Attachment 2 – Central Valley Project Improvement Act Title XXXIV of Public Law 102-575 Restoration Fund Charters

Contents

Description of Charter Information

Classification: Classification of the Charter type according to an overall category and a project type.

Location: Reference to a site name (where available) and a watershed.

Funding Years: Fiscal years covered by the Charter.

Benefits Start Year: When the impacts of the Charter will be realized. Typically, a project would become operational following construction, acquisition, or report (in the case of a study) phases of an effort.

Priority: Ranking of the Charter within a specific CVPIA authority to provide an understanding of the relative importance of different efforts.

Partners: Listing of agencies and entities assisting in the planning and implementation of the Charter through the contribution of resources. Resources may include cost-share, in-lieu services, use of facilities, or other technical support during the development of a project.

Related Programs: List of related programs and activities supported by the Charter such as BDCP, RPA, Recovery Plans, CVJV, etc. to provide an understanding of the relationship between the proposed Charter and other efforts by Federal, State, and local entities.

Authority: Provision under the CVPIA supported by the Charter that will allow the government to undertake the action and determine the relevant reimbursement and cost-share requirements.

- **Authority**: One or more legislative provisions for the action and the relative contribution to the different provisions of the legislation.
- **Percentage**: Fraction of the total Charter costs attributable to the Authority.
- **Description**: Justification for why the Charter is allowable under the Authority and for the specific fraction, if applicable.

Metric(s): Anticipated accomplishments from successful completion.

Deliverables: Anticipated documentation and timeline for key activities under the Charter, typically public documents and reports that would be referenced by title.

- **Date**: The estimated year and month when the deliverable will be available.
- **Title**: The anticipated name or citation of the deliverable.

Narrative: A one or two paragraph(s) description of the Charter background, benefits, deliverables, additional information (e.g., cost basis), and changes since prior Charters, if any.

Data Management: Information on where reports and data for this Charter will be permanently housed and the relevant protocols for understanding the information.

Risks: Narrative or bulleted list of uncertainties and potential project management related issues that might change including, the scope, schedule, or budget.

Cost Estimate: Summary of costs by fiscal year and fund. The information in Resources Data automatically populates this table.

Activities and Resources: Cost estimates to undertake the activity.

- **Type**: Category of resource, e.g., labor, equipment, agreement, etc.
- **Total**: Dollar value of the resource.
- **Agency**: Agency expending the resource.
- **Fund**: Source of the resource.
- **Description**: Text narrative of the activities and basis for the estimate.

2020 Annual Work Plan Public Draft

On-Going Fisheries Charters

Central Valley Project Improvement Act
Title XXXIV of Public Law 102-575

American River Rotary Screw Trap Monitoring

Annual quantification of juvenile Chinook salmon production and the abundance of juvenile steelhead in the American River using rotary screw traps.

DCN:	AFRP2129
Classification:	Performance Monitoring, Performance Monitoring
Location:	American River
Funding Years:	2017 - 2021
Benefits Start Year:	2017
Priority:	SIT Critical Monitoring Need - Monitoring of juvenile salmon production on the American River provides fundamental data that are necessary to assess the biological response to habitat restoration activities in a CVP watershed.
Partners:	CDFW, Pacific States Marine Fisheries Commission
Related Programs:	Structured Decision Making

Authority

Provision	Percentage
(b)(15) CAMP	100%

Metrics

Name	Value	Units	Comment
Count of fish produced	1	number of fish	The production or abundance of different life stages of juvenile salmon and steelhead are calculated on an annual basis based on monitoring data that are collected with rotary screw traps.

Deliverables

Deliverables in all years of this project will be coordinated with the CVPIA Data Manager, CVPIA Science Coordinator, and CVPIA Fish Resource Area Coordinator.

Date	Title
Annually	Annual American River rotary screw trap report

Project Management Team

Cesar Blanco – USFWS-CVPIA

Narrative

The rotary screw trap monitoring activities in the American River supply data that can be used to assess the biological response to habitat management activities in the American River watershed. As such, they can be used to infer, at a watershed-level scale, how habitat restoration activities are affecting the number of juvenile Chinook salmon and steelhead in that river.

Data Management

The PMT Data Steward will coordinate with external partners and biannually with the CVPIA Data Manager on the transmission of long-term monitoring and other pertinent data defined by the SIT and the PMT per the 2020 Data Guidance.

Field data will be recorded on data sheets or directly into a recording device/computer and transferred into a computer spreadsheet or database. The PMT Data Steward will coordinate with the CVPIA Data Manager on the transmission of relevant and pertinent data defined by the SIT and the PMT per the 2020 Data Guidance. Field data, analyses, and reports will be stored and backed up on a PMT computer/server.

Risks

Risk	Likelihood	Impact
Low, unless funding distribution is delayed	1	2

Cost Estimate

Year	Fund	Total	BOR	FWS
2017	CVPRF	$223,050	$0	$223,050
2018	CVPRF	$221,300	$0	$221,300
2019	CVPRF	$231,200	$0	$231,200
2020	CVPRF	$225,000	$0	$225,000
2021	CVPRF	$231,750	$0	$231,750

Total Cost: $1,132,300

Internal Agency Resources Table

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
2017								
Monitoring								
Agreement	TBD	$223,050	1.00	0.00	$223,050	FWS	CVPRF	NA
2018								
Monitoring								
Agreement	TBD	$221,300	1.00	0.00	$221,300	FWS	CVPRF	NA
2019								
Monitoring								
Agreement	TBD	$231,200	1.00	0.00	$231,200	FWS	CVPRF	NA
2020								
Monitoring								
Agreement	F13AC00053	$225,000	1.00	0.00	$225,000	FWS	CVPRF	Project cost includes the 6% contract overhead cost
2021								
Monitoring								
Agreement	F13AC00053	$231,750	1.00	0.00	$231,750	FWS	CVPRF	The 2021 project cost uses the prior year cost estimate (and therefore includes the 6% contract overhead cost) and includes a 3% inflation cost.

American River Juvenile Salmonid and Habitat Monitoring

This project links modeling and empirical data to evaluate how the existing and potential rearing habitat available in the lower American River (LAR) impacts the timing, size, and variation in out migration, carrying capacity, and population dynamics of LAR fall-run Chinook salmon.

DCN:	AFRP2109
Classification:	Monitoring
Location:	American River
Funding Years:	2019 - 2021
Benefits Start Year:	2019
Priority:	SIT FY2018 Tech Memo: - Fall Chinook – American River, Improve/increase juvenile rearing habitat (floodplain) - Winter Chinook – Create/improve juvenile rearing habitat in non-natal tributaries
Partners:	Cramer Fish Sciences, Sacramento Water Forum, cbec, inc., CDFW
Related Programs:	CVPIA (b)(13), CVPIA (b)(2)

Authority

Provision	Percentage
(b)(15) CAMP	100%

Metrics

Name	Value	Units	Comment
Abundance of recruits produced by spawning adults in restored habitats	1	number of fish	Task 3-4: Chinook Salmon otolith and genetic sample collection. Data and analyses from this task will improve future iterations of the SIT DSM model by quantifying how the production potential of habitat restoration actions applied in the LAR and how different life-history types of fall-run Chinook Salmon use rearing habitats in the LAR. These tasks will determine how spawning habitat restoration sites have enhanced juvenile production and how juvenile Chinook Salmon and steelhead utilize existing rearing habitat, DSM model information gaps.
DSM parameter estimates	1	N/A	Task 1: LAR SDM helps inform the broader CVPIA SIT and DSM process by improving the precision and accuracy of coefficients used in the SIT DSM and the life-cycle models for anadromous fishes upon which the DSM is based.
Rearing habitat in the LAR	1	acres	Task 2: ESHE modeling. This task builds off a topographic survey and 2D hydraulic model that has been funded by USFWS, Water Forum, and SAFCA. Rearing habitat estimates can be calculated for

			steelhead and multiple run-timing groups of Chinook Salmon. This task will estimate current juvenile rearing capacity, a DSM model information gap.
Abundance of juvenile salmonids	1	number of fish	Task 4: Annual juvenile salmonid survey. Data generated from these surveys will provide abundance estimates of steelhead and juvenile chinook rearing in restored and unrestored habitats. These data will improve habitat-use estimates in the SIT DSM
Sediment volume	1	cubic yards	Task 6: Sediment budget modeling. This study would compare a 2017 digital elevation model (DEM) with a 2006 DEM to quantify the change over 11 years, resolving the average annual volume of sediment exported. Results from this study can be used to estimate restoration project lifespan and aid project prioritization in the SIT DSM. This task will determine how much sediment should be added to the river annually and the longevity of gravel augmentation projects, DSM model information gaps.

Deliverables

Deliverables in all years of this project will be coordinated with the CVPIA Data Manager, CVPIA Science Coordinator, and CVPIA Fish Resource Area Coordinator.

Date	Title
Dec. 2020	LAR SDM meeting (Task 1.1)
Dec. 2020	ESHE modeling final report (Task 2.1)
Dec. 2020	AFS symposium proceedings (6 manuscripts) (Task 3.2)
Jan. 2021	Year 3 otolith and genetic data report (Task 3.1)
Feb. 2021	AFS research symposium (Task 3.2)
Dec. 2022	Genetics and otolith data report
Dec. 2022	Juvenile rearing data report
Dec. 2022	Sediment budget report

Project Management Team

Paul Cadrett – USFWS-Lodi (paul_cadrett@fws.gov)
Chris Hammersmark – CBEC – (c.hammersmark@cbecoeng.com)
Lilly Allen – City of Sacramento, The Water Forum – (lallen@cityofsacramento.org)
Joe Merz – Cramer Fish Sciences (jmerz@fishsciences.net)
John Hannon – USBR-BDO

Narrative

1. The SIT DSM model for fall-run Chinook, suggests the Lower American River (LAR) priority is increasing juvenile rearing habitat; however, the finer-scale LAR DSM model isn't as conclusive. Information gaps can be filled with studies extending and enhancing existing models. This

charter outlines actions that will better characterize LAR rearing habitat use, resolve discrepancies between the SIT and LAR DSM models, and improve our understanding of Chinook habitat use in the LAR and delta.

2. The main Core Team priorities addressed in this charter are improving fall-run and winter-run Chinook salmon and steelhead juvenile rearing habitat.
   - *Task 1- Application of the LAR DSM Model*
     The LAR DSM model will be refined to help prioritize decision making on the LAR, identifying future restoration locations and restoration project type to provide the greatest benefit toward the doubling goal.
   - *Task 2- Habitat Modeling*
     We will quantify existing available habitat and the additional habitat required to reach the doubling goal, building on past efforts to model habitat requirements and a 2D hydrodynamic model.
   - *Task 3- Otolith and Genetic Analysis*
     This task provides funds to complete, and extend, a study conducted from 2014-2016 using genetic samples and otoliths from adult and juvenile Chinook to assess reproductive success of adults utilizing restored habitats and analyze the effects of water management on outmigration timing and life history diversity.
   - *Task 4- Juvenile Salmonid Monitoring*
     This task determines steelhead and fall-run Chinook salmon habitat use data within the LAR with emphasis on better understanding habitat restoration effects on salmonid rearing, growth, and survival.
   - *Task 5- On-call Modeling*
     This task supports decision making processes with data and modeling analyses to quantify differences between alternatives. Analyses include: redd dewatering estimates, identification of stranding areas, monitoring and modeling temperature conditions under various release patterns.
   - *Task 6- Sediment Budget Development*
     A sediment budget will estimate the average annual volume of material that is exported from the LAR, quantifying the annual sediment deficit and developing estimates of the longevity of gravel augmentation efforts.
3. See Metrics and Deliverables sections.
4. Short-term objectives and anticipated outcome:
   - Refinement and validation of existing LAR DSM, SIT DSM, and ESHE models
   - Validated large-scale LAR DEM and 2D hydraulic/habitat suitability models
   - Juvenile salmonid outmigration timing, growth, and life-history variants
   - Enumeration of steelhead and Chinook rearing in restored and unrestored habitats
   - Sediment budget and gravel augmentation project longevity estimate
   - Improved tools and on-call analyses to support real-time management decision making
5. Genetic mark-recapture and otolith microchemistry (Task 3) provide a cost-effective means of acquiring high-quality data relative to standard monitoring techniques. Data include tracking natural production success from restored locations, determining life history diversity, straying, and the contribution of hatchery and wild adult Chinook salmon. Task 3 will be conducted in collaboration with CDFW and other interested stakeholders, increasing efficiency and subsequently reducing costs.

6. This charter aims to develop further a DSM tailored to the LAR and apply inference from that model in an ARM framework. This charter serves as a large-scale test case for the broader SIT DSM and ARM process, where information gained in the LAR will help improve applications in other watersheds.
7. This charter will help fill key information gaps in current DSMs; refer to Metrics section for specifics.
8. If this charter is not implemented, information gaps will remain that limit the extent to which resource agencies can make management decisions that maximize Chinook salmon production.

Data Management

The PMT Data Steward will coordinate with external partners and biannually with the CVPIA Data Manager on the transmission of long-term monitoring and other pertinent data defined by the SIT and the PMT per the 2020 Data Guidance.

Field data will be recorded on data sheets or directly into a recording device/computer and transferred into a computer spreadsheet or database. The PMT Data Steward will coordinate with the CVPIA Data Manager on the transmission of relevant and pertinent data defined by the SIT and the PMT per the 2020 Data Guidance. Field data, analyses, and reports will be stored and backed up on a PMT computer/server.

ESHE model documentation (Task 2) will be submitted as supplemental material with the final report.

Genetic and otolith sample databases (Tasks 3 & 4) will be submitted to Center for Data Management upon project completion.

Task 5 All field data from juvenile rearing studies will be submitted annually to the Center for Data Management.

Task 5 will help bolster DSM models (Task 1) and provide a means of ground-truthing model predictions (Task 2). Modeling outputs from Tasks 1, 2, 6, and 7 will leverage existing data from previous monitoring efforts to improve the efficiency and effectiveness of management actions. Data Contact: Paul Cadrett (paul_cadrett@fws.gov)

Risks

Risk	Likelihood	Impact
High flows	2	2
Not obtaining permits	1	3
Collaboration failure	1	1

Cost Estimate

Year	Fund	Total	BOR	FWS	Local
2019	CVPRF	$1,155,400	$0	$1,155,400	$0
2019	Local	$150,000	$0	$0	$150,000
2020[1]	CVPRF	$0	$0	$0	$0
2021	CVPRF	$180,200	$0	$180,200	$0

Total Cost: $1,485,600

[1] The FY2019 funding amount of $1,155,400 included $180,200 which was the FY2020 allocated funding for this project.

