs. No elderberry shrubs would be removed or trimmed.

Though elderberry shrubs are present within the action area, USFWS Guidelines for VELB would be implemented prior to and during all stages of the project to avoid any potential adverse impacts to the species. The proposed action will adhere to the following conservation measures:

- Shrubs within 100 feet of the project site would be surrounded with orange fencing at a 20-foot radius and flagged prior to construction.
- A USFWS approved biologist will conduct environmental awareness training to instruct construction personnel crews working in the vicinity of the identified shrubs about the status of VELB and the need to protect its elderberry host plant. The training and supporting materials will include identification of special status species, required practices before the start of construction, general measures that are being implemented to conserve these species as they relate to the proposed project, and penalties for noncompliance. Upon completion of training, construction personnel will sign a form stating that they have attended the training and understand all the conservation measures. Training will be conducted in English and other languages, as appropriate. Proof of this instruction will be kept on file with the contractor. Reclamation will provide USFWS with a copy of the training materials and copies of the signed forms.
- Temporary stockpiling of excavated or imported material will occur only in approved construction staging areas and outside of the established driplines of elderberry shrubs. Excess excavated soil will be used on site or disposed of at a regional landfill or other appropriate facility.
- Standard precautions will be employed by the construction contractor to prevent the accidental release of fuel, oil, lubricant, or other hazardous materials.
- A litter control program will be instituted. The contractor will provide closed garbage containers for the disposal of all food-related trash items. All garbage will be removed daily.
- The contractor will ensure that dust control measures (e.g., watering) are implemented in the vicinity of any elderberry shrub within 100 feet of construction activities.
- To avoid affecting the VELB, dirt roads would be watered at least twice each day when being used by gravel trucks and other project-related vehicles.

As described above and when taking into consideration implementation of the Guidelines, effects on the VELB from the project are extremely unlikely to occur and are thus, discountable. Reclamation has determined that the project will have an insignificant effect to VELB and therefore is not likely to adversely affect VELB.

The Proposed Action could potentially cause impacts to the beetle during mobilization of equipment within the project area. Trucks would generate dust which may harm elderberry plants. Species information and conservation guidelines for the VELB were established by USFWS in 1999 *(U.S. Fish and Wildlife Service 1999)* and are incorporated by reference. The guidelines were designed mainly to mitigate development-related impacts on VELB. The proposed action would not include development that would impact the beetle or its associated habitat.

Bank Swallow (*Riparia riparia*)
Bank swallow holes were identified during a site visit at the Tobiasson site along the scoured vertical bank (river left). Design was altered to avoid the levee by moving the east bank site downstream. Bank protection projects have contributed to the loss of habitat for bank swallows (DFG 1992). The selected sites do no occur on banks of suitable material and/or steepness. Any future sites selected that contain habitat with vertical cliffs would be surveyed for bank swallow holes. If bank swallow nest holes are found, the site would not be considered.

Bald Eagle (*Haliaeetus leucocephalus*)
Surveys for migratory birds, including bald eagles, would be conducted by a qualified biologist within a 50-foot radius of the construction site two weeks prior to construction.

The bald eagle nest on the north side of Highway 44 is located near Turtle Bay Island (Site 4). USFWS recommends a 660 foot buffer for a single construction activity visible from the nest and within one mile of the nest (FWS 2007). Turtle Bay Island is within this buffer; however side channel construction on the island would be outside of the buffer. Bald eagle sensitivity to human activities is highest during the courtship and nest building period, which is typically between January and March in California (FWS 2007). Sites located within a ½ mile of a known bald eagle nest would be completed between September and December.

The Proposed Action would provide benefits to fish populations, which would increase foraging opportunities for bald eagles. Impacts to bald eagles would be considered minor based on the abundance of suitable foraging habitat in the vicinity of the project area.

Western Yellow-billed Cuckoo (*Coccyzus americanus*)
Riparian habitat in the project area is fragmented by residential, commercial, and industrial development. The Proposed Action could affect the WYBC through

vegetation removal necessary for access and side channel development. However, side channel development could provide long-term benefits through improved riparian habitat and decreased channelization. Construction noise has the potential to affect reproduction through potentially masking vocal signals (Bowles 1995).

The project area does not provide suitable breeding habitat. However, WYBC may utilize the area as stopover foraging habitat. Due to the timing of WYBC presence in the project area (June through mid-September) it is unlikely they would be present during construction activities. The Proposed Action will adhere to the following conservation measures:

- Vegetation removal would not occur between March 1st and August 31st. Prior to construction during the month September, surveys would be completed for the presence of nesting birds. If WYBC are found, Reclamation would consult with USFWS on how to proceed.

Through the use of timing windows and pre-construction surveys, effects on WYBC from implementation of the Proposed Action are extremely unlikely to occur. Beneficial impacts may occur with increased riparian habitat and decreased channelization.

California Red-Legged Frog (*Rana aurora draytonii*)

Several selected sites include ponds created by former side-channels that could provide potential CRF habitat. However, high fluctuations in flows and temperature preclude much of the habitat in Central Valley rivers.

In 2005, the USFWS provided guidance on site assessments and field surveys for CRF. Surveys should be completed at night between January and July for adults and during the day between July and September for sub-adults (USFWS 2005b). Qualified biologists shall complete surveys for CRF at sites with deep-water pools with dense emergent vegetation (Turtle Bay Island, Cypress Ave North, Kapusta, Anderson Island, Reading Island). Surveys completed in accordance with USFWS guidance are valid for two years. As surveys expire or as new sites are selected, qualified biologists would complete new surveys for CRF as necessary.

The Proposed Action will adhere to the following conservation measures:

- Qualified biologists would complete surveys for CRF at sites with deep-water pools with dense emergent vegetation.
- Surveys would be updated every two years and as new sites are selected that contain CRF frog habitat.

Fisheries

Due to the life history timing of winter-run Chinook Salmon, spring-run Chinook Salmon, steelhead, it is possible for one or more life stages (i.e., migrating, holding, or spawning adults; incubating eggs; or rearing and emigrating juveniles) to be present at some point within the action area

throughout the year. Additionally, it is possible for one or more life stages of Green Sturgeon (i.e., migrating and holding adults; or rearing and emigrating juveniles) to be present in the lower 37 miles of the action area (RM 280 to RM 243). The timing of construction work windows varies between three zones within the action area (Table 3). These different seasonal work windows are designed to minimize harm to incubating eggs and pre-emergent fry for winter-run Chinook Salmon, spring-run Chinook Salmon, steelhead, and Green Sturgeon. However, work windows would overlap with some salmonid spawning and incubation periods, pre-construction salmonid redd surveys would be conducted in Zones 2 and 3 by a qualified biologist prior to any construction activities that would occur during spawning and incubation periods; any instream work that may cause turbidity within 200 feet upstream of active spawning or redds would be avoided.

Short-term increases in turbidity and suspended sediment levels associated with construction may negatively impact fish populations temporarily through reduced availability of food, reduced feeding efficiency, and exposure to toxic sediment released into the water column. Fish responses to increased turbidity and suspended sediment can range from behavioral changes (alarm reactions, abandonment of cover, and avoidance) to sublethal effects (e.g., reduced feeding rate), and, at high suspended sediment concentrations for prolonged periods, lethal effects (Newcombe and Jensen 1996). If this occurs while adults are spawning or embryos are incubating, injury or mortality to incubating eggs or alevins may occur through the infiltration of fine sediment into salmonid redds with a reduction of intra-gravel water circulation and in severe cases entombment of salmonid eggs and through preventing Green Sturgeon eggs from adhering to each other. The deposition of fine sediments in food producing riffles could also reduce the abundance and availability of aquatic insects on which juveniles feed, and result in the loss of rearing cover for juveniles; in the action area, silt and sand on the stream bottom would be disturbed during placement of new materials, however, the amount of sediment that may be re-suspended during project installations is not likely to be significant; any re-suspension and re-deposition of instream sediments is expected to be localized and temporary and would not reach a level that would acutely affect aquatic organisms. The use of seasonal work windows would generally prevent the siltation of winter-run Chinook Salmon, spring-run Chinook Salmon, and steelhead redds and Green Sturgeon eggs. In Zones 2 and 3, pre-construction surveys for spawning salmonids and redds would minimize the likelihood of injury resulting from the re-suspension and re-deposition of instream sediments.