Internal Agency Resources Table

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
2019								
Monitoring								
Agreement	Juvenile Rearing Study	$120,000	1.00	0.06	$127,200	FWS	CVPRF	Tagging and recapture efforts on the LAR.
Planning and Analysis								
Direct Contribution	Quantifying rearing habitat for ESHE modeling	$100,000	1.00	0.00	$100,000	Local	Other	Sacramento Area Flood Control Agency 50% contribution to the green LiDAR topographic survey and 2D hydraulic model.
Agreement	Quantifying rearing habitat for ESHE modeling	$85,000	1.00	0.06	$90,100	FWS	CVPRF	Build off of topographic survey and 2D hydraulic model to quantify the habitat required to reach the CVPIA doubling goal.
Direct Contribution	Quantifying rearing habitat for ESHE modeling	$50,000	1.00	0.00	$50,000	Local	Other	Sacramento Water Forum 25% contribution to the green LiDAR topographic survey and 2D hydraulic model (CVPIA also contributed 25% toward this effort (2015 funding)).
Agreement	On-call modeling	$20,000	1.00	0.06	$21,200	FWS	CVPRF	Support for cbec to provide real-time, on-call modeling
Agreement	Modeling sediment budget	$35,000	1.00	0.06	$37,100	FWS	CVPRF	Comparison of 2017 digital elevation model (DEM) and 2006 digital elevation model (DEM) to quantify changes in sediment budget
Agreement	Complete LAR DSM model	$50,000	1.00	0.06	$53,000	FWS	CVPRF	Complete LAR DSM model
Research								
Agreement	Otolith and Genetic Analysis	$610,000	1.00	0.06	$646,600	FWS	CVPRF	Otolith microstructure and microchemistry analysis and genetics analysis for otoliths collected in 2016 and 2018

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
2020								
Monitoring								
Agreement	Juvenile Rearing Study	$120,000	1.00	0.06	$127,200	FWS	CVPRF	Juvenile tagging and recapture efforts on the LAR.
Planning and Analysis								
Agreement	Quantifying rearing habitat for ESHE modeling	$10,000	1.00	0.06	$10,600	FWS	CVPRF	Update topographic survey and 2D hydraulic model to quantify the habitat required to reach the CVPIA doubling goal.
Agreement	Refine LAR DSM model	$20,000	1.00	0.06	$21,200	FWS	CVPRF	Refine LAR DSM model
Agreement	On-call modeling	$20,000	1.00	0.06	$21,200	FWS	CVPRF	Support for cbec to provide real-time, on-call modeling
2021								
Monitoring								
Agreement	Juvenile Rearing Study	$120,000	1.00	0.06	$127,200	FWS	CVPRF	Juvenile tagging and recapture efforts on the LAR.
Planning and Analysis								
Agreement	Refine LAR DSM model	$20,000	1.00	0.06	$21,200	FWS	CVPRF	Refine LAR DSM model
Agreement	On-call modeling	$20,000	1.00	0.06	$21,200	FWS	CVPRF	Support for cbec to perform real-time, on-call modeling
Agreement	Quantifying rearing habitat for ESHE modeling	$10,000	1.00	0.06	$10,600	FWS	CVPRF	Update topographic survey and 2D hydraulic model to quantify the habitat required to reach the CVPIA doubling goal.

American River Salmonid Habitat Restoration

Restore juvenile Chinook salmon and steelhead rearing habitat and enhance natural channel processes on the lower American River.

DCN:	AFRP2112
Classification:	Habitat Improvement, Habitat Restoration
Location:	Ancil Hoffman, American River
Funding Years:	2017 - 2022
Benefits Start Year:	2018
Priority:	SIT FY2018 Tech Memo: Fall Chinook – American River, Improve/increase juvenile rearing habitat (floodplain) Winter Chinook – Create/Improve juvenile rearing habitat in non-natal tributaries
Partners:	NMFS, Sacramento County, Sacramento Water Forum, SAFCA, USBR, CDFW, FWS
Related Programs:	NMFS, CDFW

Authority

Provision	Percentage
(b)(13)	100%

Metrics

Name	Value	Units	Comment
Large Chinook emigrants	24000	number of fish	Assumes 2 large Chinook supported per square meter of rearing habitat (SIT value)
Habitat created/improved	3	acres	Estimate that 3 acres of rearing habitat will be created/improved
Material moved	25000	cubic yards	Estimate that 25,000 cubic yards of material will be moved and 100 - 200 pieces of large wood added.

Deliverables

Deliverables in all years of this project will be coordinated with the CVPIA Data Manager, CVPIA Science Coordinator, and CVPIA Fish Resource Area Coordinator.

Date	Title
Nov. 2018	Habitat project completed - ~3 acres of new habitat
May. 2019	Aerial photos and shapefile of Chinook spawning locations
Sep. 2019	Effectiveness Monitoring Report
Nov. 2020	The cycle above repeats annually

Project Management Team

John Hannon (USBR)
Paul Cadrett (USFWS)
Lilly Allen (Water Forum)
Mike Healey (CDFW)
Ruth Goodfield (NMFS)

Narrative

1. The project creates and enhances juvenile rearing habitat for Chinook salmon and steelhead by increasing floodplain and side channel habitat, incorporating new woody material, and adding coarse substrate. This is a continuation of annual restoration actions that started in 2008. The 2020 project location will be Ancil Hoffman, Lower Sailor, or El Manto. The project management team will determine the ultimate location each year following completion of the prior year (2019) project and synthesis of past monitoring results.
2. Specific activities include side channel and floodplain excavation, sorting of the excavated material, placement of the suitable sorted material into the river channel, and addition of woody material and boulders and monitoring the effectiveness of that work. A companion charter to this charter (American River Structured Decision Making) includes an additional monitoring component of the work.
3. The projects seek to increase the abundance and size of juvenile salmonids emigrating from the American River and ultimately result in a higher naturally produced salmonid return.
4. The 2018 project will be designed to produce approximately 24,000 large Chinook emigrants, based on the SIT value of 2 large Chinook/m**2, and also benefit juvenile steelhead habitat productivity.
5. Permits are largely in hand, so most of the funding supports on the ground restoration work.
6. The objective is to provide suitable rearing habitat adjacent to and downstream of spawning areas. Secondary benefits are encouragement of natural river processes through scaling of habitat to the flow regime.
7. Implementation is led by the successful collaboration with the diverse American River stakeholders of the Water Forum and Northern California Water Agency salmon plan, American River FISH group, and American River Parkway Advisory committees. Sacramento Area Flood Control Agency provides approximately $100,000 cost share for the Paradise Beach juvenile rearing habitat project. The Water Forum contributes the time and resources their staff spends on the project.
8. No specific objections to the charter are known. Occasionally local interested parties have site-specific concerns relating to walking paths, dust, turbidity, perceived mining activity, or effects to boating features. These will be worked out as they occur on a one on one basis with the interested individuals.

Data Management

The PMT Data Steward will coordinate with external partners and biannually with the CVPIA Data Manager on the transmission of long-term monitoring and other pertinent data defined by the SIT and the PMT per the 2020 Data Guidance.

Field data will be recorded on data sheets or directly into a recording device/computer and transferred into a computer spreadsheet or database. The PMT Data Steward will coordinate with the CVPIA Data Manager on the transmission of relevant and pertinent data defined by the SIT and the PMT per the 2020 Data Guidance. Field data, analyses, and reports will be stored and backed up on a PMT computer/server.

1. Project designs and as-built survey results will be included in a basis of design report prepared by CBEC under contract with the Water Forum. The monitoring included in this charter includes riverwide aerial photography conducted during Chinook spawning in November and December. The photography provides for a river-wide redd count and enables the visible redds to be mapped in a GIS shapefile. It also provides a visual as-built view of the current year project and of changes that occur at other project sites and throughout the river through time. In addition, monitoring includes high priority effectiveness monitoring activities that contribute to the American River structured decision making. Effectiveness monitoring would also be achieved through a companion charter (American River SDM project).
2. CVPIA data management center to be utilized when available.
3. Relates to the objective of providing rearing habitat close to spawning habitat and helps determine project longevity at all sites to feed into back improving effectiveness of future habitat improvement designs.
4. Data will be housed at the Bureau of Reclamation Bay Delta Office, US Fish and Wildlife Service Stockton Office, and the Sacramento Water Forum office. Contact John Hannon at jhannon@usbr.gov for data.

Risks

Risk	Likelihood	Impact
Flows too high to work in river	1	3
Permits not obtained	1	3

Cost Estimate

Year	Fund	Total	BOR	FWS
2018	CVPRF	$1,000,000	$1,000,000	$0
2019	CVPRF	$1,000,000	$1,000,000	$0
2020	CVPRF	$1,000,000	$1,000,000	$0
2021	CVPRF	$1,000,000	$1,000,000	$0
2022	CVPRF	$1,000,000	$1,000,000	$0

Total Cost: $5,000,000

Internal Agency Resources Table

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
2018								
Construction								
Agreement	Sacramento Water Forum	$985,000	1.00	0.00	$985,000	BOR	CVPRF	Financial Assistance Agreement for project management and implementation. The Water Forum staff support is provided as an in-kind donation.
Monitoring								
Agreement	Contract	$15,000	1.00	0.00	$15,000	BOR	CVPRF	Aerial photography FAR contract solicited through competitive bid.
2019								
Construction								
Agreement	Sacramento Water Forum	$985,000	1.00	0.00	$985,000	BOR	CVPRF	Financial Assistance Agreement for project management and implementation. The Water Forum staff support is provided as an in-kind donation.
Monitoring								
Agreement	Contract	$15,000	1.00	0.00	$15,000	BOR	CVPRF	Aerial photography FAR contract solicited through competitive bid.
2020								
Construction								
Labor	Sacramento Water Forum	$985,000	1.00	0.00	$985,000	BOR	CVPRF	Financial Assistance Agreement for project management and implementation. The Water Forum staff support is provided as an in-kind donation.
Labor	Contract	$15,000	1.00	0.00	$15,000	BOR	CVPRF	Aerial photography FAR contract solicited through competitive bid
2021								
Construction								

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
Agreement	Sacramento Water Forum	$985,000	1.00	0.00	$985,000	BOR	CVPRF	Financial Assistance Agreement for project management and implementation. The Water Forum staff support is provided as an in-kind donation.
Monitoring								
Labor	Contract	$15,000	1.00	0.00	$15,000	BOR	CVPRF	Aerial photography FAR contract solicited through competitive bid
2022								
Construction								
Agreement	Sacramento Water Forum	$985,000	1.00	0.00	$985,000	BOR	CVPRF	Financial Assistance Agreement for project management and implementation. The Water Forum staff support is provided as an in-kind donation
Monitoring								
Agreement	Contract	$15,000	1.00	0.00	$15,000	BOR	CVPRF	Aerial photography FAR contract solicited through competitive bid

Butte Sink/Sutter Bypass - Evaluating the Role(s) of the Butte Sink and Sutter Bypass for Butte Creek Spring-Run Chinook Salmon and Other Central Valley Juvenile Salmonid Populations

This proposal will evaluate the growth benefits of the Sutter Bypass and compare survival between the Sacramento River and lower Butte Creek/Sutter Bypass area.

DCN:	AFRP2103
Classification:	Research, Monitoring
Location:	Sutter Flood Control Bypass, Butte Creek
Funding Years:	2019 - 2023
Benefits Start Year:	2019
Priority:	SIT FY2020 Tech Memo - Increase access to juvenile rearing habitat in Sutter and Yolo Bypasses - Increase access to non-natal tributaries to open up habitat in Upper and Upper Mid Sacramento River, Aug-March The NMFS 2014 Recovery Plan for Central Valley Chinook Salmon and steelhead supports 'Implement projects to increase Butte Creek floodplain habitat availability to improve habitat conditions for juvenile rearing' Butte Creek Action ID 2.14
Partners:	DWR, Golden Gate Salmon Association, Metropolitan Water District, NMFS, UC-Davis, USFWS
Related Programs:	NMFS-RP

Authority

Provision	Percentage
(b)(15) CAMP	100%

Metrics

Name	Value	Units	Comment
Evaluation of Survival	1	percentage of fish	Tagged Fish will be evaluated for percentage of survival.
Evaluation of Fish Growth	1	percentage of fish	Chinook will be evaluated for enhanced fish condition.
Food Web Productivity	1	metadata	Water samples collected for invertebrate diversity analysis.

Deliverables

Deliverables in all years of this project will be coordinated with the CVPIA Data Manager, CVPIA Science Coordinator, and CVPIA Fish Resource Area Coordinator.

Date	Title
Jun. 2021	Annual Report
Mar. 2023	Final Report
Jun. 2022	Annual Report

Project Management Team

Jim Early – USFWS-RBFO
Matt Brown – USFWS-RBFO
Cesar Blanco – USFWS-CVPIA
Derek Rupert – USBR-NCAO
Elissa Buttermore – USBR-BDO

Narrative

This project was previously approved in the FY19 Annual Work Plan based on the FY19 Priorities of improve rearing habitat for winter-run Chinook salmon and improve survival for juveniles on Butte Creek. Both runs are being observed in the Sutter Bypass. Continuing the study has both short-term objective-specific monitoring elements by providing real time input on habitat condition, as well as long-term trend monitoring elements, as the project can be used to assess trends if/when habitat expansion occurs via a change in operations, restoration, etc. The FY20 Call for Project Proposals identifies in Table 2: Juvenile tributary survival as a Tier 1 Priority and juvenile river growth as a Tier 2 Priority. This project will continue to provide critical data to inform the Peterson 2014 DSM.

The Butte Creek spring-run Chinook salmon have been a relatively successful and stable population compared to other populations in the Central Valley. To date, there is little data to suggest the mechanism for this relative success. NOAA Fisheries designated Butte Creek and Sutter Bypass as a critical habitat for Central Valley spring-run Chinook salmon.

The purpose of this study is to quantify the benefits of the flooded Sutter Bypass and Butte Sink for juvenile Chinook salmon compared to adjacent main river channel habitats. Future management actions can utilize this information to maximize benefits to juvenile salmon and help enhance the abundance of Chinook salmon populations in the Central Valley. Consequently, it is crucial to first have a better understanding of what mechanisms and locations create high quality habitat for juvenile salmonids. To do this, we propose to address the following questions:

1. How does the hydrology of the lower Butte Creek (Butte Sink and Butte Slough) and the Sutter Bypass affect juvenile salmon?
2. What are the growth benefits of juvenile salmonids rearing in the lower Butte Creek and Sutter Bypass?
3. What runs of Salmon utilize the Sutter Bypass?

The NMFS 2014 Recovery Plan for Central Valley Chinook Salmon and Steelhead supports 'Implement projects to increase Butte Creek floodplain habitat availability to improve habitat conditions for juvenile rearing' Butte Creek Action ID 2.14.

Data Management

The PMT Data Steward will coordinate with external partners and biannually with the CVPIA Data Manager on the transmission of long-term monitoring and other pertinent data defined by the SIT and the PMT per the 2020 Data Guidance.

Field data will be recorded on data sheets or directly into a recording device/computer and transferred into a computer spreadsheet or database. The PMT Data Steward will coordinate with the CVPIA Data Manager on the transmission of relevant and pertinent data defined by the SIT and the PMT per the 2020 Data Guidance. Field data, analyses, and reports will be stored and backed up on a PMT computer/server.

This project proposal supports overall FY20 SIT priorities by collecting and providing information for the DSM on fish survival, habitat availability, flow and temperature for Chinook salmon. Additionally, it addresses juvenile tributary survival, and the value of increasing perennially inundated juvenile habitat in the Sacramento River for all runs of Chinook salmon.

Data will be maintained and housed at UC Davis and reports submitted to USFWS at https://www.fws.gov/redbluff/afrp.html

Risks

Risk	Likelihood	Impact
Impacts to wild spring Chinook	2	1

Cost Estimate

Year	Fund	Total	BOR	FWS
2019	CVPRF	$775,720	$0	$775,720
2020[2]	CVPRF	$17,925	$0	$17,925
2021	CVPRF	$441,500	$0	$441,500

Total Cost: $1,235,145

[2] The FY2019 funding amount of $775,720 included $388,169, which was the FY2020 allocated funding for this project. The $17,925 is additional FY20 funding to cover added genetic sampling, water sampling, and materials as part of the original agreement.