Impacts to riparian vegetation would occur due to vegetation removal necessary for access and side channel development. Shaded riverine aquatic habitat (SRA) provides cover and substrate for food production. The loss of riparian vegetation and SRA would be temporary.

The following Best Management Practices (BMPs) are included to minimize adverse effects on fish:

- Added gravel would be uncrushed, rounded "natural river rock" with no sharp edges, and the distribution of particle size would be in accordance with recommendations of the Anadromous Fish Restoration Program.
- Front loaders placing the gravel would have rubber wheels and would be moving slow enough for fish to avoid disturbed areas.
- Work would be during August through September (the period of lowest potential impact to salmonids).
- Gravel would be washed and have a cleanliness value of 85 or higher, based on CalTrans Test #227, and the gravel would be completely free of oils, clay, debris, and organic material.

The goal of the Proposed Action is to beneficially affect salmon and steelhead spawning and rearing habitat with the result of increasing the production of these species in the upper Sacramento River. Work in the river would be limited to times of the year when effects on salmon and steelhead life stages in the river can be minimized. The egg incubation period is the most sensitive life stage so timing windows (Table 3) have been developed to avoid impacts. Although salmonids may be present in the river, they would be sufficiently mobile to avoid instream work and areas of temporary turbidity.

Construction would dislodge aquatic benthic organisms and the gravel being placed in the river would take a few months to recolonize. During construction this would provide a feeding opportunity for fish downstream (Merz 2008).

On October 9, 2015, NMFS provided Reclamation with a Biological Opinion (BO) concluding that the proposed action is not likely to jeopardize the continued existence of the federally listed as endangered Sacramento River winter-run Chinook Salmon (*Oncorhynchus tshawytscha*) evolutionarily significant unit (ESU), threatened Central Valley spring-run Chinook Salmon (*O. tshawytscha*) ESU, threatened California Central Valley steelhead (*O. mykiss*) Distinct Population Segment (DPS), or threatened Southern DPS of North American Green Sturgeon (*Acipenser medirostris*), and is not likely to destroy or adversely modify designated critical habitat. Additionally, NMFS included an incidental take statement, with reasonable and prudent measures and non-discretionary terms and conditions that are necessary and appropriate to avoid, minimize, or monitor incidental take of listed species associated with the project.

Reasonable and prudent measures are nondiscretionary measures that are necessary or appropriate to minimize the impact of the amount or extent of incidental take (50 CFR 402.02).

The terms and conditions described below are non-discretionary, and the Reclamation or any applicant must comply with them in order to implement the reasonable and prudent measures included in the BO (50 CFR 402.14).

Reasonable and Prudent Measure 1 - Reclamation shall ensure impacts from the sites to be implemented each year are within the parameters of the opinion. Uncertainties regarding which sites will be implemented each year could lead to impacts not analyzed.

a) Reclamation shall obtain NMFS approval of proposed sites each year.
b) Reclamation shall obtain NMFS approval of final plans at each site, each year, prior to implementation.
c) Reclamation shall continue meeting and working with the SRRT, including consideration of recommendations and concerns.

Reasonable and Prudent Measure 2 - Reclamation shall minimize impacts to listed species.

a) Fish Passage: Reclamation shall ensure upstream and downstream fish passage is unobstructed throughout construction period within a portion of the Sacramento River.
b) Sedimentation and Turbidity: Within one week prior to construction, Reclamation shall coordinate with CDFW to obtain real-time aerial or boat redd survey data, and perform pre-construction surveys the day prior to construction; if redds from listed species are present within 200 feet downstream, Reclamation shall contact NMFS with minimization plan and wait for final approval before implementation.
c) To avoid impacting undetected winter-run and spring-run Chinook Salmon redds (including incubating eggs and pre-emergent fry), Reclamation shall implement "additional measures" described in the Project Description above for minimizing sediment mobilization during the months of October, November, and December for projects implemented in Zone 2 (and may extend to Zone 3 depending on observed redds).
d) Reclamation shall use techniques to gently encourage fish to leave any watered side channel areas prior to creating berms to isolate construction. If fish remain in pools, Reclamation shall contact NMFS and CDFW for relocation.

Reasonable and Prudent Measure 3 - Reclamation shall minimize impacts to riparian vegetation.

a) Reclamation shall replace any SRA removed during site access, or implementation of restoration activities within the project footprint. If the site is to be used again the following year, replace within the Action Area in sections of the river that have diminished SRA habitat. A detailed re-vegetation plan should be provided to NMFS and should include a

timeframe, and a list of species and designs depicting the proposed location for each species and their density. The vegetation plan should also include proposed irrigation and vegetation monitoring schedules which will likely be needed for several years.

Reasonable and Prudent Measure 4 - Reclamation shall prepare and provide for NMFS' approval, a monitoring and maintenance plan, as well as prepare and provide annual reports.

a) Reclamation shall develop the monitoring and maintenance plan in coordination with the SRRT, and provide to NMFS by September 1, 2016 for approval. This plan shall include how listed species and habitat will be monitored, and any annual maintenance needed for specific sites.
b) Reclamation shall provide an annual report, by September 1, of each year, documenting of the effects of the action on listed species and critical habitat in the action area.

Reclamation intends to comply with all three of the EFH conservation recommendations that NMFS identified including:

1) replacing any SRA riparian habitat at a 3:1 ratio within the action area, specifically in areas with diminished SRA habitat;
2) adopting Term & Condition 2 (a) as a fish passage measure (i.e., ensure upstream and downstream fish passage is unobstructed throughout construction period within a portion of the Sacramento River); and
3) retaining minimization measures described for pre-construction redd surveys for listed species, for fall- and late-fall-run Chinook Salmon redds (i.e., conduct pre-construction salmonid redd surveys within 200 feet downstream of a project site [aerial and/or boat] and implement avoidance measures [e.g., modification of work area; turbidity management such as a sediment curtain, or placing a gravel berm to redirect flow; changing timing of activities] to minimize effects if project activities may affect egg survival).

3.3 Geology and Soils

3.3.1 Affected Environment

California is divided into 11 Geomorphic Provinces. The project area is located within the Great Valley province. The northern portion of the province includes the Sacramento Valley, which is formed by the Sacramento River.

Valley lands consist of deep alluvial and Aeolian soils. In the past, a balance existed between erosion and deposition along the Sacramento River. However, construction of dams, levees, and water projects has altered streamflow and other hydraulic characteristics of the Sacramento River. In some areas, human-induced changes have stabilized and contained the river, while in other reaches the loss of riparian vegetation has reduced sediment deposition and led to increased erosion. In alluvial river sections, bank erosion and sediment deposition cause channel

migrations that are vital to maintaining instream and riparian habitats. Land subsidence in the Sacramento Valley is localized and concentrated in areas of overdraft from groundwater pumping.

Most of Shasta County is characterized by moderately expansive soils with areas of low expansiveness in the South Central Region and highly expansive soils in the mountains.

3.3.2 Environmental Consequences

No Action Alternative

Under the No Action Alternative, Reclamation would not place gravel in the Sacramento River below Keswick Dam, nor would side-channels be developed. Therefore, no impacts on geology or soils would occur.

Proposed Action

The Proposed Action consists of gravel placement, floodplain and side-channel establishment, and instream habitat structures. Construction activities would involve excavation and grading, which could increase the potential for soil erosion.

In river work, such as riffle supplementation would be completed by starting with gravel placement at the edge of the river. This would allow for loaders to drive on the newly placed gravel and avoid distributing fine sediments.

Approximately 25,000 cubic yards of material at each site may need to be excavated, sorted, and redeposited in the nearby channel. Sorted gravel may be used in riffle supplementation. Unsuitable or excess gravel would be spread on the riverbank within the project footprint. Fine sediments could be distributed on the floodplain to aid in vegetative growth. Grading may occur to remove the surface level of any armored material.

Habitat structures such as spider logs would be designed in a way to avoid increasing the likelihood of bank failure or channel migration by selecting areas such as pools and backwater eddies for installation.

All disturbed soils within the project site would be stabilized to reduce erosion potential both during and following construction. Planting, seeding with native species, and mulching would be used. Where suitable vegetation cannot reasonably be expected to become established non-erodible material would be used for such stabilization.

The project area is not located in a fault zone according to the Alquist-Priolo Earthquake Fault Zoning Map. The Proposed Action would not expose people or structures to potential adverse effects involving the rupture of a known earthquake fault, strong seismic ground shaking, or ground failure, including liquefaction. The Proposed Action would not involve septic tanks or alternative waste water disposal systems.

3.4 Hazards and Hazardous Materials

3.4.1 Affected Environment

A hazardous material is defined as "a substance or material… capable of posing an unreasonable risk to health, safety, and property when transported in commerce" (49 CFR 171.8). California Health and Safety Code Section 25501 defines a hazardous material as "any material that… poses a significant present or potential hazard to human health and safety or to the environment if released." Hazardous materials may include fuel, lubricants, and hydraulic fluid. A discussion of water quality and potential hazards to water quality associated with the project is presented in Section 3.7 Hydrology and Water Quality.

Fires present hazard risks to rural and urban development in the upper Sacramento River area. Based on a review of the California Department of Forestry and Fire Protection (CAL-FIRE) statewide map of fire hazard severity zones, the upper Sacramento River area includes lands designated as high and very high risk (CAL-FIRE 2007).

Surface waters pose hazards to persons engaging in boating and other water-based activities on these water bodies. Water hazards are posed by equipment operations, flow velocity, morphology, instream or submerged material, accessibility, and water temperature.

3.4.2 Environmental Consequences

No Action Alternative

Under the No Action Alternative, Reclamation would not place gravel in the Sacramento River below Keswick Dam, nor would side-channels be developed. Therefore, no impacts on hazards and hazardous materials would occur.

Proposed Action

The potential spill of hazardous materials (e.g., fuel, lubricants, hydraulic fluid) during construction and staging activities into the upper Sacramento River could have deleterious effects. Construction equipment operated in or adjacent to the river presents the risk of a spill of hazardous materials into the river (e.g., construction equipment leaking fluids). Construction activities that include refueling of construction equipment on location can result in minor fuel and oil spills. Without rapid containment and clean up, these materials could have deleterious effects on all salmonid life stages within close proximity to construction activities.

Reclamation, or a designated contractor, would develop and implement a Spill Prevention Containment and Countermeasures Plan (SPCCP) prior to the onset of construction. The SPCCP would include measures to be implemented onsite that would keep construction and hazardous materials out of waterways and drainages. The SPCCP would include provisions for daily checks for leaks; hand-removal of external oil, grease, and mud; and the use of spill containment booms for refueling. In addition, all construction equipment refueling and maintenance would be restricted to designated staging areas located away from streams and sensitive habitats.

Reclamation expects that adherence to BMPs that dictate the use, containment, and cleanup of contaminants would minimize the risk of introducing such products to the waterway because the prevention and contingency measures would require frequent equipment checks to prevent leaks, would keep stockpiled materials away from the water, and would require that absorbent booms are kept on-site to prevent petroleum products from entering the river in the event of a spill or leak.

The Proposed Action would not be located at a site on the Hazardous Waste And Substances Site List, known as the Cortese List, pursuant to Government Code Section 65962.5 (DTSC 2015). No site listed in the Proposed Action is within one-quarter mile of an existing or proposed school.

Redding Municipal Airport is located approximately 2 miles from Site 11, Kapusta. Benton Airfield is located within 2 miles of Sites 3-7. Lake California Air Park and Red Bluff Municipal Airport also occur along the Sacramento River in the project area. The project would not have an impact on public or private airstrips.

Instream habitat structures such as boulders and logs generally have the potential to create water hazards. The placement of habitat structures would occur within developed side channels and sloughs outside of the main channel. Since the channels would be designed to be about one to three feet deep, they would not create boating hazards.

Portions of the Proposed Action are located within the High Fire Hazard Severity Zone. Occupational Safety and Health Administration (OSHA) has fire protection and prevention standards (29 CFR 1926.150, Subpart F) which require a fire protection program to be followed throughout construction work. Reclamation will comply with the elements of OSHA's fire protection and prevention standards.

3.5 Hydrology and Water Quality

3.5.1 Affected Environment

Hydrology

Flows in the upper Sacramento River (between Shasta Dam and RBDD) are controlled by the releases from Shasta and Keswick Dams and vary significantly by season and year. Water stored in upstream reservoirs during the winter and spring is released in the summer and fall for municipal and industrial supply, irrigation, water quality, power generation, recreation and fish and wildlife purposes. Historically, the upper Sacramento River was highly responsive to periodic precipitation events and seasonal variation. Since completion of the dams, flows are now lower in the winter and spring and higher in the summer and fall. Major west-side tributaries to the Sacramento River in this reach of the river include Clear and Cottonwood creeks. Major east-side tributaries to the Sacramento River in this reach of the river include Battle, Bear, Churn, Cow, and Paynes creeks.

In 1960, Reclamation and the California Department of Fish and Game (now the California Department of Fish and Wildlife), entered into a Memorandum of Agreement establishing flow objectives in the Sacramento River. The requirements were included in State Water Resource Control Board Order 90-05 and 91-01, which maintain minimum releases at 3,250 cfs at Keswick Dam from September through the end of February in all water years, except critically dry years. The orders additionally required Keswick and Shasta Dams to be operated to meet a daily average water temperature of 56 F as far downstream as practicable to protect fisheries. Water releases from Keswick Dam can vary greatly throughout the year with minimum flows observed at 2,750 cubic feet per second (cfs) and maximum flows up to 38,100 cfs. The median flow release from Keswick is approximately 5,630 cfs. During the site visits in January 2014 and September 2014, releases from Keswick Dam were 3,300 cfs, and 5,500 cfs respectively. Keswick Dam is typically operated to provide a minimum flow of 3,250 cfs for fish. On June 4, 2009, NMFS issued the NMFS BO for listed anadromous fishes and their critical habitats governing the coordinated long-term operation of the CVP and SWP. The 2009 BO established Sacramento River water temperature requirements.

Water Quality

The main sources of water in the Sacramento River below Keswick Dam are rain and snowmelt that collect in upstream reservoirs and are released in response to water needs or flood control. The quality of surface water downstream of Keswick Dam is also influenced by other human activities along the Sacramento River downstream of the dam, including historical mining, agricultural, and municipal and industrial (M&I) activities. Water quality issues within the primary project area of the Sacramento River include the presence of mercury, pesticides, trace metals, turbidity, and toxicity from unknown origin (CALFED 2000a).

The Central Valley Regional Water Quality Control Boards (RWQCB) has determined that the 25-mile segment of the upper Sacramento River between Keswick Dam and Cottonwood Creek is impaired by levels of dissolved cadmium, copper, and zinc that periodically exceed water quality standards developed to protect aquatic life (CVRWQCB 2002). Elevated levels of metal have resulted in fish population declines and even mortality. The impairment results primarily from inactive mines in the watershed, predominantly the Iron Mountain site upstream of Keswick Dam. The reach is also listed under Clean Water Act (CWA) 303(d) by the Central Valley RWQCB for unknown sources of toxicity (CVRWQCB 2010).