Internal Agency Resources Table

Type	Name	Rate	Frac	MU	Total	Agency	Fund	Description
2019								
Management								
Labor	Labor UCD	$149,268	1.00	0.00	$149,268	FWS	CVPRF	Growth Study
Labor	Overhead CESU	$60,504	1.00	0.00	$60,504	FWS	CVPRF	Overhead @ 18.5%
Labor	Labor USCS	$137,279	1.00	0.00	$137,279	FWS	CVPRF	Growth Study
Labor	Travel	$3,000	1.00	0.00	$3,000	FWS	CVPRF	Overhead @ 18.5%
Research								
Equipment or Materials	Juvenile Rearing Cages and PIT supplies	$17,500	1.00	0.00	$17,500	FWS	CVPRF	Juvenile Rearing Cages and PIT supplies
Agreement	Data Analysis	$20,000	1.00	0.00	$20,000	FWS	CVPRF	Genetic otolith analysis
2020								
Management								
Labor	Travel	$5,088	1.00	0.00	$5,088	FWS	CVPRF	Travel for Meetings and Conferences for Project Representatives
Labor	Labor	$364,342	1.00	0.00	$364,342	FWS	CVPRF	Growth Study, Hydrology, Food Web and Water Quality sampling Labor includes staff from UCD and NOAA
Research								
Equipment or Materials	Sampling	$11,483	1.00	0.00	$11,483	FWS	CVPRF	Materials and Supplies - cages, DO sensors, Field Supplies, PPE Gear, Lab Supplies, Data Supplies, Vehicle rental
Labor	Data Analysis	$7,256	1.00	0.00	$7,256	FWS	CVPRF	Genetic analysis from our wild fish collection 200-250 Samples
2021								
Management								
Labor	Labor	$416,782	1.00	0.00	$416,782	FWS	CVPRF	Growth Study, Hydrology, Food Web and Water Quality sampling Labor includes staff from UCD and NOAA
Labor	Scientific Publications	$4,081	1.00	0.00	$4,081	FWS	CVPRF	Scientific Peer Review and Publications
Labor	Travel	$5,438	1.00	0.00	$5,438	FWS	CVPRF	Travel for Meetings and Conferences for Project Representatives

Type	Name	Rate	Frac	MU	Total	Agency	Fund	Description
Research								
Equipment or Materials	Sampling	$7,579	1.00	0.00	$7,579	FWS	CVPRF	Materials and Supplies - cages, DO sensors, Field Supplies, PPE Gear, Lab Supplies, Data Supplies, Vehicle rental
Labor	Data Analysis	$7,620	1.00	0.00	$7,620	FWS	CVPRF	Genetic analysis from our wild fish collection 200-250 Samples

Clear Creek Stream Channel Restoration Phase 3C

This project completes the final phase of the 1999 Clear Creek Floodway Restoration Project conceptual plan. The project improves the stream channel, floodplains, and associated habitats of the Phase 3C site increasing spawning and rearing habitat for salmonids.

DCN: AFRP2128
Classification: Habitat Improvement, Habitat Restoration
Location: Clear Creek
Funding Years: 2017 - 2022
Benefits Start Year: 2020
Priority: This project addresses the legislative 3406(b)(12) priority.
Partners: BLM, CDFW, DWR, FWS
Related Programs: Clear Creek Technical Task Force

Authority

Provision	Percentage
(b)(12)	100%

Metrics

Name	Value	Units	Comment
Wetland and riparian planting and maintenance	12.4	acres	
Upland seeding and mulching	29.8	acres	

Deliverables

Deliverables in all years of this project will be coordinated with the CVPIA Data Manager, CVPIA Science Coordinator, and CVPIA Fish Resource Area Coordinator.

Date	Title
Dec. 2020	Quarterly updates to Phase 3C Project Management Team and CCTT
Sep. 2023	Report - fish, riparian, geomorphic

Project Management Team

Sean Frische – Project Manager, USBR-MPCO
Derek Rupert – Fish Biologist, USBR-NCAO
Matt Brown – Fish Biologist – RBFWS
Charles Chamberlain – Fish Biologist – RBFWS
Tricia Bratcher – Environmental Scientist – DFW
Mike Berry – Environmental Scientist – DWR
Laura Brodhead – Ecologist – BLM.

Narrative

Phase 3C is the final phase of a 2-mile multi-phase restoration plan described in the Conceptual Plan (M&T 1999) and Clear Creek Technical and Design Document (M&T 1999). Phase 3C will create floodplain and stream channels in the lowest part of this 2-mile reach.

The project includes elements to enhance riverine and riparian functions, and aquatic habitats. Channel re-alignment will return the main channel to its historic alignment, lengthen the main channel, increase sinuosity, and establish a more complex channel with suitable stream bed materials for spawning. Channel split features will increase shoreline area for fry habitat. Additional channels and alcoves will be built to inundate at 200 cfs to expand fish rearing habitat at frequent flows. An off-channel pond with adjacent seasonal wetlands will increase habitat diversity and create off-channel rearing habitat. The project will expand seasonal wetlands, increase and enhance riparian, emergent, and wetland vegetation, and create floodplain surfaces which are at suitable elevations to increase natural recruitment of cottonwoods.

The design incorporates Beaver Dam Analogues (BDA's) to mimic the natural form and function of beaver dams, where surfaces are wetted through increased backwatering. Each BDA allows juvenile fish to migrate downstream through the structures. Organic materials used to initiate the structure will break down over time. There are numerous beavers in the project area and the structure may be maintained and repaired by natural beaver colonization. In the absence of maintenance by the existing beaver population, annual maintenance (~1 day/year) is required. If BDA's are not maintained, the earthen bases of the BDAs and the pond control structure will retain water in the ponds and fish passage between the ponds, but water levels will be lower, and less area of the pond will have adequate depth to meet temperature targets.

Approximately 2 acres of lowered floodplain are incorporated into the 90% design. These surfaces will be lowered approximately 1–5 ft to create floodplain surfaces which are inundated at flows between 200 and 1,000 cfs. Lowered floodplain areas will increase the connectivity between floodplain surfaces and the active channel. Increased floodplain conductivity will increase natural cottonwood recruitment, increase habitat complexity, provide rearing habitat, and create velocity refugia for salmonids and other aquatic species across a broad range of flows greater than base flow. These lowered areas may naturally develop additional scour channels, maintaining a complex network of channels and floodplain surfaces that are activated over a range of flows.

Some of the plant materials included in the 90% revegetation design were selected to be installed and established with minimal post-project irrigation. Riparian and emergent plantings were intended to be installed into substrates that are in contact with the summer and fall late season groundwater capillary fringe. Soil moisture and shallow groundwater were intended to be the main water available to those plantings; because of this, plantings must be done correctly at the specified depths to be successful. Pole cuttings must be installed directly into visible groundwater to survive with minimal irrigation.

Without irrigation, it can be expected that there will be areas of high survival and areas with little or no survival. The 90% revegetation strategy relies heavily on nursery-grown plants, and one revegetation goal is to establish healthy and vigorously growing plants. To accomplish this goal, irrigation is often necessary to protect vulnerable plantings from installation and thermal stress.

Thermal stress may be the result of low ambient moisture, lack of precipitation, and high temperatures that exist during summer conditions when projects are constructed and in subsequent summers before tree/shrub canopies can be established.

Data Management

The PMT Data Steward will coordinate with external partners and biannually with the CVPIA Data Manager on the transmission of long-term monitoring and other pertinent data defined by the SIT and the PMT per the 2020 Data Guidance.

Field data will be recorded on data sheets or directly into a recording device/computer and transferred into a computer spreadsheet or database. The PMT Data Steward will coordinate with the CVPIA Data Manager on the transmission of relevant and pertinent data defined by the SIT and the PMT per the 2020 Data Guidance. Field data, analyses, and reports will be stored and backed up on a PMT computer/server.

Information for the charter including relevant protocols for understanding the information will be permanently housed at Northern California Area Office of Reclamation and the Red Bluff Fish and Wildlife Office of the Service.

Habitat modeling of existing and proposed condition will be compared to assess the benefit of Phase 3C – primarily to juvenile salmonid rearing, but also to spawning. InSALMO will be utilized to make a model-based prediction of the production difference between existing and proposed conditions. Coordination will also occur to asses model comparisons based on the coarse resolution model of the Decision Support Model (DSM) being used to evaluate restoration metrics on the much broader scale. InSALMO and DSM results will be assessed for differences in the two approaches.

Risks

Risk	Likelihood	Impact
Cost estimate higher than expected	2	2

Cost Estimate

Year	Fund	Total	BOR	FWS
2017	CVPRF	$4,397,469	$3,899,639	$497,830
2018	CVPRF	$1,000,000	$900,000	$100,000
2019	CVPRF	$406,316	$406,316	$0
2020	CVPRF	$737,990	$737,990	$0
2021	CVPRF	$83,840	$83,840	$0
2022	CVPRF	$83,840	$83,840	$0
2023	CVPRF	$25,000	$25,000	$0

Total Cost: $6,734,455

Internal Agency Resources Table

Type	Name	Rate	Frac	MU	Total	Agency	Fund	Description
2017								
Construction								
Labor	Environmental permitting	$25,653	1.00	0.00	$25,653	BOR	CVPRF	
Labor	Fish biologist	$239,150	0.20	0.00	$47,830	FWS	CVPRF	Pre-project juvenile salmon habitat use study to evaluate the effectiveness of the project and inform critical uncertainties of DSM.
Labor	Project management	$50,000	1.00	0.00	$50,000	BOR	CVPRF	
Agreement	Construction contract	$2,700,000	1.00	0.00	$2,700,000	BOR	CVPRF	Design build construction contract
Labor	Design and data collection	$275,986	1.00	0.00	$275,986	BOR	CVPRF	Includes design and value engineering costs
Agreement	Avian surveys	$225,000	1.00	0.00	$225,000	FWS	CVPRF	Pre- and post-project avian surveys to evaluate the effectiveness of the entire project and to document progress towards mitigation requirements.
Agreement	Land acquisition	$180,000	1.00	0.00	$180,000	BOR	CVPRF	Agreement with BLM to acquire private property in project footprint required for construction.
Contingency	Non-contract costs	$500,000	1.00	0.00	$500,000	BOR	CVPRF	Contingency of approximately 20% for construction of Phase 3C
Agreement	Vegetation surveys	$225,000	1.00	0.00	$225,000	FWS	CVPRF	Pre- and post-project vegetation surveys to evaluate the effectiveness of the entire project and to document progress towards mitigation requirements.
Labor	Construction management and procurement	$18,000	1.00	0.00	$18,000	BOR	CVPRF	
Agreement	Complete revegetation, wetlands creation and road removal	$150,000	1.00	0.00	$150,000	BOR	CVPRF	Complete work including revegetation, road removal and re-alignment, and wetlands creation and modification that was not completed in Phase 3B due to lapse in contract.

Type	Name	Rate	Frac	MU	Total	Agency	Fund	Description
2018								
Construction - Phase 3C of Stream Channel Restoration Project								
Agreement		$900,000			n/a	BOR	CVPRF	Note: $4,900,000 of the total Design/Build contract anticipated award in FY18. ~$5,450,000 is a recent estimate for the entire contract plus contingencies based on work provided by Reclamation. The $0.9 mil in FY18 plus $4.0 mil carried over from FY17 funds construction.
Evaluate Phase 3C performance using geomorphic, fish, avian, riparian, herp and mercury monitoring								
Agreement		$100,000			n/a	FWS	CVPRF	Supplemental funding for monitoring described in project proposal potentially including fish, geomorphological, avian, riparian, and herpetological and mercury evaluations. Information for evaluation of impacts and effectiveness.
2019								
Design Data								
Labor	TSC-Sediment/River	$35,000	1.00	0.00	$35,000	BOR	CVPRF	Design
Labor	TSC-Sediment/River	$50,473	1.00	0.00	$50,473	BOR	CVPRF	Design support during construction

Environmental Compliance and Permitting								
Labor	MP Environmental Group	$51,000	1.00	0.00	$51,000	BOR	CVPRF	Environmental permitting
Management								
Labor	MPCO	$200,000	1.00	0.00	$200,000	BOR	CVPRF	Project management
Labor	MPCO	$58,930	1.00	0.00	$58,930	BOR	CVPRF	Construction management
Labor	MPCO 3800	$10,913	1.00	0.00	$10,913	BOR	CVPRF	Procurement admin
2020								
Implementation								
Labor	TSC - Sediment/ River group	$302,000	0.08	0.00	$24,160	BOR	CVPRF	
Labor	Mid Pacific Contract Office CM	$269,000	0.31	0.00	$83,390	BOR	CVPRF	
Labor	Mid Pacific Contract Office PM	$269,000	0.20	0.00	$53,800	BOR	CVPRF	
Monitoring								
Labor	MP Environmental Group	$208,000	0.08	0.00	$16,640	BOR	CVPRF	
2021								
Implementation								
Labor	Mid Pacific Contract Office PM	$269,000	0.11	0.00	$29,590	BOR	CVPRF	
Labor	TSC - Sediment/ River group	$302,000	0.08	0.00	$24,160	BOR	CVPRF	
Labor	Mid Pacific Contract Office CM	$269,000	0.05	0.00	$13,450	BOR	CVPRF	
Monitoring								
Labor	MP Environmental Group	$208,000	0.08	0.00	$16,640	BOR	CVPRF	
2022								
Implementation								
Labor	Mid Pacific Contract Office CM	$269,000	0.05	0.00	$13,450	BOR	CVPRF	
Labor	TSC-Sediment/River group	$302,000	0.08	0.00	$24,160	BOR	CVPRF	
Labor	MP Contract Office PM	$269,000	0.11	0.00	$29,590	BOR	CVPRF	
Monitoring								
Labor	MP Environmental Group	$208,000	0.08	0.00	$16,640	BOR	CVPRF	
2023								
Labor	MPCO	$25,000	1.00	0.00	$25,000	BOR	CVPRF	

Clear Creek Phase 3B Completion

This project completes Phase 3B floodplain restoration actions that were unfinished/unfunded at time of original construction due to State bond crisis. This project fulfills commitments made to permitting agencies, the public, and landowners.

DCN: AFRP2127
Classification: Habitat Improvement, Administration
Location: Lower Clear Creek (Downstream of Whiskeytown Dam), Clear Creek
Funding Years: 2018 - 2021
Benefits Start Year: 2021
Priority: This project addresses the legislative 3406(b)(12) priority.
Partners: CDWR, NMFS, NPS, NRCS, Point Blue Conservation Science, Western Shasta Resource Conservation District, BLM, CDFW
Related Programs: NMFS-RPAs, CALFED, NMFS-RP

Authority

Provision	Percentage
(b)(12)	100%

Metrics

Name	Value	Units	Comment
(b)(12): Stream Channel restored (miles)	2	miles	CPAR goal was 2 miles for the entire program based on the length of the first stream channel restoration project proposal in 1999. Subsequent projects and those currently under consideration could exceed metric value.
Permit requirement	1	completion	Permit requirement1completionAddress commitments made to Corps and BLM as the public landowner regarding the mass balance of riparian and wetland loss/creation over the Lower Clear Creek Floodway Rehabilitation effort. This project will complete floodplain work that was left unfunded at the time of construction of Phase 3B.