State and federal law mandates a series of programs for the management of surface water quality. In the State of California, water resources are protected under the federal CWA and the State Porter-Cologne Water Quality Control Act, which created the SWRCB and nine RWQCB, each responsible for a water-quality control plan (California RWQCB, 1998). In the project area the Central

Valley RWQCB is responsible for designating beneficial uses and establishing water quality objectives.

3.5.2 Environmental Consequences

No Action Alternative

Under the No Action Alternative, Reclamation would not place gravel in the Sacramento River below Keswick Dam, nor would side-channels be developed. Existing conditions would continue. Therefore, no impacts on hydrology or water quality would occur.

Proposed Action

Hydrology

The hydrologic effects of the Proposed Action are limited to changes in water surface elevations resulting from the introduction of the gravel and redirection of some flow from the main river down the proposed side-channels.

Topographic site surveys would be conducted before and after the more complex project sites (e.g. side channels). The extent of each project site would be surveyed and X, Y, Z real world coordinates would be provided in sufficient density and extent to enable design and two dimensional hydraulic modeling of project sites to occur. Grade checks would be provided during project implementation to assist project personnel in meeting designed elevations. At the completion of project implementation an as-built survey would be conducted to provide a visual comparison of site elevations to the designed elevations.

Project designs would be completed through an iterative process with input from the interagency coordination group. The interagency group would finalize the project sites and develop design parameters. Iterative modeling would be used to fine tune project features to meet species requirements based on habitat suitability criteria. The designs would consist of a topographic surface displayed in hard copy design drawings and provided electronically in AutoCAD or ArcGIS. Design drawings would include a project overview displayed on existing topography and/or aerial photography, an overview of the site showing depth of cut and fill, and an overview of the site showing completed elevations. Drawings would include on-the-ground staking to aid in orienting field activities to the design surface. Survey staking would be placed on the ground in coordination with implementation personnel in a configuration to aid in completing the design.

Water Quality

The Proposed Action would be completed in accordance with permit conditions and BMPs to protect water quality. These practices would prevent sediments, fuels, hydraulic fluids, hazardous material, and other pollutants from entering the river, and control turbidity within acceptable levels.

Gravel placed in the river would be obtained from a commercial source or onsite and processed to minimize turbidity plumes. Some turbidity is expected and would be monitored in accordance with relevant permits. If turbidity levels

exceed permits standards, the pace of work would be altered to help meet standards. Instream work associated with placing the gravel in the river would likely result in short-term turbidity plumes immediately downstream of the construction area, within the permitted limits.

The re-suspension and deposition of instream sediments is an indirect effect of construction equipment and gravel entering the stream. Suspended solids and turbidity generally do not acutely affect aquatic organisms unless they reach high levels (i.e., levels of suspended solids reaching 25 mg/L). At these levels, suspended solids can adversely affect the physiology and behavior of aquatic organisms and may suppress photosynthetic activity at the base of food webs, affecting aquatic organisms either directly or indirectly (Alabaster and Lloyd 1980). Gravel placed in the river would be processed as needed to maintain water quality standards. Furthermore, the Clean Water Act § 401Water Quality Certification that would be issued for the Proposed Action would limit the potential effects of fine sediment on fish by limiting the maximum increase of turbidity and suspended sediment over background levels.

BMPs to control erosion and storm water sediment runoff would be implemented including, but not limited to, straw bales, straw wattles, silt fences, and other measures as necessary to minimize erosion and sediment-laden runoff from project areas.

Equipment would not operate in an active stream channel except as necessary to construct temporary stream crossings and place spawning gravel and in-stream habitat structure. When in-channel work is unavoidable, clean spawning gravel would be used to create a pad in the channel from which equipment would operate. Spawning gravel would also be used to construct any required in-stream crossings. In-stream construction would proceed in a manner that minimizes sediment discharge. Following completion of restoration activities, the spawning gravel would be removed from the stream channel or spread evenly across the bottom of the channel, consistent with existing gravels. All stream crossings within the main channel would be designed to ensure that conditions are maintained for effective upstream and downstream fish passage, at all times and under all flow conditions. Instream work that may cause turbidity within 200 feet upstream of active spawning and redds would be avoided.

The amount of sediment that may be re-suspended during project installations is not likely to be significant; any re-suspension and re-deposition of instream sediments is expected to be localized and temporary and would not reach a level that would acutely affect aquatic organisms

Best Management Practices

- During in river work, turbidity would be monitored and construction pace slowed if turbidity exceeds criteria established by the Regional Water

Quality Control Board in its Clean Water Act §401 Water Quality Certification.

- All equipment working within the stream channel would be inspected daily for fuel, lubrication, and coolant leaks; and for leak potentials (e.g. cracked hoses, loose filling caps, stripped drain plugs); and all equipment must be free of fuel, lubrication, and coolant leaks.
- Vehicles or equipment would be washed/cleaned only at approved off-site areas.
- All equipment would be cleaned prior to working within the stream channel to remove contaminants that may enter the river and adjacent lands.
- All equipment would be fueled and lubricated in a designated staging area located outside the active river channel.
- Spill prevention kits would be in close proximity to construction areas, and workers would be trained in their use.
- Gravel would be processed as needed prior to being placed in the river.

3.6 Noise

The loudness of sound preserved by the human ear is dependent primarily on the overall sound pressure level and frequency content of the sound source. The human ear is not equally sensitive to loudness at all frequencies in the audible spectrum. To better relate overall sound levels and loudness to human perception, frequency-dependent weighting networks were developed. There is a strong correlation between the way humans perceive sound and A-weighted sound levels (abbreviated dBA). A-weighted sound levels are a standard tool to predict community response to environmental and transportation noise. Sound levels expressed as dB in this section are A-weighted sound levels, unless noted otherwise.

3.6.1 Affected Environment

The existing noise environment within the project area is typical of an open-space area within a suburban environment. The existing noise environment is primarily influenced by vehicular traffic noise on local and regional roadway network. Noise from interspersed industrial and commercial land uses, and outdoor activities (e.g., people talking, dogs barking, and operation of landscaping and agricultural equipment), contribute to the existing noise environment to a lesser extent. Equivalent sound level (L_{eq}) is an hourly average noise level descriptor.

Noise-sensitive land uses generally include those uses where exposure to noise would result in adverse effects, as well as uses where quiet is an essential element of the intended purpose. In the vicinity of the project site, sensitive land uses include residential and park areas near the gravel augmentation sites and along proposed gravel haul routes. These land uses could potentially experience noise impacts associated with project construction and/or increased traffic from project operation.

Redding Municipal Airport and Benton Airfield are both located within 2 miles of project area. Lake California Air Park and Red Bluff Municipal Airport also occur along the Sacramento River in the project area.

Table 4 - Construction Equipment Noise Levels		
Type of Equipment	L_{max} @ 50 feet (dBA)[1]	Acoustical Usage Factor (%)
Loader	80	40
Dozer	85	40
Excavator	85	40
Off-road Dump Truck	84	40
Pump	77	50
Truck	88	40

[1]Source: Table 9.1 FTA Construction Equipment Noise Emission Levels (USDOT 2006).

3.6.2 Environmental Consequences

No Action Alternative

Under the No Action Alternative, Reclamation would not place gravel in the Sacramento River below Keswick Dam, nor would side-channels be developed. There would be no impacts to noise since no construction, including the transportation of gravel, would take place.

Proposed Action

Construction equipment noise levels listed in Table 5 are the maximum levels at 50 feet. The equivalent hourly average noise level (L_{eq}) would be less than the maximum levels (L_{max}) for each type of equipment. The Proposed Action would incorporate four BMPs for the control of construction noise levels. Implementation of the following BMPs generally results in reduction of construction-generated noise levels by 15 dB to 25 dB. Additionally, sound from outdoor construction activities typically dissipates at a rate of 4.5 dBA to 6.0 dBA for each doubling of distance (FHWA 1980).

Best Management Practices

- Construction operations and associated activities shall comply with the operational hours outlined in the City of Redding General Plan; construction operations are prohibited between the hours of 7 pm and 6 am and 7 pm and 7 am from September 16 through May 14.
- Provide and maintain noise control devices for construction equipment. Construction equipment shall be properly maintained per manufacturers' specifications and fitted with the best available noise suppression devices (i.e., mufflers, silencers, wraps, etc).
- Coordinate routes and arrange equipment to minimize disturbance to noise-sensitive uses. Construction equipment usage shall be arranged to

minimize travel adjacent to occupied residences and turned off during prolonged periods of non-use.
- Designate a disturbance coordinator to respond to all public complaints.

Hauling of gravel outside of the project sites would be limited to Monday through Friday, except holidays, from 7 am to 5 pm. The City of Redding General Plan state that construction operations are prohibited to occur between the hours of 7 pm and 6 am, and 7 pm and 7 am from September 16 through May 14.

Based on construction equipment noise emission levels and the incorporation of the above BMPs, implementation of the Proposed Action would comply with the City of Redding Master Plan exterior noise level standard of 55 L_{eq} at noise-sensitive areas in the project vicinity. Noise-sensitive areas include residential areas, parks, schools, churches, hospitals, and long-term care facilities (City of Redding 2000).

Noise impacts would be temporary and localized and there would be no long-term operational noise sources. Construction associated with the project would include the use of front-end loaders, bulldozers, excavators and trucks. Construction operations would not generate high levels of ground vibration, such as that from blasting, pile driving, or pavement breaking.

3.7 Recreation

3.7.1 Affected Environment

The Sacramento River corridor is an important recreation resource for the northern California region. Access and facilities are found on both public and private land. This section describes existing recreation and public access resources in the project area, from approximately RM 302 downstream to RM 275. Recreational activities within this area include fishing, boating, hiking, horseback riding, biking, picnicking, wildlife viewing/nature observation, and urban recreational activities.

River use and the recreation opportunities available vary throughout the year with the highly variable flow of the river. River temperature is cold year-round because of the release of water from the deep cold-water layers of Keswick Reservoir, and Shasta Lake upstream. Winter water temperatures are in the 40s Fahrenheit and summer water temperatures do not rise above the mid-50s.

The Sacramento River is known for good fishing opportunities. Species such as salmon, steelhead, rainbow trout, sunfish, largemouth bass, and striped bass can be found within the river. Fly fishing is popular in the project area. Fishing access within the project area is located at the Diestlehorst Pasture (Market Street), Turtle Bay, Kapusta, and Reading Island properties. Boating opportunities are abundant along the Sacramento River. Public boat ramps in the project area are located at South Bonnyview and Turtle Bay Exploration Park.

Opportunities for trail activities such as walking, jogging, bicycling, and horseback riding are available throughout this stretch of the river. There are 10 sites with trails or access to trails. The most notable trail along this section of river is the Sacramento River Trail. Opportunities for developed camping along or near the river are located mainly at privately operated RV parks and fishing resorts.

Redding's municipal parks along this section of the river provide picnic tables, parking, and other amenities such as such as horseshoes, sports fields, playgrounds, and fishing/boating access.

Several sites are located on City of Redding property. Site 3, Turtle Bay Island is located near the Turtle Bay Exploration Park and access would be through the park using a portion of the Sacramento River Trail. Site 6, Shea is located near the Cascade Community Park, which offers picnic areas, a basketball court, and a BMX bike track, and could provide a potential access route. Cypress Avenue Bridge South (Site 7) is located along the Henderson OSA, which provides trails and a public disc golf course.

The City of Anderson manages Anderson River Park, located at RM 282. The park provides picnic areas, disc golf and community events.

Reading Island is managed in part by BLM. Group camping is available with a permit from BLM. A boat ramp into Anderson Creek Slough provides access for canoes and kayaks, but may be difficult for motorboats.

3.7.2 Environmental Consequences

No Action Alternative

Under the No Action Alternative, Reclamation would not place gravel in the Sacramento River below Keswick Dam, nor would side-channels be developed. There would be no impacts to recreation since no construction would take place.

Proposed Action

Construction would be limited to weekdays, except holidays, during normal work hours. During construction, trails would be signed, cautioning users that equipment would be crossing. When there are repetitive trucks hauling gravel across the trails a flag person wearing OSHA-approved vests and using the "Stop/Slow" paddle may be present. Access routes have been designed to avoid heavy recreation areas; however several sites would require partial closures of parks and/or trails.

Trails and portions of parks that would need to be closed would be limited to when work is actually occurring. For several sites, this would be limited to trucks hauling gravel across trails.

Gravel injections could occur at flows less than 15,000 cfs during any time of the year. Riffle supplementation could occur when flows are less than 10,000 cfs between October 1 and May 15th. The river is wide enough for boats to go around

construction vehicles. Signs would be posted upstream of construction areas to warn boaters where in-river work would take place. Designs for gravel augmentation would ensure a continuous navigable channel at least one foot deep and 30 feet wide. Habitat structure would be placed at the stream margins. Navigation would not be impacted.

Site 2 access would be through an existing unpaved trail that runs parallel to the Sacramento River Trail and would require crossing a portion of the Shasta Rail Trail. Damage to existing paved trails would be minimized by using unpaved trails and limiting the area that trucks cross to a single intersection.

Site 4 access would be through Turtle Bay Exploration Park closing a portion of the Sacramento River Trail, which would be coordinated with the City of Redding.

Site 7 access may require temporary closure of some portions of the Henderson OSA, which would be coordinated with the City of Redding.

Site 9 access may occur through the Cascade Community Park. To avoid impacts to the relatively small park, access would likely occur through an unpaved parking lot nearby to the east.

Site 11 access from the shore may occur through the Kapusta OSA. The majority of the work would occur on Kapusta Island; however the mainland OSA may still be impacted by hauling trucks and staging areas.

Site 12 would require access through several trails in Anderson River Park. Construction activities would occur in the undeveloped portions of the park. A large network of trails and developed uses provides visitors with recreation opportunities outside of the project area. Impacts to Anderson River Park recreation would be less than significant and temporary.

Site 13 access to Reading Island could impact recreation on the island. Construction activities would be coordinated with the BLM and private landowners.

Instream habitat structures such as boulders and logs generally have the potential to create water hazards. The placement of habitat structures would occur within developed side channels and sloughs outside of the main channel. Since the channels would be designed to be about one to three feet deep, they would not create boating hazards.

The Proposed Action would not increase the use of existing facilities, nor substantially contribute to the physical deterioration of facilities. The construction or expansion of new facilities would not be involved with implementation of the Proposed Action.

Recreation opportunities in the project area are abundant. The impacts to the parks, trails, boating, and fishing areas along the river would be less than significant when compared to the total recreation opportunities for the

surrounding population. Impacts to recreation from construction activities would be temporary and localized. Activities that may impact public recreation areas would be coordinated with the responsible agencies.

3.8 Transportation and Traffic

Determination of roadway operating conditions is based upon comparison of traffic volumes to roadway capacity. “Levels of service” (LOS) describe roadway operating conditions. LOS is a qualitative measure of the effect of a number of factors, which include speed and travel time, traffic interruptions, freedom to maneuver, safety, driving comfort and convenience, and operating costs. Levels of service are designated "A" through "F" from best to worst, which cover the entire range of traffic operations that might occur. LOS "A" through "E" generally represent traffic volumes at less than roadway capacity, while LOS "F" represents over capacity and/or forced conditions.