Deliverables

Deliverables in all years of this project will be coordinated with the CVPIA Data Manager, CVPIA Science Coordinator, and CVPIA Fish Resource Area Coordinator.

Date	Title
Mar. 2020	Wetland balance analysis.
Jun. 2020	Phase 3B Completion bid documents
Oct. 2020	Award Design-Build contract.

Date	Title
Dec. 2021	As-built project data package
Nov. 2022	Final project completion report

Project Management Team

Sean Frische – Project Manager, USBR-MPCO
Derek Rupert – Fish Biologist, USBR-NCAO
Matt Brown – Fish Biologist – RBFWS
Charles Chamberlain – Fish Biologist – RBFWS
Tricia Bratcher – Environmental Scientist – DFW
Mike Berry – Environmental Scientist – DWR
Laura Brodhead – Ecologist – BLM.

Narrative

Initial construction portions of the Lower Clear Creek Phase 3B Restoration project were completed in the late 2000's. Final floodplain modifications, wetland, and riparian replanting efforts for the site were to be funded by the State of California, but a portion of those tasks were not completed due to the California Bond Crisis (2008). The purpose of this charter is to finish restoration at the Phase 3B Restoration site and realize the complete benefits of a fully constructed site. Additionally, in discussions regarding other Lower Clear Creek Floodway Restoration Project phases, the Army Corps of Engineers (Corps) has expressed concern regarding the balance of wetland and riparian loss and creation over the 20-year multiple phase period of the lower Clear Creek Floodway Restoration Program, of which Phase 3C is the final remaining piece (scheduled for 2019 construction and completion). The Corps wants a final accounting of the loss/creation balance. This Phase 3B Completion project provides an opportunity to address the Corps' concerns regarding the balance of wetlands. This project is critical for meeting the commitments CVPIA has made to permitting agencies and the landowner (BLM). These commitments will also improve floodplain habitats for salmon and terrestrial species by creating additional floodplain habitat (riparian, wetland), reducing fragmentation between earlier revegetated section of the floodplain, and further augmenting spawning habitat.

The Phase 3B Completion project supports CVPIA goals and 2019 SIT priorities. Clear Creek stream restoration was individually called out in the CVPIA, under section b(12), and Phase 3B in an integral part of this large effort. Phase 3B completion project supports three SIT priorities: 1) Increasing seasonally inundated juvenile Chinook Salmon habitat, 2) Increase perennially inundated juvenile Chinook Salmon habitat, and 3) maintain spawning habitat in CVP streams.
The first steps to the Phase 3B Completion project began in 2019, with CVPIA funds, with a thorough inventory of the current site conditions (e.g. wetlands delineation and site evaluations). From this preliminary information, the Clear Creek Technical Team will prioritize and select key aspects of the Phase 3B site to address. Known issues include, wetlands creation, road decommissioning, road re-routing, revegetation, and poor floodplain performance.

Planned project schedule:
FY2019 – Wetland Delineation

FY 2020 – Design, NEPA, and permitting. A contract (via competitive bid) will be established to design and engineer a plan for implementing the key components selected by the CCTT. This contract will also incorporate any NEPA and permit applications needed to complete the work.

FY 2021- Construction and implementation. A contract (via competitive bid) will be established to implement the designed plans and CCTT selected components. This contract will include year-1 of re-vegetation irrigation and an as-build data package.

FY 2022 – Irrigation and final clean up. A contract (via competitive bid [may be inclusive of Construction and Implementation Contract above]) will be established to complete the second (and final) year of revegetation irrigation and to clear up any remnant project infrastructure. This contract will also include a final project completion report.

Data Management

The PMT Data Steward will coordinate with external partners and biannually with the CVPIA Data Manager on the transmission of long-term monitoring and other pertinent data defined by the SIT and the PMT per the 2020 Data Guidance.

Field data will be recorded on data sheets or directly into a recording device/computer and transferred into a computer spreadsheet or database. The PMT Data Steward will coordinate with the CVPIA Data Manager on the transmission of relevant and pertinent data defined by the SIT and the PMT per the 2020 Data Guidance. Field data, analyses, and reports will be stored and backed up on a PMT computer/server.

Information for the charter including relevant protocols for understanding the information, will be permanently housed at Northern California Area Office of Reclamation and the Red Bluff Fish and Wildlife Office of the Service.

Short-term Objective Specific Monitoring: At the Phase 3B site, STOS monitoring will evaluate the projects performance in meeting the CCTT selected key components. This could include wetlands performance evaluations, revegetation performance, floodplain inundation levels, juvenile fish habitat creation, and aesthetic resource evaluations, among others.

Long-term Trend Monitoring: At the Phase 3B site, LTT monitoring will continue to access the overall performance of the LCCFRP. This includes (but in not limited to) adult salmonid escapement levels, salmonid spawning assessments, juvenile production, egg-to-fry survival assessments, geomorphic evaluations, avian response, and habitat assessments.

Risks

Risk	Likelihood	Impact
Floodway wetland inventory identifies wetland creation needs that exceed available budget.	2	2

Cost Estimate

Year	Fund	Total	BOR	FWS
2018	CVPRF	$0	$0	$0
2019	CVPRF	$35,000[3]	$35,000	$0
2020	CVPRF	$200,000	$200,000	$0
2021	CVPRF	$75,000	$75,000	$0

Total Cost: $310,000

[3] No funds spent in FY18. This charter supersedes the FY18 Charter.

Internal Agency Resources Table

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
2019								
Construction								
Agreement	Construction contract	$35,000	1.00	0.00	$35,000	BOR	CVPRF	Wetland delineation
2020								
Construction								
Agreement	Construction contract	$150,000	1.00	0.00	$150,000	BOR	CVPRF	Initial estimate of design and construction costs for Phase 3B Completion
Planning and Analysis								
Labor	Natural Resource Specialist	$50,000	0.10	0.00	$50,000	BOR	CVPRF	Inventory and account for mass balance of wetland creation and loss over the approximate 20-year period of the Lower Clear Creek Floodway Restoration Program. Quantify wetland creation needed to meet long-term commitment to ACOE and BLM.
2021								
Construction								
Labor	Contingency	$75,000	1.00	0.00	$75,000	BOR	CVPRF	50% of estimated construction cost.

Clear Creek Gravel Augmentations

Place gravel into Clear Creek to provide spawning habitat for anadromous salmonids and to promote geomorphic processes that create habitat for all in-river fish life history stages.

DCN: AFRP2126
Classification: Habitat Maintenance
Location: Clear Creek
Funding Years: 2018 - 2023
Benefits Start Year: 2018
Priority: SIT FY2020 Tech Memo:
- Maintain spawning habitat in the CVP streams
This project also addresses the legislative 3406(b)(12) priority.
Partners: CDWR, NPS, BLM, CDFW
Related Programs: NMFS-RP, NMFS-RPAs, CVPIA (b)(12), EWP

Authority

Provision	Percentage
(b)(12)	100%

Metrics

Name	Value	Units	Comment
(b)(12): Spawning gravel placed annually (tons)	12000	tons	Approximate amount of gravel augmented annually, which will increase supply, promote alluvial processes, and is manageable within a season.
(b)(12): Area of spawning habitat	347308	square feet	The long-term goal is to produce and maintain usable spawning habitat greater than or equal to the amount available pre-Whiskeytown Dam construction (347,308 square feet above the George overlook).

Deliverables

Deliverables in all years of this project will be coordinated with the CVPIA Data Manager, CVPIA Science Coordinator, and CVPIA Fish Resource Area Coordinator.

Date	Title
Dec. 2020	Annual Project Completion Report
Dec. 2021	Annual Project Completion Report
Dec. 2022	Annual Project Completion Report

Project Management Team

Paul Zedonis – USBR-NCAO
Derek Rupert – USBR-NCAO

Charlie Chamberlain – USFWS-RBFO
Matt Brown – USFWS-RBFO

Narrative

The CVPIA (b)(12) program has a long-standing responsibility to augment gravel in Clear Creek to replace desirable sediment fractions blocked by the presence and operation of Whiskeytown Reservoir and historic gravel mining. To avoid jeopardy of ESA listed Spring-run Chinook Salmon (*Oncorhynchus tshawytscha*) and Central Valley steelhead (*O. mykiss*), this program is identified within the ESA requirements issued for continued operation of the CVP/SWP and is identified in the NMFS OCAP BO as RPA Action I.1.3 (NMFS 2009). The gravel program is likewise identified in NMFS' Recovery Plan for these listed species (NMFS 2014). This program also benefits Clear Creek's Fall- and Late Fall-run Chinook Salmon. These gravel augmentations support three SIT priorities: 1) maintain spawning habitat in CVP streams, 2) Increasing perennially inundated juvenile Chinook Salmon habitat (Sacramento River watershed upstream of the American R. confluence), and 3) Increase seasonally inundated juvenile Chinook Salmon habitat at 2-yr frequency (Sacramento River watershed upstream of the American R. confluence).

From 1996 to 2018, approximately 175,000 tons of coarse gravel have been placed into Clear Creek. FWS (Red Bluff) annually monitors the amount of spawning habitat for all Clear Creek runs of Chinook Salmon and steelhead. The project also helps to restore sediment transport processes, such as coarse bedload transport continuity, alternating bar riffle sequences, and sediment deposition on floodplain surfaces (floodplain habitat enhancement). Flow events transport gravel downstream, and injections of gravel help restore and maintain balance. Desirable river channel floodway processes are critically dependent on sediment transport and support long-term fish habitat formation and riparian community development. System wide gravel routing has not yet been achieved. However, augmented gravels are approaching gravel routing between most of the frequently used augmentation sites.

The Clear Creek Restoration Program (3406(b)(12) evaluates the amount of spawning habitat using Potential Spawning Habitat Mapping (PSAM) and Spawning Habitat Use (SHU) data collected by USFWS. SHU maps and quantifies all habitat actually used or disturbed during spawning in reaches used by Fall-run Chinook Salmon. PSAM maps and quantifies areas that meet spawning habitat criteria of depth, velocity, and substrate for steelhead and three runs of Chinook Salmon (Spring-run, Fall-run, and Late Fall-run). Overall trends in spawning area can be detected with these methods as well as changes on reach and site-specific scales.

In 2018, the PSAM surveys showed record high spawning habitat in 5 of the 8 monitored gravel augmentation sites on Clear Creek (2010 to present; USFWS unpublished data). Both Chinook and steelhead spawn in augmented gravel at increasingly higher rates (USFWS unpublished data).

The Clear Creek Technical Team is exploring ways to address the needs of the Decision Support Model (DSM), including consideration of metrics we believe important to Clear Creek and northern Sacramento salmonid populations that aren't necessarily captured in the current structure of the DSM.

In spring 2018, a subcommittee of the CCTT formed and continues to develop a new conceptual model, goals, reach-specific objectives, valuable metrics, and an explicit adaptive management framework for the augmentation program.

FY2020, FY2021, and FY2022 represents projected costs to augment up to 12,000 tons of gravel into Clear Creek.

Data Management

The PMT Data Steward will coordinate with external partners and biannually with the CVPIA Data Manager on the transmission of long-term monitoring and other pertinent data defined by the SIT and the PMT per the 2020 Data Guidance.

Field data will be recorded on data sheets or directly into a recording device/computer and transferred into a computer spreadsheet or database. The PMT Data Steward will coordinate with the CVPIA Data Manager on the transmission of relevant and pertinent data defined by the SIT and the PMT per the 2020 Data Guidance. Field data, analyses, and reports will be stored and backed up on a PMT computer/server.

Compliance and effectiveness monitoring for the project are conducted as part of the (b)12 Clear Creek Adaptive Management Monitoring Charter which funds FWS Red Bluff Office, and includes fishery, habitat, and geomorphic components. There are short- and long-term aspects of each of these components. Short-term, Objective Specific (STOS) monitoring will include repeat topological surveys of the gravel projects as they change over time, and documentation of spawning use during year-round spawning ground surveys. While the first physical and biological responses of the project will be detected with these methods, they are also long-running monitoring programs that inform Long-Term Trend monitoring (LTT). Most of our monitoring efforts are spatially explicit and suitable for analysis on multiple scales:
Watershed Scale: Longitudinal topographic surveys, LiDAR; bedload transport and sediment budget; annual adult salmonid population estimates; annual juvenile production estimates; annual juvenile productivity estimates (juvenile production / adult escapement); InSALMO modeled outmigrants per year; temperature monitoring system of loggers.

Spawning-reach Scale: Topographical change, especially estimating volumes of gravel moving in and out of project sites; salmonid spawning habitat suitability mapping salmonid spawning habitat use; redd distribution surveys; salmonid use of supplemental gravel.

Meso- and Micro-habitat Scale: Spawning gravel evaluation: sediment size; juvenile habitat use studies compare salmonid densities between: restored and control reaches, physical habitat treatments, habitat types, types or presence of riparian vegetation; macro-invertebrate studies comparing gravel restoration types in treated and control areas.

STOS monitoring quantitative predictions of the expected outcomes of the gravel additions include 1) a 5% increase in PSAM in the year following gravel addition, 2) Based on previous observation we expect an increase of 16% Spawning Habitat Use per year following gravel mobilization, 3) The percent of redds in injection gravel in the upper reaches of Clear Creek increases roughly 5% per

year. Note, we expect some of these relationships to be asymptotic, eventually reaching some yet-to-be-determined maximum levels.

LTT monitoring quantitative predictions include 1) an increase in PSAM to pre-dam conditions, 2) sustained increase in Spawning Habitat Use to a carrying capacity value which has yet to be determined, 3) an increase in tons per year until the system has been recharged with sediment. 4) the size distribution of gravel in spawning areas will converge on the size distribution preferred by salmonids. Another important metric for LTT monitoring is the number of juveniles produced per female salmonid.

The Clear Creek Technical Team has discussed metrics to study to see how our monitoring may help inform the DSM process. The DSM in its current state does not identify spawning gravel as a primary limiting factor for Chinook Salmon and steelhead in Central Valley streams. Our information may help support or modify this initial conclusion of the DSM. Additional factors or data sources we have considered following up on include gravel size specifications, outmigrants per year from InSALMO model, Potential Spawning Area Mapping, watershed-wide bulk sediment sampling, macro-invertebrate abundance and species richness and Juvenile Habitat Use.

Risks

Risk	Likelihood	Impact
Funding reductions	1	2
High fuel costs	2	1

Cost Estimate

Year	Fund	Total	BOR	FWS
2018	CVPRF	$309,662	$309,662	$0
2019	CVPRF	$315,758	$315,758	$0
2020	CVPRF	$320,000	$320,000	$0
2021	CVPRF	$329,600	$329,600	$0
2022	CVPRF	$339,200	$339,200	$0
2023	CVPRF	$349,200	$349,200	$0
2024	CVPRF	$359,200	$359,200	$0
2025	CVPRF	$369,200	$369,200	$0

Total Cost: $2,691,820

Internal Agency Resources Table

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
2018								
Implementation								
Labor	Permit support	$241,542	0.04	0.00	$9,662	BOR	CVPRF	Staff support for environmental compliance.
Agreement	Inject up to 12,000 tons of gravel at various locations	$300,000	1.00	0.00	$300,000	BOR	CVPRF	Gravel projects towards CVPIA target of 25,000 tons per year
2019								
Implementation								
Agreement	Inject up to 12,000 tons of gravel at various locations	$306,000	1.00	0.00	$306,000	BOR	CVPRF	Gravel projects towards CVPIA target of 25,000 tons per year
Labor	Permit support	$243,957	0.04	0.00	$9,758	BOR	CVPRF	Staff support for environmental compliance.
2020								
Implementation								
Agreement	Contract - Augment up to 12,000 tons of gravel at various locations	$320,000	1.00	0.00	$320,000	BOR	CVPRF	(b)12 gravel augmentation
2021								
Implementation								
Agreement	Contract - Augment up to 12,000 tons of gravel at various locations	$320,000	1.00	0.03	$329,600	BOR	CVPRF	
2022								
Implementation								
Agreement	Contract - Augment up to 12,000 tons of gravel at various locations	$320,000	1.00	0.06	$339,200	BOR	CVPRF	(b)12 gravel augmentation

Data and Analytic Support

SIT support via data visualization & stewardship, and peer review management.