3.8.1 Affected Environment

The City of Redding requires a Traffic Impact Analysis (TIA) when a project would potentially cause a substantial increase in traffic. Generally a project that adds 35 or more new vehicle trips during a peak hour would require a TIA (City of Redding 2009).

3.8.2 Environmental Consequences

No Action Alternative

Under the No Action Alternative, Reclamation would not place gravel in the Sacramento River below Keswick Dam, nor would side-channels be developed. There would be no impacts to traffic since no construction, including the transportation of gravel, would take place.

Proposed Action

Construction activities would be confined to each project site, with access from paved roads. Traffic impacts would generally be related to the transportation of gravel to on-site stockpiles at each project site.

Construction-related traffic would occur from daily commutes by construction workers and the delivery of gravel. Gravel additions would be completed at up to three sites per year using approximately 20,000 cubic yards (28,000 tons) at each site. Hauling of gravel outside of the project sites would be limited to Monday through Friday, except holidays, from 7 am to 5 pm for approximately one month per site (22 working days). Delivery of gravel to any site would not be done at the same time as delivery to another site. Using 24-ton trucks to transport the gravel to the staging area, each site would create approximately 54 trips (one-way) per day. Additional traffic would occur from daily worker trips to the site.

Floodplain and side channel habitat enhancements may occur at up to two sites per year. Excess gravel would be redistributed on the riverbank or in the channel within the project area. Traffic impacts related to side channel enhancements

would occur from the initial staging of equipment on the project site and from daily commutes by construction workers.

Bicycle and pedestrian trails may be temporarily blocked during gravel delivery and construction activities. Haul trucks and equipment would cross several trails. During construction, these trails would be signed, cautioning users that equipment would be crossing. During times when there is repetitive trucks crossing the trails when gravel is being delivered, a flag person wearing OSHA-approved vests and using the "Stop/Slow" paddle may be present. Access paths have been designed to avoid heavy recreation areas; however, several sites would require partial closures of recreation areas. Impacts to bicycle and pedestrian trails would be temporary.

Potential impacts to traffic would be temporary and related to the construction activities. Existing land uses would not be altered by the Proposed Action and there would not be permanent changes to Levels of Service.

3.9 Cultural Resources

"Cultural Resources" is a broad term that applies to prehistoric, historic-era, and architectural resources, as well as to traditional cultural properties. Cultural resources can include archaeological sites, which contain evidence of past human lifeways; the built environment, which consists of structures such as buildings, roadways, bridges, dams, and canals; and locations importantly associated with the history or cultural identity of living communities. Historic properties are, by definition, cultural resources that are included in, or eligible for inclusion in, the National Register of Historic Places (NRHP). Title 54 U.S.C. § 306108, commonly known as Section 106 of the National Historic Preservation Act (NHPA), requires the Federal government to take into consideration the effects of its undertakings on historic properties. This is accomplished through the Section 106 process as outlined at 36 CFR Part 800.

3.9.1 Affected Environment

At the time of this investigation, the specific location of each project site was not completely defined. Therefore, Reclamation developed a project area that includes 13 restoration locations, with a collective total of approximately 1,193 acres. Five of these 13 restoration locations were chosen for potential implementation in 2015 and were, therefore, the subject of final planning and detailed design. These five restoration locations are considered the project area of potential effects (APE) for the cultural resources evaluation, and include: Site 1 Keswick Dam (1 acres), Site 3 Market Street South (19 acres), Site 5 Kutras – small pond (a 6.6-acre subset of the total 40 acre project area), Site 6 Cypress Avenue Bridge North (22 acres), and Site 11 Kapusta – Michalak side channel (4 acre subset of the total 117.15-acre project area). The APE includes a cumulative total of approximately 52.6 acres.

In an effort to identify historic properties in the proposed APE, Reclamation conducted a cultural resources inventory covering the entirety of the APE and

surrounding project area. These inventory efforts, which included a records search through the Northeastern Information Center and Shasta Historical Society, pedestrian surveys of the APE, and outreach to Native American contacts identified by the Native American Heritage Commission (NAHC) as having an interest in the project area. The results of these identification efforts are detailed in a report titled *Cultural Resources Investigation for the Upper Sacramento River Anadromous Fish Habitat Restoration Program, Shasta County, California* (Barnes 2015).

3.9.2 Environmental Consequences

No Action Alternative

Under the No Action Alternative, Reclamation would not place gravel in the Sacramento River below Keswick Dam, nor would side-channels be developed. There would be no impacts to cultural resources since no construction, including the transportation and staging of gravel, would take place.

Proposed Action

Reclamation conducted records searches, consultation, and archaeological pedestrian surveys, which identified one historic property within the APE: the Anderson-Cottonwood Irrigation District diversion dam. Reclamation applied the criteria of adverse effect (36 CFR § 800.5[1]) and determined that the activities associated with restoring salmonid habitat in the Sacramento River would not alter any of the characteristics that would make the ACID diversion dam eligible for listing. The proposed construction activities would occur on existing roads and on areas previously modified and constructed for the ACID diversion dam. Since there would be no changes to these facilities, Reclamation determined that a finding no adverse effect to historic properties for this undertaking pursuant to 36 CFR § 800.5(b) is appropriate.

Pursuant to the regulations at 36 CFR § 800.3(f)(2), Reclamation contacted the Redding Rancheria, notifying this tribe of Reclamation's involvement in funding and implementing this project and requesting their assistance in the identification of sites of religious and cultural significance or identification of historic properties that may be affected by the proposed undertaking. Reclamation also contacted the Shasta Nation, the Wintu Tribe of Northern California, and the Winnemem Wintu, requesting their assistance in identifying any known historic properties of concern that may be affected by the undertaking. To date, Reclamation has received no responses from the Indian tribes contacted. If any concerns related to the proposed action are subsequently identified, Reclamation will consult with the concerned Indian tribe or tribes on a resolution.

Based on the information provided above and in the enclosed report, Reclamation reached a finding of no historic properties affected pursuant to 36 CFR § 800.4(d)(1). Reclamation initiated consultation with the SHPO of this finding of effect through correspondence dated September 30, 2015. In accordance with 36 CFR § 800.4(d)(1)(i), if the SHPO does not object within 30 days of receipt of an

adequately documented finding, Reclamation's responsibilities under Section 106 are fulfilled.

Additional research and field work will be required as other restoration areas in the project area become defined through the design process. Reclamation will implement the steps in the Section 106 process as outlined at §800.3 to §800.6 with subsequent phases of the habitat restoration program.

3.10 Environmental Commitments

Environmental commitments are measures or practices adopted to reduce or avoid adverse effects that could result from project implementation. These are also known as protective measures and are in accordance with relevant permits. The following section describes the best management practices, environmental commitments, and mitigation measures that would be implemented under the Proposed Action:

Protection Measure #1 – Air Quality

- Reasonably available control measures would be implemented at each project site, including, but not limited to, watering dirt roads and construction areas.
- Hauling of gravel outside of the project sites would be limited to Monday through Friday, except holidays, from 7 am to 5 pm.

Protection Measure #2 – Valley Elderberry Longhorn Beetle

- Shrubs within 100 feet of the project site would be surrounded with orange fencing at a 20-foot radius and flagged prior to construction.
- A USFWS approved biologist would conduct environmental awareness training to instruct construction personnel crews working in the vicinity of the identified shrubs about the status of VELB and the need to protect its elderberry host plant. The training and supporting materials would include identification of special status species, required practices before the start of construction, general measures that are being implemented to conserve these species as they relate to the proposed project, and penalties for noncompliance. Upon completion of training, construction personnel would sign a form stating that they have attended the training and understand all the conservation measures. Training would be conducted in English and other languages, as appropriate. Proof of this instruction would be kept on file with the contractor. Reclamation would provide USFWS with a copy of the training materials and copies of the signed forms.
- Temporary stockpiling of excavated or imported material would occur only in approved construction staging areas and outside of the established driplines of elderberry shrubs. Excess excavated soil would be used on site or disposed of at a regional landfill or other appropriate facility.