DCN: AFRP2116
Classification: Monitoring, Science Integration Team
Location: Central Valley Wide
Funding Years: 2015 - 2021
Benefits Start Year: 2015
Priority: Manage CVPIA Data Management Strategy
Partners: FWS, USBR
Related Programs: CAMP

Authority

Provision	Percentage
(b)(15) CAMP	100%

Metrics

Name	Value	Units	Comment
Peer Reviews	1	Completion	On-call to compile list of peer reviewers and to complete peer review of 2019 Fall Run DSM and 2020 Near Term Restoration Strategy in conjunction with Reclamation & USGS Science Integrity policies.
Data Visualization	1	metadata	Visualization/Presentation of DSM output per USGS & Reclamation
Data Management	1	Website	Organize, manage, and provide permanent access to all CVPIA data the contractor can get their hands on.

Deliverables

Deliverables in all years of this project will be coordinated with the CVPIA Data Manager, CVPIA Science Coordinator, and CVPIA Fish Resource Area Coordinator.

Date	Title
Dec. 2017	Tech Memo Support description
Mar. 2018	Review of 2017 Technical Memorandum
Mar. 2018	Review of 2017 Fall Run DSM
Mar. 2018	Phase I - Contract Closeout Summary
Jun. 2019	Website with access to tools, data, and SIT meeting notes, as well as SIT related materials and meeting calendar
Dec. 2019	Annotated Outline of 2020 Near Term Restoration Strategy

Project Management Team

Mike Beakes – USBR-BDO – COR
Rod Wittler – USBR-CVPIA
Cesar Blanco – USFWS-CVPIA
James Peterson – USGS-OSU CRU
Mike Urkov – Flow West

Narrative

1. Visualization of DSM results - SIT support. Contractor supports SIT at the direction of the Science Coordinator, Science Mentor, and the Fish Resource Area Coordinator. Visualization includes using standard software to graph or otherwise present results of DSM"s and other analyses to the SIT at regular SIT meetings, SIT workshops, or packaged as a PDF for email distribution. Purpose of visualization is to enable SIT to interpret DSM output for establishing priorities.
2. Data Coordination – Coordinates all other DB's supported by CVPIA or accessed by CVPIA. Contractor is aware of and coordinates all data used as input to the DSM"s. Works closely with Science Mentor and Data Coordinator to maintain and provide access to data relevant to each of the DSMs.
3. Data Stewardship – Manages all DSM related data and DSM versioning using R constructs. Contractor supports the Science Mentor and Science Coordinator by stewarding DSM related data. Uses principles of "Tidy Data". Works to standardize and automate data input for the DSM's. Works to interface with the CVPIA Projects GIS DB.
4. Peer Review management – procures and manages peer reviewers for CVPIA as required by Reclamation.

At the direction of the Science Coordinator and/or the Fish Resource Area Coordinator, Contractor manages peer review for the SIT and CVPIA. Management includes establishing and maintaining a list of qualified peer reviewers from multiple disciplines, preparing standard contract language, scheduling peer reviews based on requests from the Science Coordinator, Science Mentor, or Fish Resource Area Coordinator, procuring peer review services at industry rates, communicating with peer reviewers, and ensuring timely completion of peer reviews.

Data Management

The PMT Data Steward will coordinate with external partners and biannually with the CVPIA Data Manager on the transmission of long-term monitoring and other pertinent data defined by the SIT and the PMT per the 2020 Data Guidance.

Field data will be recorded on data sheets or directly into a recording device/computer and transferred into a computer spreadsheet or database. The PMT Data Steward will coordinate with the CVPIA Data Manager on the transmission of relevant and pertinent data defined by the SIT and the PMT per the 2020 Data Guidance. Field data, analyses, and reports will be stored and backed up on a PMT computer/server.

Contractor visualizes, coordinates, and stewards data generated by the USGS via the DSM"s. Contractor will store all pertinent data on their own system and Reclamation will initiate efforts to transfer all data/meta data to a DOI system in 2020. The 3406(g) program (MP-700; Michael Wright) is the point of contact for maintaining the mirror of the contractor's data.

Risks

Risk	Likelihood	Impact
Peer Review	2	2
Visualization	1	2
Stewardship	1	2

Cost Estimate

Year	Fund	Total	BOR	FWS
2015	CVPRF	$379,547	$379,547	$0
2016	CVPRF	$325,887	$325,887	$0
2017	CVPRF	$323,911	$323,911	$0
2018	CVPRF	$135,000	$135,000	$0
2019	CVPRF	$260,000	$260,000	$0
2019	WRR	$434,000	$434,000	$0
2020	CVPRF	$260,000	$260,000	$0
2020	WRR	$429,619	$429,619	$0
2021	CVPRF	$260,000	$260,000	$0
2021	WRR	$425,436	$425,436	$0
2022	CVPRF	$260,000	$260,000	$0
2022	WRR	$421,723	$421,723	$0
2023	CVPRF	$260,000	$260,000	$0
2023	WRR	$417,548	$417,548	$0

Total Cost: $4,592,671

Internal Agency Resources Table

Type	Name	Rate	Frac	MU	Total	Agency	Fund	Description
2015								
Planning and Analysis								
Agreement	R12PC20254	$379,547	1.00	0.00	$379,547	BOR	CVPRF	Phase I contract – Year 1
2016								
Planning and Analysis								
Agreement	R12PC20254	$325,887	1.00	0.00	$325,887	BOR	CVPRF	Phase I contract – Year 2
2017								
Planning and Analysis								
Agreement	R12PC20254	$323,911	1.00	0.00	$323,911	BOR	CVPRF	Phase I contract – Year 3
2018								
Planning and Analysis								
Agreement	140R2018C0042	$135,000	1.00	0.00	$135,000	BOR	CVPRF	Phase I contract funded through March, 2018. This amount is for 2nd half of FY18 via a new Phase II contract. $125k contract; $10k contract mgmnt
Agreement	140R2018C0042	$434,000	1.00	0.00	$434,000	BOR	WRR	Phase II contract; $81,500 project mgmnt
2019								
Planning and Analysis								
Agreement	140R2018C0042	$260,000	1.00	0.00	$260,000	BOR	CVPRF	Phase II contract; $10k contract mgmnt.
Agreement	140R2018C0042	$429,619	1.00	0.00	$429,619	BOR	WRR	Phase II contract; $83,960 project mgmnt
2020								
Planning and Analysis								
Agreement	140R2018C0042	$260,000	1.00	0.00	$260,000	BOR	CVPRF	Phase II contract; $10k contract mgmnt.
Agreement	140R2018C0042	$425,436	1.00	0.00	$425,436	BOR	WRR	Phase II contract; $86,460 project mgmnt
2021								
Planning and Analysis								
Agreement	140R2018C0042	$260,000	1.00	0.00	$260,000	BOR	CVPRF	$250k contract; $10k contract mgmnt.
Agreement	140R2018C0042	$421,723	1.00	0.00	$421,723	BOR	WRR	Phase II contract; $89,120 project mgmnt

Type	Name	Rate	Frac	MU	Total	Agency	Fund	Description
2022								
Planning and Analysis								
Agreement	140R2018C0042	$260,000	1.00	0.00	$260,000	BOR	CVPRF	$250k contract; $10k contract mgmnt.
Agreement	140R2018C0042	$417,548	1.00	0.00	$417,548	BOR	WRR	Phase II contract; $91,820 project mgmnt
2023								
Planning and Analysis								
Agreement	140R2018C0042	$260,000	1.00	0.00	$260,000	BOR	CVPRF	$250k contract; $10k contract mgmnt.

Delta Tidal Habitat Restoration and Monitoring

This Parr Study project goal is to expand, and execute, a planned study of juvenile salmon in the Sacramento-San Joaquin River Delta and Suisun Bay region.

DCN:	AFRP2111
Classification:	Monitoring
Location:	Delta, exact locations TBD, Sacramento-San Joaquin Delta
Funding Years:	2018 - 2020
Benefits Start Year:	2018
Priority:	SIT FY2017 Tech Memo: Tier 1 Priority - Growth and survival of juveniles rearing in the Delta.
Partners:	DWR, USBR
Related Programs:	CDWR, CSAMP, Interagency Ecological Program, NMFS-RPAs, CDFW

Authority

Provision	Percentage
(b)(15) CAMP	100%

Metrics

Name	Value	Units	Comment
Newly connected tidal habitat	2500	acres	
Food web contribution	0	N/A	Metrics include chlorophyll and invertebrate abundance.
Rearing salmonid growth rate	0	condition	A relative weight comparison of juvenile salmonids to control sites.

Deliverables

Deliverables in all years of this project will be coordinated with the CVPIA Data Manager, CVPIA Science Coordinator, and CVPIA Fish Resource Area Coordinator.

Date	Title
Oct. 2018	EIS/EIR
Oct. 2018	Design Specifications
Oct. 2018	Annual Monitoring Report
Oct. 2019	Annual Monitoring Report
Oct. 2020	Annual Monitoring Report
Oct. 2021	Annual Monitoring Report

Project Management Team

Ian Smith – USBR-BDO

Josh Israel – USBR-BDO
Rod Wittler – USBR-CVPIA
Brett Harvey & James Newcomb – DWR
Jason Hasrick & Lenny Grimaldo – ICF
Anna Sturrock – UC Davis
Rachel Johnson – NMFS

Narrative

The goal of this Study is to partially address RPA Action I.6.1 of the 2009 NMFS BO which states the need to restore floodplain rearing habitat for salmonids in the lower Sacramento River basin. The U.S. Fish and Wildlife Service 2008 on the Long-term Operations of the CVP and SWP BO (USFWS 2008) includes an action to restore 8,000 acres of tidal habitat for the benefit of Delta smelt. If these 8,000 acres also provide suitable rearing habitat for salmonids, they may be used in partial satisfaction of the RPA Action I.6.1 (NMFS 2009). RPA Action I.6.1 calls for restoration of biologically appropriate durations and magnitudes. To gain better biological understanding, RPA Action I.6.1 requires performance goals and associated monitoring, including habitat attributes, juvenile metrics, and inundation depth and duration criteria. Uncertainty in the biological response associated with tidal wetland restoration was also identified as a significant uncertainty in the Central Valley Project Improvement Act (CVPIA) structure decision model efforts and new information will improve these models aimed to integrate project selection and monitoring into adaptive management. The tidal parr study (Study), headed by Brett Harvey of California Department of Water's (DWR) Division Environmental Services (DES), will create methodology to address gaps in biological monitoring data of juvenile salmonids in the Sacramento-San Joaquin River Delta and Suisun Bay region for use in the CVPIA and BO monitoring and project selection efforts. The Study results should be useful for designing and adaptively managing higher functioning juvenile salmonid habitat restoration in the Sacramento-San Joaquin River Delta and associated regions.

The primary objectives of the Study are to:

1. Expand, and execute, a planned study of juvenile salmon in the Sacramento-San Joaquin River Delta and Suisun Bay region. The study will add additional sampling locations and methods with a focus on restored and soon-to-be-restored marsh location to gain better understanding the impact to juvenile salmonid distribution, abundance, and growth.
2. Update CVPIA SIT salmon life-cycle models and structured decision-making models with quantitative information from this study to assist in restoration project prioritization and design.

Narrative for Objective 1: To determine the timing and relative density of juvenile salmon occurrence at selected restored and soon-to-be-restored marsh locations, fish will be sampled with net gear at biweekly intervals, during the December through June salmon out-migration period, over three years, 2019-2021. The timing, relative density, and biometrics of juvenile salmon at these restoration locations will be compared to catches in other shallow water habitats, which will be sampled during the same period, using the same methods, as part of a simultaneously occurring study funded by California Proposition 1 Watershed Restoration Grant Program. Therefore, the Study will both capitalize upon, and augment a previously planned and fully funded study.

Since juvenile salmon are difficult to capture in shallow water and marsh habitats, water samples will be taken in parallel with net-gear sampling and analyzed for salmon environmental DNA (eDNA) as an indicator of salmon presence or absence. Detection ability of eDNA assays at distance from and time following salmon occurrence at a location will be tested using salmon in enclosures at sampling locations (see next paragraph). Net-gear and eDNA sampling applied in concert will provide a more comprehensive and nuanced evaluation of juvenile salmon presence in these habitats and will allow mutual validation of each technique.

Data Management

The PMT Data Steward will coordinate with external partners and biannually with the CVPIA Data Manager on the transmission of long-term monitoring and other pertinent data defined by the SIT and the PMT per the 2020 Data Guidance.

Field data will be recorded on data sheets or directly into a recording device/computer and transferred into a computer spreadsheet or database. The PMT Data Steward will coordinate with the CVPIA Data Manager on the transmission of relevant and pertinent data defined by the SIT and the PMT per the 2020 Data Guidance. Field data, analyses, and reports will be stored and backed up on a PMT computer/server.

The PMT Data Steward will coordinate with external partners and biannually with the CVPIA Data Manager on the transmission of long-term monitoring and other pertinent data defined by the SIT and the PMT per the 2020 Data Guidance.

Field data will be recorded on data sheets or directly into a recording device/computer and transferred into a computer spreadsheet or database. The PMT Data Steward will coordinate with the CVPIA Data Manager on the transmission of relevant and pertinent data defined by the SIT and the PMT per the 2020 Data Guidance. Field data, analyses, and reports will be stored and backed up on a PMT computer/server.

Central Valley salmonid monitoring programs have suffered from inconsistent and/or inadequate funding, limiting successful species recovery and effective use of limited resources. Successful adaptive management relies on accurate data provided by effective monitoring studies. This charter offers a funding mechanism to complete such a study evaluating Delta restoration for CV salmonids. Adaptive management and monitoring will provide a framework to obtain the appropriate types and amounts of data to evaluate the effectiveness of recovery actions and progress toward recovery.

Reclamation, with DES, will use this charter to study pervious restoration sites to record effectiveness of implemented action. The coordinated research/monitoring will target information gaps focused on:

1. Habitat- Primary and secondary production, and food web monitoring.
2. Viability- Growth rate, and condition factor of rearing salmonids.

Data will be collected and stored via EcoRestore, DWR, and Reclamation.

To determine the growth benefits afforded to juvenile salmon by restored marsh habitat, juvenile salmon of hatchery origin will be reared in enclosures at the fish-sampling locations during March

and April of 2019-2021. Enclosure-reared fish will be assessed at biweekly intervals for changes in fork length, weight, stomach fullness, diet based on gut contents, and energy reserve based on liver weight.

Products, Milestones, Deliverables

Objective 1:

1. Monthly meetings with Reclamation's point of contact during the planning and implementation phases. This component of Objective 1 & 2 is to ensure the status of the study relevant to the timeline provided.
2. Annual data summaries to be shared with collaborative modeling teams (i.e. CVPIA Science Integration Team) within 60 days of the end of the field season.

Objective 2: Data analyses and report writing will commence in July 2021, and begin with preliminary summary statistics, data exploration, and graphical representation comparing responses among sampling locations. General linear models or generalized additive models will be constructed to examine the relationship between response variables and location and habitat quality variables, including prey availability and water quality. Model selection will be performed using Akaike's Information Criteria or other appropriate model selection tool.

Products

1. Semi-annual progress updates.
2. Poster or oral presentation at the 2020 and 2021 IEP workshop and the 2020 Bay-Delta Science conference. Final results will be reported to the public by poster or oral presentation at the 2022 IEP workshop and the 2022 Bay-Delta Science Conference.
3. A final report describing the trawl survey results, the eDNA survey results, and the growth study. These may take the form of separate manuscripts prepared for peer-reviewed journal submission.

Risks

Risk	Likelihood	Impact
DWR not able to purchase Broadmoor Island land.	1	3
Unable to obtain proper permits	1	3

Cost Estimate

Year	Fund	Total	BOR	FWS
2018	CVPRF	$250,000	$250,000	$0
2019	CVPRF	$250,000	$250,000	$0
2020	CVPRF	$250,000	$250,000	$0

Total Cost: $750,000

Internal Agency Resources Table

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
2018								
Construction								
Agreement	Construction and Maintenance; Monitoring and Reporting	$250,000	1.00	0.00	$250,000	BOR	CVPRF	$250,000 allotted for funding monitoring at the sites, coordinated through FRP and SIT.
2019								
Construction								
Agreement	Construction and Maintenance; Monitoring and Reporting	$250,000	1.00	0.00	$250,000	BOR	CVPRF	$250,000 allotted for funding monitoring at the sites, coordinated through FRP and SIT.
2020								
Construction								
Labor	Construction and Maintenance; Monitoring and Reporting	$250,000	1.00	0.00	$250,000	BOR	CVPRF	$250,000 allotted for funding monitoring at the sites, coordinated through FRP and SIT.

Feather River: Sunset Pumps Sturgeon and Salmon Passage

Removal of Sunset Pumps Facilities and Improvements to Sutter-Butte Main Canal

DCN:	AFRP2104
Classification:	Habitat Improvement, Fish Passage
Location:	Feather River
Funding Years:	2019 - 2024
Benefits Start Year:	2021
Priority:	SIT FY2020 Tech Memo: - Increase access to Chinook juvenile rearing habitat in Sutter and Yolo Bypasses - Improve Green Sturgeon Passage at Tisdale, Fremont Weir and Sunset Pumps.
Partners:	NMFS, Sutter Extension Water District, CDFW, CDWR
Related Programs:	CDFW, CDWR

Authority

Provision	Percentage
(b)(1)	100%

Metrics

Name	Value	Units	Comment
Habitat	28	miles	Access to this habitat will be increased.
Barrier Removal	1	# improv.	One barrier will be removed.
Green Sturgeon	1	# fish	See explanation in narrative.
Chinook Salmon	1	# fish	See explanation in narrative.

Deliverables

Deliverables in all years of this project will be coordinated with the CVPIA Data Manager, CVPIA Science Coordinator, and CVPIA Fish Resource Area Coordinator.

Date	Title
Dec. 2020	Feasibility Study; Design Plans
Dec. 2020	Annual Reports
Dec. 2021	Permits; Monitoring Reports
Dec. 2023	Initial Construction Actions

Project Management Team

Paul Cadrett (USFWS)
Amanda Ott (CDWR)
Lynn Phillips (SEWD)

Colin Purdy (CDFW)
Tracy McReynolds (CDFW)
Tanya Sheya (CDFW)
Ruth Goodfield (NMFS)
Rod Wittler (USBR-CVPIA)

Narrative

This project is ongoing and directly addresses the 2020 SIT priority for green sturgeon of improve passage at Tisdale, Fremont Weir, and Sunset pumps.

Quantitative prediction of expected outcome: Green Sturgeon: The number of females to successfully spawn is expected to increase by 100% (from 4 to 8). Average female has 142,000 eggs so an additional 568,000 green sturgeon eggs are expected to be produced per year.

Chinook Salmon (spring- and fall-run combined): Pre-spawning mortality is expected to drop off by 50% from the average observed from the carcass surveys (from 20% to 10%). The 10% more spawning from an escapement of 48,000 is 4,800 male and female salmon, or 2,400 females x ~5,000 eggs/female = 12,000,000 additional salmon eggs are expected to be produced per year.

The Sunset Pumps dam (i.e., boulder weir) is operated by Sutter Extension Water District (SEWD) and spans the Feather River near Live Oak, California. It is a well-known, long-standing impediment to fish passage, most notably for spring-run Chinook salmon and green sturgeon. In addition to causing migratory delays to spring- and fall-run Chinook salmon adults and green sturgeon, acoustic tag data suggests that disorientation and predation near Sunset Pumps may decrease the survival of out-migrating juvenile Chinook salmon and steelhead. This multi-year project would entirely remove the Sunset Pumps facility (i.e., dam and pumps) from the Feather River, which is the best solution for long-term improvement of fish passage and access to 28 miles of habitat as well as overall ecosystem function. In exchange, the capacity of the Sutter-Butte Main Canal would be increased, thereby maintaining SEWD's water supply.

Planning for this project has been ongoing since late 2014, with project management, modeling, and initial design and alternatives analyses facilitated or conducted by CDWR, USFWS, and SEWD staff. CDWR has established a SharePoint site to assist with project coordination. Initial modeling tasks addressing both the dam removal and canal modifications have been completed. A hydraulic model has been developed to provide an initial evaluation of sediment volume upstream of the dam, identify existing and post-project channel profiles, and determine effect on upstream diversions. Additionally, an analysis completed by GEI Consultants (contracted by SEWD) has conceptual-level recommendations that involve improving approximately 7.4 miles of canal. CVPIA funds are especially needed to complete planning, design, and permitting, and initiate monitoring and preliminary construction actions. Most of the construction and implementation costs are expected to be funded through large matching grants from the California Department of Fish and Wildlife Proposition 1 Restoration Fund and the Northern Sacramento Valley Integrated Regional Water Management Plan, which require significant matching funds and also that projects are 'shovel-ready' with designs and permits in hand. Implementation funding is also being pursued through the DWR Agricultural Water Use Efficiency, DWR IRWM, and DWR Water-Energy grant programs.

The project addresses AFRP Final Restoration Plan/CPAR evaluation E5, 'Identify and remove physical and water quality barriers that impede access for white sturgeon and green sturgeon to spawning habitat or facilitate passage around these barriers' and Working Paper (V. 3) limiting factor 3 for sturgeon in the Feather River, 'Barriers that prevent or slow the migration of sturgeon to spawning habitat.' The project is supported by NMFS's 2014 recovery plan for Central Valley salmonids, specifically Recovery Action FER-2.13, 'Modify Sunset Pumps to provide unimpeded upstream passage of adult steelhead and Chinook salmon (and sturgeon) and to minimize predation of juveniles moving downstream.'

Data Management

The PMT Data Steward will coordinate with external partners and biannually with the CVPIA Data Manager on the transmission of long-term monitoring and other pertinent data defined by the SIT and the PMT per the 2020 Data Guidance.

Field data will be recorded on data sheets or directly into a recording device/computer and transferred into a computer spreadsheet or database. The PMT Data Steward will coordinate with the CVPIA Data Manager on the transmission of relevant and pertinent data defined by the SIT and the PMT per the 2020 Data Guidance. Field data, analyses, and reports will be stored and backed up on a PMT computer/server.

Short-term monitoring will include as-built surveys (depth and water velocity) of the river channel following facility and weir removal. Pre- (and post-) project monitoring of juvenile salmonids would occur using acoustic tagging as part of this project, with the objective of quantifying changes in survival of outmigrants through the Sunset Pumps reach before and after facility removal. Short- and long-term monitoring also will be addressed through CDWR's existing fisheries monitoring program, which includes adult sturgeon tagging and tracking, roving surveys done with ARIS cameras, larval surveys, and egg mat studies; Chinook salmon carcass surveys; steelhead redd surveys; and rotary screw trapping of juvenile salmonid outmigrants. Sampling sites located upstream and downstream of Sunset Pumps are included in many of these surveys. The objective would be to quantify changes in the proportion and timing of adult migration and spawning in the reaches above Sunset Pumps. Chinook salmon and steelhead timing and return rates to the Feather River Hatchery also are tracked and could be used to assess the effectiveness of this project. The RSTs could be used to detect changes in juvenile production.

Risks

Risk	Likelihood	Impact
This project has a high likelihood of successful implementation (overall low risk) because multiple agencies, local water districts, and the facility owner (SEWD) support it. The project management team includes project managers Mark Gard (USFWS), Amanda Ott (CDWR), and Lynn Phillips (SEWD); and technical experts Mark Gard (USFWS), Colin Purdy (CDFW), Tracy McReynolds (CDFW), Tanya Sheya (CDFW), and Ruth Goodfield (NMFS).	1	1

Risk	Likelihood	Impact
Full implementation will cost about $21M and is expected to be funded through CDFW Prop 1 funds, the Northern Central Valley IRWMP, or the DWR Agricultural Water Use Efficiency, DWR IRWM, and DWR Water-Energy grant programs. Probability of funding is high (i.e., risk is low) because with the initial CVPIA funding, cost share and 'shovel-ready' requirements of these programs will be met.	1	1
The project has a high cost, necessitating phased implementation. Potential adverse impacts related to e.g. flood control or sediment transport are expected to be minimal, and modeling should allow adjustment to the design or phasing of implementation to accommodate any concerns and result in overall low risk.	1	1

Cost Estimate

Year	Fund	Total	BOR	FWS	DWR
2019	CVPRF	$2,138,000	$0	$2,138,000	$0
2019	SIK	$95,000	$0	$0	$95,000
2020[4]	CVPRF	$0	$0	$0	$0
2020	SIK	$95,000	$0	$0	$95,000
2021	CVPRF	$957,200	$0	$957,200	$0
2021	SIK	$95,000	$0	$0	$95,000
2022	SIK - (Prop 1)	$6,000,000	$0	$0	$6,000,000
2023	SIK - (Prop 1)	$6,000,000	$0	$0	$6,000,000
2024	SIK - (Prop 1)	$6,000,000	$0	$0	$6,000,000

Total Cost: $21,380,200

[4] The FY2019 funding amount of $2,138,000 included $957,200, which was the FY2020 allocated funding for this project.

Internal Agency Resources Table

Type	Name	Rate	Frac	MU	Total	Agency	Fund	Description
2019								
Design								
Agreement	New agreement, if funded, Agreement # TBD	$1,053,600	1.00	0.06	$1,054,800	FWS	CVPRF	Feasibility study/alternatives assessment/ draft and final designs for both removing the Sunset Pumps facility from the Feather River and modifying the Sutter-Butte Main Canal.
Management								
Agreement	New agreement, if funded, Agreement # TBD	$40,000	1.00	0.06	$41,200	FWS	CVPRF	Supplemental project management funds.
In-Kind Labor	Feather River Sunset Pumps Sturgeon and Salmon Fish Passage	$50,000	1.00	0.00	$50,000	DWR	SIK	CDWR will provide funding to support project management and website services.
Environmental Compliance and Permitting								
Agreement	New agreement# TBD, if funded	$830,000	1.00	0.06	$830,000	FWS	CVPRF	Environmental compliance (CEQA, NEPA, etc.) and permitting for removal of the existing facilities and improvements to the Sutter-Butte Main Canal.
Monitoring								
Agreement	New agreement, if funded, Agreement # TBD	$200,000	1.00	0.06	$212,000	FWS	CVPRF	Pre-project fish monitoring (acoustic tags and receivers).
In-Kind Labor	Feather River Sunset Pumps Sturgeon and Salmon Fish Passage	$45,000	1.00	0.00	$45,000	DWR	SIK	CDWR pre-project fish monitoring--staff, boats, etc.

Type	Name	Rate	Frac	MU	Total	Agency	Fund	Description
2020								
Management								
In-Kind Labor	Feather River Sunset Pumps Sturgeon and Salmon Fish Passage	$50,000	1.00	0.00	$50,000	DWR	SIK	CDWR will provide funding to support project management and website services.
Monitoring								
In-Kind Labor	Feather River Sunset Pumps Sturgeon and Salmon Fish Passage	$45,000	1.00	0.00	$45,000	DWR	SIK	CDWR pre-project fish monitoring--staff, boats, etc.
2021								
Construction								
Agreement	New agreement# TBD, if funded	$500,000	1.00	0.06	$530,000	FWS	CVPRF	Start of initial modifications to Sutter-Butte Main Canal.
Design								
Agreement	New agreement# TBD, if funded	$283,019	1.00	0.06	$300,000	FWS	CVPRF	Feasibility study/alternatives assessment/draft and final designs for both removing the existing facility and modifying the Sutter-Butte Main Canal.
Management								
In-Kind Labor	Feather River Sunset Pumps Sturgeon and Salmon Fish Passage	$50,000	1.00	0.00	$50,000	DWR	SIK	CDWR will provide funding to support project management and website services.
Agreement	New agreement# TBD, if funded	$20,000	1.00	0.06	$21,200	FWS	CVPRF	Supplemental project management funds.
Monitoring								
Agreement	New agreement# TBD, if funded	$100,000	1.00	0.06	$106,000	FWS	CVPRF	Pre-project fish monitoring (acoustic tags and receivers).
In-Kind Labor	Feather River Sunset Pumps Sturgeon and Salmon Fish Passage	$45,000	1.00	0.00	$45,000	DWR	SIK	CDWR pre-project fish monitoring--staff, boats, etc.

Type	Name	Rate	Frac	MU	Total	Agency	Fund	Description
2022								
Construction								
Agreement (Prop 1)	New agreement# TBD, if funded	$6,000,000	1.00	0.00	$6,000,000	DWR	SIK	Construction of preferred alternative
2023								
Construction								
Agreement (Prop 1)	New agreement# TBD, if funded	$6,000,000	1.00	0.00	$6,000,000	DWR	SIK	Construction of preferred alternative
2024								
Construction								
Agreement (Prop 1)	New agreement# TBD, if funded	$6,000,000	1.00	0.00	$6,000,000	DWR	SIK	Construction of preferred alternative

Green Sturgeon Juvenile Investigation

Green Sturgeon Juvenile Rearing Habitat Investigation

DCN:	AFRP2118
Classification:	Research, Monitoring, Modeling
Location:	Upper Sacramento River Mainstem
Funding Years:	2018 - 2021
Benefits Start Year:	2019
Priority:	This project supplies the SIT with data for the Sturgeon DSM per Table 17 of the SIT FY2020 Tech Memo.
Partners:	NMFS, USACE, USBR
Related Programs:	CVPIA (b)(1), NMFS, NMFS-RPA

Authority

Provision	Percentage
3406(g)	100%

Metrics

Name	Value	Units	Comment
Habitat Assessment	160	miles	Determine, in given water year, number of linear river miles of the Sacramento River utilized as rearing habitat for Green Sturgeon juveniles based on temperature and flow operations from Shasta/Keswick dams under in situ annual temperature management plan.