- Standard precautions would be employed by the construction contractor to prevent the accidental release of fuel, oil, lubricant, or other hazardous materials.
- A litter control program would be instituted. The contractor would provide closed garbage containers for the disposal of all food-related trash items. All garbage would be removed daily.
- The contractor would ensure that dust control measures (e.g., watering) are implemented in the vicinity of any elderberry shrub within 100 feet of construction activities.
- To avoid affecting the VELB, dirt roads would be watered at least twice each day when being used by gravel trucks and other project-related vehicles.

Protection Measure #3 – Fisheries

- Added gravel would be uncrushed, rounded "natural river rock" with no sharp edges, and the distribution of particle size would be in accordance with recommendations of the Anadromous Fish Restoration Program.
- Front loaders placing the gravel would have rubber wheels and would be moving slow enough for fish to avoid disturbed areas.
- Gravel would be washed and have a cleanliness value of 85 or higher, based on CalTrans Test #227, and the gravel would be completely free of oils, clay, debris, and organic material.
- Reasonable and prudent measures and EFH recommendations proposed by NMFS would be implemented by Reclamation.

Protection Measure #4 – Bald Eagles

- A 660-foot buffer would be maintained for a single construction activity visible from the nest and within one mile of the nest (FWS 2007).
- Sites located within a ½ mile of a known bald eagle nest would be completed between September and December.
-

Protection Measure #5 – Western Yellow-billed Cuckoo

- Vegetation removal would not occur between March 1st and August 31st. Prior to construction during the month of September, surveys would be completed for the presence of nesting birds. If WYBC are found, Reclamation would consult with USFWS on how to proceed.

Protection Measure #6 - California Red-legged Frog

- Qualified biologists would complete surveys for CRF at sites with deep-water pools with dense emergent vegetation.
- Surveys would be updated every two years and as new sites are selected that contain CRF frog habitat.

Protection Measure #7 – Cultural Resources

- In the unlikely event that previously unidentified cultural resources are discovered as a result of this undertaking, the construction activities would cease and Reclamation Cultural Resource Staff would be notified and

consulted on how to proceed. Reclamation would follow the procedures for post-review discoveries on Federal lands as described in the regulations at 36 CFR § 800.13. Work may not continue in the area of the discovery until Reclamation issues a notice to proceed.

- In the event that human remains are identified during the course of the proposed project, all construction activities would cease and a Reclamation Archaeologist would be consulted on how to proceed. Note that all human remains identified on lands owned by the Federal government are subject to the Native American Graves Protection and Repatriation Act (NAGPRA) (25 USC 3001). The procedures for dealing with the discovery of human remains on Federal lands are described in the regulations that implement NAGPRA, found at 43 CFR § 10, and in Reclamation's Directives and Standards for the Inadvertent Discovery of Human Remains on Reclamation Lands (LND 07-01). All work in the vicinity of the discovery would be halted and Reclamation's Regional Archaeologist would be notified immediately. This notification would be followed by a written report within 48 hours. Project implementation in the vicinity of the discovery would not resume until Reclamation complies with the 43 CFR § 10 regulations and provides notification to proceed.
- If human remains and associated materials are encountered during construction on non-Federal lands, work in that area would be halted and the Sierra County Coroner's Office would be immediately contacted pursuant to Health and Human Safety Code Section 7050.5. If the remains are determined to be of Native American origin, the Native American Heritage Commission (NAHC) would be notified within 24 hours of determination, as required by PRC Section 5097.

Protection Measure #8 – Geology and Soils

- All disturbed soils within the project site would be stabilized to reduce erosion potential both during and following construction.
- Planting, seeding with native species, and mulching would be used. Where suitable vegetation cannot reasonably be expected to become established non-erodible material would be used for such stabilization.

Protection Measure #9 – Hazardous Materials

- A Spill Prevention Containment and Countermeasures Plan (SPCCP) would be developed prior to the onset of construction activities.
- The SPCCP would include provisions for daily checks for leaks; hand-removal of external oil, grease, and mud; and the use of spill containment booms for refueling.
- All construction equipment refueling and maintenance would be restricted to designated staging areas located away from streams and sensitive habitats.

Protection Measure #10 - Water Quality

- Turbidity would be monitored during instream work. Construction would be curtailed if turbidity exceeds permit criteria.
- All equipment working within the stream channel would be inspected daily for fuel, lubrication, and coolant leaks; and for leak potentials (e.g. cracked hoses, loose filling caps, stripped drain plugs); equipment must be free of fuel, lubrication, and coolant leaks.
- Vehicles or equipment would be washed only at approved off-site areas.
- All equipment would be cleaned prior to working within the stream channel.
- Equipment would be fueled and lubricated in designated staging areas located outside the stream channel and banks.
- Spill prevention kits would be kept near construction areas and train workers in their use.
- Gravel would be processed as needed prior to being placed in the river.

Protection Measure #11 – Noise

- Construction operations and associated activities would comply with the operational hours outlined in the City of Redding General Plan; construction operations are prohibited between the hours of 7 pm and 6 am, and 7 pm and 7 am from September 16 through May 14.
- Noise control devices for construction equipment would be proved and maintained.
- Transportation routes would be coordinated and equipment arranged to minimize disturbance to noise-sensitive uses.
- A disturbance coordinator would be designated to respond to all public complaints.

Protection Measure #12 – Recreation and Traffic

- Construction would be limited to weekdays, except holidays, during normal work hours.
- Trails would be signed, cautioning users of the equipment. During times when there is repetitive trucks crossing the trails when gravel is being delivered, a flag person wearing OSHA-approved vests and using the "Stop/Slow" paddle may be present.
- Designs for gravel augmentation would ensure a continuous navigable river channel at least one foot deep and the 30 feet wide at 3,250 cfs.

3.11 Cumulative Effects

The cumulative effects of implementation of reasonably foreseeable projects and the alternatives as compared to conditions under the No Action Alternative and the Proposed Action are discussed below. Cumulative effects are impacts on the environment that result from the incremental impacts of an alternative when added to other past, present, and reasonably foreseeable future actions of Federal, state, or local agencies or individual entities or persons (40 CFR 1508.7). Such impacts can result from individually minor, but collectively significant, actions

taking place over time (40 CFR 1508.8). Cumulative effects include the effects of future State, tribal, local or private actions that are reasonably certain to occur in the project area.

Past, present, and reasonably foreseeable future actions were identified and considered in this analysis and are summarized below.

Sacramento River Salmonid Spawning Gravel Augmentation Program at Keswick Dam (2013)

The project placed approximately 5,000 tons of spawning gravel into the Sacramento River at the Keswick Dam injection in 2011. Additional gravel placements of 15,000 and 14,000 tons were placed in 2013 and 2014, respectively. Environmental compliance and permitting were completed and a NEPA Categorical Exclusion Checklist was signed.

Painter's Riffle Anadromous Fish Habitat Enhancement Project (2014)

Glenn-Colusa Irrigation District (GCID) signed an Initial Study/Mitigated Negative Declaration in accordance with CEQA on September 18, 2014 for Painter's Riffle Anadromous Fish Habitat Enhancement Project. The Painter's Riffle area was developed in 1986 with a side channel constructed for spawning habitat, but the channel was subsequently destroyed by changes in river conditions. The side channel and spawning riffle restoration was completed in 2014. The project would not cumulatively affect or be affected by the Proposed Action.