Deliverables

Deliverables in all years of this project will be coordinated with the CVPIA Data Manager, CVPIA Science Coordinator, and CVPIA Fish Resource Area Coordinator.

Date	Title
Sep. 2019	Annual Report
Sep. 2020	Annual Report

Project Management Team

Josh Gruber – USFWS-RBFO
Matt Brown – USFWS-RBFO
Bill Poytress – USFWS-RBFO
Derek Rupert – USBR-NCAO

Narrative

Sacramento River flow and temperature management influences the quantity and quality of sturgeon juvenile rearing habitat in the Sacramento River. This information is critical input to the CVPIA SIT Green Sturgeon DSM effort. This project corresponds with the FY 2020 SIT Core Team specific priority for Green Sturgeon of "adaptively managing flows, habitats, and/or temperature to increase juvenile recruitment". The information derived from this project will assist in adaptively managing annual temperature management plans for Shasta/CVPIA water resources with respect to the biological needs of winter-run Chinook Salmon (NMFS 2009 OCAP BO RPA) and Green Sturgeon. The project is collaborative in-nature and in execution and evaluates multiple listed species.

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The effects of flow and temperature management operations of the Central Valley Project, most directly Shasta and Keswick dams, are currently biologically focused at conserving Endangered winter-run Chinook salmon. Current water resource management operations have impacts to Threatened Green Sturgeon who cohabitate in the upper Sacramento River temporally and spatially during their spawning and juvenile rearing periods. The water temperature needs for salmon spawning, egg incubation and hatching are generally lower than for Green Sturgeon. We hypothesize that, dependent upon annual water year type and resultant storage capacity, temperature and flow management for winter Chinook may result in benefits or negative impacts to the quantity and quality of spawning and rearing habitat of Green Sturgeon in the Sacramento River. A recent publication by Hamda et al. (2019) has modeled the impacts of temperature management for winter-run on Green Sturgeon. Data from this project will be used to validate modeling results and either support or allow for recalibration on model parameters. Our working hypothesis is therefore as follows:

> Ho = Water resource management (via flow and temperature manipulation) focused on winter-run Chinook salmon has no effect on the quantity of Green Sturgeon spawning and/or juvenile rearing habitat.
> Ha = Water resource management (via flow and temperature manipulation) focused on winter-run Chinook salmon does affect the quantity of Green Sturgeon spawning and/or juvenile rearing habitat.

Funding of this Charter in FY2020 and beyond would continue and expand upon work already funded and in progress to allow greater assessment via quantification of juvenile rearing habitat in terms of linear miles of the Sacramento River based on physical data collection efforts (e.g., flow and temperature monitoring coupled with juvenile habitat occupancy using telemetry). Quantification of juvenile sturgeon rearing habitat has been noted as a significant data gap in the SIT team Decision Support Model that is currently being developed for Green Sturgeon. This project fits well within

the multiple CVPIA SIT FY2020 monitoring priorities of evaluating juvenile sturgeon habitat use, fish routing and the effect of temperature and flow operations of CVP facilities on this species as well as winter-run (multi-species benefits).

NMFS (2015) 5-Year Review of the Southern Distinct Population Segment of the North American Green Sturgeon indicated the juvenile life-history stage is one of the least understand phases of this species. Efforts to learn about how annual Sacramento River flow and temperature management (i.e., annual temperature management plan) affect the quantity and quality of juvenile rearing habitat in the Sacramento River are greatly desired by NMFS, USFWS, and USBR. Without this research, it is impossible to evaluate the potential effects of flow and temperature management (e.g., for winter-run Chinook salmon) and diversion operations on the availability of rearing habitat for Green Sturgeon.

This research could allow for assessment of potential habitat restoration efforts to directly benefit Green Sturgeon and potentially optimize water resource allocation for winter Chinook in an adaptive management framework. This research could result in having the required baseline information to make progress toward achieving the CVPIA doubling goal for this species. This would occur by knowing what habitat exists and is utilized by Green Sturgeon and how other rivers (e.g., the Feather or Yuba) may or may not have similar habitat which could then be used to determine feasibility of various restoration actions (e.g., flow/temp management strategies or habitat restoration activities) to achieve greater population numbers. This work could also aid in filling data gaps required to assist with Recovery or delisting of Green Sturgeon from the Endangered Species Act.

Data Management

The PMT Data Steward will coordinate with external partners and biannually with the CVPIA Data Manager on the transmission of long-term monitoring and other pertinent data defined by the SIT and the PMT per the 2020 Data Guidance.

Field data will be recorded on data sheets or directly into a recording device/computer and transferred into a computer spreadsheet or database. The PMT Data Steward will coordinate with the CVPIA Data Manager on the transmission of relevant and pertinent data defined by the SIT and the PMT per the 2020 Data Guidance. Field data, analyses, and reports will be stored and backed up on a PMT computer/server.

Data produced by this project will be used in the development of a sub-module of the Science Integration Team's Salmon Decision Support Model(s). The Project Management Team Leader will coordinate with the CVPIA Science Coordinator on the development and submission of a SIT DSM Modification Proposal (Using the standard proposal template), as well as ensure progress on completing the sub-module in cooperation with the Science Integration Team.

Telemetry and physical habitat data (temp. flow, velocity, depth, and substrate composition) generated by this project will be coordinated with USACE modeling staff to produce habitat use models. Information developed by this charter will be stored at the USFWS Red Bluff Fish & Wildlife Office and reports posted to the office website: http://www.fws.gov/redbluff/

Risks

Risk	Likelihood	Impact
Attaining research permits	1	1

Cost Estimate

Year	Fund	Total	BOR	FWS
2018	CVPRF	$147,832	0	$147,832
2019	CVPRF	$348,645	$0	$348,645
2020[5]	CVPRF	$0	$0	$
2021	CVPRF	$177,033	$0	$177,033

Total Cost: $673,510

[5] The FY2019 funding amount of $348,645 included $174,823, which was the FY2020 allocated funding for this project.

Internal Agency Resources Table

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
2018								
Research								
Equipment or Materials	Equipment and Materials to support data gathering and analysis	$48,800	1.00	0.0	$48,800	FWS	CVPRF	Field equipment and additional support materials
Labor	RBFWO Biologist or Technicians	$241,542	0.41	0.0	$99,032	FWS	CVPRF	Based on RBFWO estimated FY16 FTE rate. Will consist of small portions of time from multiple RBFWO staff
2019								
Research								
Equipment or Materials	Equipment and Materials to support data gathering and analysis	$59,389	1.00	0.22	$72,455	FWS	CVPRF	Field equipment and additional support materials
Labor	RBFWO Biologist or Technicians	$251,781	0.33	0.22	$101,367	FWS	CVPRF	Based on RBFWO estimated FY16 FTE rate. Will consist of small portions of time from multiple RBFWO staff
Research								
Equipment or Materials	Field equipment and support materials	$50,594	1.00	0.22	$61,725	FWS	CVPRF	Equipment and supplies for data gathering and analyses.
Labor	RBFWO Biologists and Technicians	$243,957	0.38	0.22	$113,098	FWS	CVPRF	Staff costs associated with data collection and analyses.
2021								
Research								
Equipment or Materials	Field equipment and support materials	$49,288	1.00	0.22	$60,131	FWS	CVPRF	Equipment and supplies for data gathering and analyses
Labor	RBFWO Biologists and Technicians	$243,957	0.42	0.22	$125,004	FWS	CVPRF	Staff costs associated with data collection and analyses

Growing Fish Food: Reintegrating Floodplain Food Web Productivity into the River Aquatic Ecosystem

This proposal outlines coordinated science and management approach to re-integrate agricultural floodplain productivity into river ecosystems. The project boosts aquatic food webs and support recovery of abundant fish populations by subsidizing the food-poor river ecosystem with highly productive floodplain-derived food web resources grown in intentionally inundated winter rice fields, thereby improving juvenile salmonid foraging success in non-natal rearing habitats. Data produced by these actions will be used in the development of a food web and fish growth rate sub-module of the Science Integration Team's Salmon Decision Support Model.

DCN:	AFRP2134
Classification:	Research; Monitoring, Modeling
Location:	Sacramento River, Sacramento Lower Mainstem
Funding Years:	2019 - 2021
Benefits Start Year:	2020
Priorities:	SIT FY2018 Tech Memo: Create/improve juvenile rearing habitat in non-natal tributaries; Sacramento Mainstem, Improve/increase juvenile Chinook rearing habitat; Sacramento River below Red Bluff, increase juvenile rearing habitat SIT FY2020 Tech Memo: Adaptively manage juvenile habitat restoration to allow the evaluation of the effect of habitat restoration on wild juvenile Chinook Salmon survival in the Sacramento River
Partners:	California Trout, River Garden Farms, RD 108, Northern California Water Association, UC Davis Center for Watershed sciences, San Luis & Delta-Mendota Water Authority, CVPIA, California Rice Commission, Trout Unlimited.
Related Programs:	CVPIA, NMFS-RPAs

Authority

Provision	Percentage	Comment
3406 (g)	100%	DSM Sub-module

Project Management Team

Project Leader	Jacob Katz – CalTrout
Project Administration	Ian Smith–USBR, Jayme Ohlhaver, CalTrout
Science Coordinator	Jacob Montgomery - CalTrout
Data Steward	Jacob Montgomery - CalTrout
Field and Inundation logistics	Lewis Bair–Reclamation District No 108, Roger Cornwell – River Garden Farms, Brad Matson, Sutter Mutual Water Company/RD 1500

Technical Advisors	David Guy– NCWA, Rod Wittler & Josh Israel–USBR, Cesar Blanco–USFWS, Paul Butner–CRC, Jon Rubin–Westlands, Griffin Hill–SLDMWA, Ted Sommer & Kris Tjernell–DWR, Brian Ellrott –NMFS, Jeff McCreary–DU, Collin Purdy–CDFW, Carson Jeffres, Andrew Ryppel–UC Davis, Alison Collins– MWD, Chuck Hanson–SWC

Metrics

Name	Value	Units	Comment
Water diverted to managed floodplains	40,000	Acre-feet	Determined by each District's water rights permit.
Managed floodplain duration	1,200,000	Wetted-acre/days	Measure of the residence time that floodplain area enrolled in the program remains inundated and actively producing food web resources.
Food web contribution	330	Grams Dry Carbon Zooplankton/ Acre foot of floodplain water exported	Volume floodplain water exported (AF) * zooplankton biomass density (grams dry carbon) = trophic subsidy delivered to augment in-river food webs.
Integration, coordination and transfer of data to CVPIA		N/A	Project data steward will meet with CVPIA data manager and coordinate the transfer of data to the SIT in compliance with Data Guidance.
Sub-module of the Decision Support Model		N/A	Develop a sub-module of the SIT Decision Support Model that calculates habitat-specific fish growth rates based on access to aquatic food web resources.

Deliverables

Deliverables in years 1, 2 & 3 of this project will be coordinated with the CVPIA Data Manager, CVPIA Science Coordinator, and CVPIA Fish Resource Area Coordinator.

Date	Title
	Year 1: FY 2019
Dec. 2019	Estimates of food web resources (Zooplankton, phytoplankton and nutrients) delivered to river ecosystem to benefit juvenile fish to the SIT from 2018/19 field season.
Dec. 2019	Annual technical documentation report describing monitoring results for the flood up-drain event(s).
Dec. 2019	Proposal to SIT for incorporation of results into DSM.
	Year 2-3: FY 2020-2021

June 2020	Estimates of food web resources (Zooplankton, phytoplankton and nutrients) delivered to river ecosystem to benefit juvenile fish to the SIT from 2019/20 field season
Oct 2020	Poster or presentation at Delta Science Conference.
Dec 2020	Annual technical documentation report describing monitoring results for the flood up-drain event(s).
Dec 2020	Initial version of DSM sub-module.
June 2021	Estimates of food web resources (Zooplankton, phytoplankton and nutrients) delivered to river ecosystem to benefit juvenile fish to the SIT from 2020/21 field season
Dec 2021	Annual technical documentation report describing monitoring results for the flood up-drain event(s).
Dec 2021	Manuscript submitted for peer review and publication in the open scientific literature
Dec 2021	Finalization of the sub-module for the Decision Support Model

Narrative

Conceptual model:

1. Extremely high rates of invertebrate production relevant for rearing juvenile salmonids are generated in seasonally hydrologically-activated floodplains with relatively long-duration water residence times.
2. The Central Valley floodplains have been extensively re-contoured for efficient, rapid drainage with 95% of Central Valley floodplains converted to other uses, primarily to agriculture, and hydrologically divorced from fish bearing stream channels by levees.
3. Hydrologic isolation of river channel from floodplains has turned rivers into food-scarce environments detrimentally affecting native fish populations and abundance.
4. Hydrologically reconnecting managed agricultural floodplains with river channels will augment in-river food web resources to the benefit of juvenile salmonids and other native fishes where these resources enter the Sacramento River *(i.e.,* ***greatly improve habitat quality -foraging success- in non-natal rearing habitats)***

Hundreds of thousands of acres of rice ground in the Sacramento Valley are flooded in fall and early winter to aid in rice stubble decomposition (decomp). While these fields are inundated, they produce physical conditions similar to the natural floodplain wetlands which once produced the food resources that supported the Sacramento Valley's pre-development populations of waterfowl and native fish. Under current agricultural practices, very little decomp water containing floodplain-derived "fish food" resources drains back to the river. However, if management practices are altered to actively drain floodplain waters back to the river there is potential to export these critically important floodplain-derived food web resources to the river where they may augment the aquatic ecosystem's depleted food webs and help recover endangered fish populations.

Year 1 (2018/2019) of this project pilots this action on 6,500 acres of farmland owned by a single Reclamation District – RD 108. Growth benefits for juvenile salmonids caged in the river at the outfall location of pumped floodplain waters will be experimentally determined. The project will

attempt three flood and drainage cycles but the number of flood-drain cycles will be dependent on river flows, water diversion restrictions and pumping capabilities of RD 108.

Years 2 and 3 builds on this effort by expanding this practice both in geographic space and (expanding to Sutter Mutual and other water districts) and by refining practices which facilitate multiple flood-drain cycles per season. Increasing the number of locations and the frequency of connection between "dry-side" managed floodplain resources and "wet-side" rearing fish populations will improve habitat quality and foraging success of juvenile salmonids in non-natal rearing habitats. Data collected from multiple years of landscape scale inundation actions will be compiled and shared with the Science Integration Team to inform and develop a sub-module of the Decision Support Tool.

This research is coordinating with these on-going research projects:

Development of baseline data for fish growth and lower trophic production on the Sutter Bypass
– Research conducted by the University of California Santa Cruz, the National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southwest Fisheries Science Center, University of California Davis, Center for Watershed Sciences Watershed Sciences. Project funding from the State Water Contractors and California Department of Water Resources. The purpose of this project was to quantify the growth benefits of the Butte Sink and Sutter Bypass, compared to adjacent main river channel habitats, for Butte Creek juvenile Chinook Salmon and other CCV Chinook Salmon populations that could potentially access the floodplain.

Paired Salmon Release Study and Agriculture Practice Standard Development Project – CalTrout is a science partner in this California Rice Commission lead, and NRCS funded project which is developing management practices for the rearing of salmon in "wet side" agricultural floodplains located within the flood bypass system. While the Fish Food project focuses on augmenting food web resources derived from managed inundation of farm fields and wetland habitats on the "dry side" of the levees into the river ecosystem where fish can access managed floodplain habitat.