Shasta Lake Water Resources Investigation (2015)

The Shasta Lake Water Resources Investigation has been developed to evaluate the potential enlargement of Shasta Dam and Reservoir to increase the survival of anadromous fish populations in the upper Sacramento River; increase water supplies and water supply reliability for agricultural, municipal, industrial, and environmental purposes; and address related water resources problems, needs, and opportunities (Reclamation 2015). The project is intended to increase water supply and reliability and increase survival of anadromous fish populations in the upper Sacramento River.

Other actions that may affect the action area include State or private sponsored habitat restoration activities, agricultural practices, water withdrawals and diversions, adjacent mining activities, and increased population growth resulting in urbanization and development of floodplain habitats. Habitat restoration projects may have short-term negative effects associated with in-water construction work, but these effects typically are temporary, localized, and the outcome is expected to benefit listed species and habitats. Increased water turbidity levels for prolonged periods of time may result from agricultural practices, adjacent mining activities, and increased urbanization and/or development of riparian habitat, and could adversely affect the ability of young

salmonids to feed effectively, resulting in reduced growth and survival. Turbidity may cause harm, injury, or mortality to juvenile Chinook Salmon or steelhead in the vicinity and downstream of the project area. High turbidity concentration can cause fish mortality, reduce fish feeding efficiency and decrease food availability (Berg and Northcote 1985, McLeay *et al.* 1984, NMFS 1996a). Farming and ranching activities within or adjacent to the project area may have negative effects on water quality due to runoff laden with agricultural chemicals. Water withdrawals and diversions may result in entrainment of individuals into unscreened or improperly screened diversions, and may result in depleted river flows that are necessary for migration, spawning, rearing, flushing of sediment from spawning gravels, gravel recruitment, and transport of LWM. Future urban development may adversely affect water quality, riparian function, and stream productivity.

Considering the relatively short time that instream work would be underway there would not be significant cumulative water quality effects. There would be positive effects on salmon and steelhead from implementation of the Proposed Action. Project-generated construction air emissions would not exceed thresholds and thus, would not result in cumulative impacts. Project generated noise level would be short-term in nature and would not include any long-term operations. The construction sites would likely be temporarily off limits to recreationists, and they would have to pursue their activities elsewhere.

There are no adverse impacts associated with implementation of the Proposed Action with the Environmental Commitments outlined above, and therefore there are no cumulative effects to consider. Implementation of the Proposed Action is not expected to result in significant cumulative effects, in combination with other projects, within or outside of the project area.

Section 4 Consultation & Coordination

Several Federal laws, permits, licenses and policy requirements have directed or guided the NEPA analysis and decision making process included in this EA.

4.0 Public Review Period

This EA will be available for public comment and additional analysis will be prepared if substantive comments identify impacts that were not previously analyzed or considered.

4.1 Federal Laws, Regulations, and Policies

National Historic Preservation Act (54 USC § 300101 et seq.)

54 U.S.C. § 304108, commonly known as Section 106 of the NHPA, requires that Federal agencies take into consideration the effects of their undertakings on historic properties. Historic properties are cultural resources that are included in, or eligible for inclusion in, the National Register. The 36 CFR Part 800 regulations implement Section 106 of the NHPA and outline the procedures necessary for compliance with the NHPA. Compliance with the Section 106 process follows a series of steps that are designed to identify if significant cultural resources are present in the proposed action project area and to what level they would be affected by the proposed Federal undertaking.

Reclamation initiated consultation with the State Historic Preservation Officer (SHPO) for this undertaking on September 30, 2015 via a hand-delivered consultation package. On October 27, 2015, the SHPO concurred with Reclamation's finding of no historic properties affected.

Section 7 of the Endangered Species Act (16 USC § 1531 et seq.)

Section 7 of the Endangered Species Act requires Federal agencies to ensure that discretionary federal actions do not jeopardize the continued existence of threatened or endangered species or result in the destruction or adverse modification of the critical habitat of these species.

On October 9, 2015, NMFS provided Reclamation with a BO concluding that the Proposed Action is not likely to jeopardize the continued existence of the federally listed endangered Sacramento River winter-run Chinook Salmon (*Oncorhynchus tshawytscha*) evolutionarily significant unit (ESU), threatened Central Valley spring-run Chinook Salmon (*O. tshawytscha*) ESU, threatened California Central Valley steelhead (*O. mykiss*) Distinct Population Segment (DPS), or threatened Southern DPS of North American Green Sturgeon (*Acipenser medirostris*), and is not likely to destroy or adversely modify designated critical habitat. Additionally, NMFS included an incidental take statement, with reasonable and prudent measures and non-discretionary terms and

conditions that are necessary and appropriate to avoid, minimize, or monitor incidental take of listed species associated with the project.

Reclamation sent a BA titled *Upper Sacramento River Anadromous Fish Habitat Restoration Program* to NMFS on February 3, 2015. It was determined in the BA that the Proposed Action *may affect and is likely to adversely affect* Sacramento River winter-run Chinook Salmon, Central Valley spring-run Chinook Salmon, and Central Valley steelhead, and *may affect, but is not likely to adversely modify* their critical habitats. Additionally, it was determined that the Proposed Action is not likely to eliminate or significantly diminish or disrupt EFH for Pacific salmon inhabiting the upper Sacramento River.

Reclamation will request concurrence from USFWS under Section 7 of the ESA on the impacts to the federally listed threatened Valley Elderberry Longhorn Beetle (*Desmocerus californicus dimorphus*) (VELB), Western Yellow-billed Cuckoo (*Coccyzus americanus)* (WYBC), and California Red-legged Frog (*Rana draytonii*) (CRF) and their designated or proposed Critical Habitat.

Section 401 of the Clean Water Act

Prior to the issuance of a Section 404 Permit, Reclamation must obtain a Section 401 Water Quality Certification from the Regional Water Quality Control Board (RWQCB). This declaration states that any discharge complies with all applicable effluent limitations and water quality standards. Reclamation will submit appropriate Section 401 applications to the RWQCB.

Section 404 of the Clean Water Act

Reclamation completed a Waters of the United States Delineation in 2015. Subject to U.S. Army Corps of Engineers (Corps) verification, within the project area, there are approximately 643.60 acres of the Sacramento River, regulated under Section 10 of the Rivers and Harbors Act and Section 404 of the Clean Water Act. Reclamation will submit appropriate Section 404 applications to the Corps.

Section 10 of the Rivers and Harbors Act

Section 10 of the Rivers and Harbors Act applies to the Sacramento River from the mouth of the river to Keswick Dam, including the project area. The Sacramento River was designated by the Corps as a navigable river based on the procedure described in 33 CFR Part 329. Section 10 of the Rivers and Harbors Act of 1899 (33 USC 403) prohibits the building of structures, excavation, or fill that modifies the course, location, condition or capacity of a channel of any navigable river in the U.S., unless the work has been recommended by the Corps. Section 10 jurisdiction would extend laterally over the entire water surface and bed of the navigable water body, which includes all the land and waters below the ordinary high water mark (OHWM). Designs for gravel augmentation would ensure a continuous navigable channel at least 1 foot deep and 30 feet wide at

3,250 cfs. Habitat structure would be placed at the stream margins. Navigation would not be impacted.

4.2 State and Local Laws, Regulations, and Policies

California State Lands Commission Lease

The project involves work affecting the Sacramento River. The land under the river is owned by the State Lands Commission (SLC). Reclamation has an existing lease with SLC for areas in the upper Sacramento River (Lease No. PRC 5482). Under the terms of the lease Reclamation is permitted to use the land for maintenance and placement of clean gravel for rehabilitation of winter-run Chinook Salmon spawning grounds. Reclamation will file an application to amend the existing lease to include additional sites and side-channel habitat work to cover the Proposed Action and future actions.

City of Redding Grading and Clearing Permits

In accordance with the City of Redding Code of Ordinances Chapter 16.12, a permit is required prior to work performing clearing, grading, importing or exporting of earth material. Reclamation will coordinate with the City of Redding.

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