Schedule

Oct – Dec 2018: Initiate coordination with the Science Integration Team and begin transfer of existing data to CVPIA Chinook Salmon Coarse Resolution Model and other Decision Support Tools will begin in September 2018 and continue for length of the contract.

Oct 2018 – May 2019: Field work, research, data collection and monitoring for pilot year. Due to the seasonal nature of floodplain research–which can only be conducted during the wet season when rivers rise and inundate floodplains, water is available for diversion, temperatures are within the thermal tolerances of salmon, and salmon are migrating through the Sacramento River corridor–fieldwork for this project must take place between Nov 1, and March 30th. Substantial preparation such as experimental design, grower outreach and flood and drainage coordination and installation of instrumentation is necessary in advance of field work.

June – Dec 2019: Monitoring sample processing, data analysis and coordination with the Science Integration Team and annual report preparation. Experimental design for next field season commences in June.

Oct 2019 – May 2020: Field work, research, data collection and monitoring for Year 2. Multiple inundation/drain cycles with RD 108, pilot-test with an additional district. Floodplain Lab experiments.

June – Dec 2020: Monitoring sample processing, data analysis, coordination with the Science Integration Team and annual report preparation. Experimental design for next field season commences in June.

Oct 2020 – May 2021: Field work, research, data collection and monitoring for Year 3. Multiple inundation/drain cycles with RD 108, large single cycle with an additional district. Floodplain Lab experiments. Coordination with the Science Integration Team and annual/final report preparation.

June – Dec 2021 - Monitoring sample processing, data analysis, coordination with the Science Integration Team and annual/final report preparation.

Year 1 – Pilot Year - (Oct 2018- Dec 2019)

During Year 1 this project will pilot the inundation of approximately 6,500 acres of rice fields between October and March. Fields will be actively drained directly to the Sacramento River through the Rough and Ready pumping plant. The Rough and Ready pumping facility has several levels of water export pumping capacity. For baseline conditions, a single 80cfs pump can be used. And during flood conditions or for higher discharge rates, the facility has 3 x 210cfs pumps. All these pumps can be run individually or together in various combinations for a range of export discharge rates of 80-720cfs. 5,000 acre-feet of agricultural floodplain water can be drained in 3-20 days, depending on water stages on the floodplain and in the river. River diversions will occur at the screened Wilkins Slough and Emery Poundstone pumping plants equipped with state of-the-art positive barrier fish screens and will be used for all diversions to ensure that no salmonids or other fish are entrained into the diversion and discharged into the flooded rice fields. The project will attempt three flood and drainage cycles but the number of flood-drain cycles is dependent on river flows, water diversion restrictions and pumping capabilities of RD 108.

Data will be collected on water quality, zooplankton density, and juvenile Chinook salmon growth rate at regular intervals during each flooding cycle. Temperature and dissolved oxygen data loggers recording at 15-minute intervals will be deployed and downloaded throughout the sampling period. Conductivity will be measured using a portable EC meter. Baseline river zooplankton density will be determined by sampling in the Sacramento River upstream of the floodplain drainage point source. Drainage water will be sampled at the Rough and Ready pump directly before it enters the river. Effected river samples will be taken at the point of discharge and at two sites downstream of the initial sample. In order to directly measure habitat specific growth rates, measure the effect of agricultural floodplain water export on fish growth and to compare growth rates of fish experiencing natural river conditions to those experiencing fish food-augmented conditions, hatchery-origin juvenile Chinook salmon will be confined in enclosures upstream and downstream of the Rough and Ready pumping station. Each site will have three

cages each containing 10 hatchery-origin juvenile fall run Chinook salmon. Every fish will be PIT tagged. Fish length, weight, and body condition will be recorded weekly. Flow through the Rough and Ready pumping station will be recorded by RD 108 and used, in conjunction with physical and biological metrics, to determine total food web subsidy to the river by this management action.

Years 2 and 3 (Jan 2020- Dec 2021)

In Years 2 and 3, the project will work to use lessons learned from the pilot year to grow the number of acres inundated, the number of reclamation districts (districts) participating and refine management practices to facilitate conducting multiple flood/drain cycles per season. In Year 2 the project will work to conduct three flood/drain cycles on at least 5,000 acres at RD 108 for a total 15,000 inundated acres drained. We will also begin work with Sutter Mutual Water district. In Year 3, the project plans to continue three flood/drain cycles on at least 5,000 acres at RD 108 as well as 5,000 at Sutter Mutual or another district for a total of 20,000 inundated acres drained in year 3. At the conclusion of Year 3, the project seeks to have drained approximately 40,000 acres of intentionally inundated floodplain to the Sacramento River. exporting. An estimated 330 grams of dry zooplankton carbon is exported to the river food web per acre foot of floodplain water pumped into the River.
Other Districts in the Sacramento Valley with existing managed agricultural floodplains include but are not limited to RD 70, RD 1660, RD 1000, RD 1001, RD 2047 among others. Pending water rights limitations, infrastructure constraints and unforeseen management impediments, each year the project will increase the number of locations of fish food delivery, the frequency of fish food deliveries throughout the outmigration/rearing season, and the total volume of fish food deliveries to the lower Sacramento River system to increase fish foraging success, growth rate, and survival.

Representative managed wetlands within each participating District, along with a longitudinal transect of river sites bracketing floodplain fish food export point sources will be monitored weekly throughout the field season. Water temperature, conductivity, dissolved oxygen, pH, turbidity, chlorophyll-a concentration, weather, biogeochemical constituent (e.g., nitrogen, phosphorus, and dissolved carbon), and zooplankton community assemblage and abundance data will be collected and recorded weekly throughout the field season. Temperature and dissolved oxygen loggers will be deployed at each District's fish food delivery point source, collecting data at 15-minute intervals throughout the field season. Biogeochemical samples will be subcontracted out for analysis (e.g., EcoAnalysts, Inc.). Zooplankton sample analysis will be conducted after the field season at the UC Davis Center for Watershed Sciences. Hatchery-origin juvenile Chinook salmon will be caged in the river upstream and downstream of fish food export point sources to compare baseline and managed agricultural floodplain-augmented fish diets and growth rates. Wild fish will also be sampled weekly upstream and downstream of fish food export point sources during export management actions to confirm wild fish use of these resources.

Concurrently, a managed floodplain laboratory will be constructed at River Garden Farms in Knights Landing, CA and will be used to scientifically investigate drivers, mechanisms, and outcomes of managed floodplain fish food production through controlled, replicated experiments. Specific topics to be studied include but are not limited to: effects of water

residence time on zooplankton density, effects of fish food export practices on waterfowl and shorebird populations, effects of fish presence on managed floodplain methane efflux.

Integration with Related Long-Term Monitoring Programs

This project will assist in the integration of monitoring efforts among the major entities devoted to winter and spring salmon population monitoring and conservation and collaborate with the Science Integration team to use compiled data to develop a sub-module in the Decision Support Model. Traditionally salmonid populations have been monitored by state and federal agencies with screw traps along the outmigration corridor. As rearing habitat and food availability increasingly become incorporated into the suite of conservation management strategies, a more comprehensive monitoring program is required. UC Davis researchers at the Center for Watershed Sciences the Department of Water Resources and California Rice Commission have already begun to sample rearing habitat in the Butte Sink and the Yolo and Sutter Bypasses when they are flooded. We will incorporate water quality, zooplankton, and wild fish sampling data into their reporting schema to create a centralized location for data storage and transparency. Additionally, baseline data before major conservation actions to improve access to rearing habitat are enacted will be critical for determining salmon population response to those conservation actions.

In Years 2 and 3, the project will continue to monitor the three major confluences of floodplain drainage and the lower Sacramento River. Major confluences include, but are not limited to the Colusa Drain, lower Butte Creek in Sutter Bypass, and Auburn Ravine Cross Canal. Each location will be monitored weekly for water quality and zooplankton density in similar transect experimental design used in Year 1. Baseline river zooplankton density will be determined by sampling in the Sacramento River upstream of the floodplain confluence. Floodplain water will be sampled directly before it enters the river. River samples will be taken at the confluence and at least one site downstream of the initial sample.
Representative floodplain farm fields and/or wetlands within each floodplain foodshed will also be monitored weekly throughout the winter-spring wet season. These sites were established in 2016 and continuous monitoring will generate the long-term data set needed to assess baseline conditions from which to gauge the magnitude of ecosystem response after restoration and management actions. Additional "foodshed" confluences of interest may expand to include the Butte Slough Outfall Gates and various Reclamation District discharge locations.

CalTrout's Data Steward will coordinate with external partners and the CVPIA Data Manager on the transmission of long-term monitoring, fish food export and other pertinent data defined by the SIT and the PMT per the new Data Guidance.

CVPIA Objectives: The project may contribute to improved growth rates and survival of salmonids and other native fish populations rearing in the Sacramento River through improved food web productivity and increased availability and density of food web resources.

This project will divert winter river flows to create inundated wetland habitat and facilitate productive floodplain food webs that can then be discharged into the Sacramento River where they will then be available for consumption by juvenile salmonids and other fish.

The overall propose of this project is to determine how increased availability of food resources in the Sacramento River contributes to improved rearing habitat for listed salmonids and other resident and migratory fish.

In the Central Valley of California, approximately 3360 km of state and federal levees (Inamine et al. 2010), along with local flood protection projects, have cut off approximately 95% of historical floodplain wetlands from their river channels. Recent state-wide analysis of the conservation status of freshwater fishes have concluded that lack of floodplain and other off channel habitat is an important contributor to widespread decline of many fish species (Moyle et al. 2011, Katz et al. 2013). In the Central Valley, studies have shown that, when inundated by flood waters, floodplains are generally warmer due to increased surface area and residence time compared to the relatively cool and swift river channel (Ahearn et al. 2006, Grosholz and Gallo 2006). Elevated phytoplankton growth in floodplain habitats provides food resources for grazing zooplankton and other invertebrates, which ultimately become food resources for fishes (Sommer et al. 2001b, Miiller-Solger et al. 2002, Ahearn et al. 2006, Grosholz and Gallo 2006, Jeffres et al. 2008). Due to the limited amount of floodplain habitats remaining within the levee footprint, there has been much focus on how the flood bypasses - which still hydrologically connect to river channels during high flow events - may be modified to better mimic historical shallow flooding patterns that once sustained aquatic food webs and were important drivers of fish and wildlife abundance in the Sacramento Valley.

Recent research has shown that agricultural fields in the Yolo Bypass and the Sutter Bypass can also provide a productive food web and abundant food resources for juvenile salmonids when intentionally flooded using existing irrigation infrastructure. The overall rapid growth and robust body condition of the salmon in these studies demonstrates that winter flooding of bypass agriculture fields during the non-growing season can provide high quality habitat for rearing juvenile Chinook salmon in all water years. These results suggest that changes to agricultural management and infrastructure that increase the frequency and extend the inundation duration of bypass flood events could allow bypass agriculture fields to serve as large-scale surrogates for floodplain wetlands (Katz et al. 2017).

Another potential opportunity for aquatic food web production in the Sacramento Valley is the approximately 500,000 acres of rice ground that lies on historical low-elevation floodplains that are now on the "dry-side" of flood protection levees. Over the last three decades, rice growers in the Sacramento Valley have adopted and continued to refine farm practices that provide wetland habitat for waterfowl and shorebirds on winter-flooded rice fields that remain in active agricultural production during summer (Eadie et al. 2008, Elphick 2008, Elphick et al. 2010, Strum et al. 2013). One of these practices, which occurs on approximately 300,000 acres of rice ground in the Sacramento Valley annually, is the shallow flooding of rice fields after harvest in fall to aid in rice stubble decomposition. This managed inundation produces conditions similar to natural floodplain wetlands (i.e., surrogate floodplains), and has had positive, landscape-level effects on native waterfowl populations including recent all-time high counts of wetland bird species (Elphick et al. 2010).

Current farm practices keep decomp water on fields where it percolates into the ground or evaporates. Unfortunately for fish, very little of this decomp water, which the 2017 Fish Food project pilot year showed are rich in zooplankton and other invertebrates (i.e., fish food), returns back to the river. The Fish Food project is focused on reintegrating the natural winter

productivity of these managed, "dry-side" floodplain farm fields with the river aquatic food web where it can support salmonid and other fish populations.

Data Management

The PMT Data Steward will coordinate with external partners and biannually with the CVPIA Data Manager on the transmission of long-term monitoring and other pertinent data defined by the SIT and the PMT per the 2020 Data Guidance.

Field data will be recorded on data sheets or directly into a recording device/computer and transferred into a computer spreadsheet or database. The PMT Data Steward will coordinate with the CVPIA Data Manager on the transmission of relevant and pertinent data defined by the SIT and the PMT per the 2020 Data Guidance. Field data, analyses, and reports will be stored and backed up on a PMT computer/server.

Data produced by this project will be used in the development of a sub-module of the Science Integration Team's Salmon Decision Support Model(s). The Project Management Team Leader will coordinate with the CVPIA Science Coordinator on the development and submission of a SIT DSM Modification Proposal (Using the standard proposal template), as well as ensure progress on completing the sub-module in cooperation with the Science Integration Team.

Field data will be recorded on data sheets or directly to a laptop computer and transferred into a computer database. Field data, analyses, and reports will be stored and backed-up on a CalTrout server.

Risks

Risk	Likelihood	Impact
Operating under existing water rights; project qualifies for a Notice of Exemption under CEQA with RD 108 acting as the lead agency.	I	1
Time delay on grant agreement development, review and execution for funding for Years 2 and 3: Our ability to perform work, supply large amounts of water and contract/coordinate with sub-contractors is dependent on being able to develop, review and execute grant agreements and make funding available. Given past experiences, there is a risk that the development, review and approval (Secretary) may cause significant delay in agreement execution and funding availability and may result in needing to alter the schedule or extend project timelines.	1	4
Operating in a dynamic environment: inundating/draining large amounts of farm acres and conducting in-field monitoring and research in a historic floodplain presents uncertainty based on weather, climate and flood conditions. In some cases, flood or drought years may delay work or limit our ability to meet objectives on the number of acres	1	2

inundated, amount of fish food augmented or types of data collected. We have taken preventative steps including strategically selecting field sites, moving operations outside of flood bypasses, etc. to minimize this risk.		

Cost Estimate

Year	Fund	Total	BOR	FWS	Locals and NGO match
2019	CVPRF	$997,775	$881,973	$0	$115,802
2020	CVPRF	$1,186,140	$1,083,775	$0	$102,365
2021	CVPRF	$1,378,512	$1,166,288	$0	$212,224

Total Cost: $3,562,427

Internal Agency Resources Table

Type	Name	Total	Agency	Fund	Description
2019					
Science & Monitoring					
Agreement	Research	$660,218	Local	CVPRF	Year 1 Science, and monitoring (water quality, nutrient chemistry, phytoplankton and zooplankton sampling)
In-Kind Science	Research	$115,802	Local	IKS	Year 1 Science, and monitoring (water quality, nutrient chemistry, phytoplankton and zooplankton sampling)
Water Supply & Operations					
Agreement	Water Supply	$184,500	Local	CVPRF	Year 1 Water supply and operations $28/acre/per drainage cycle – up to 6,500 acres total, plus $2,500 in project management
Reporting					
Agreement	Reporting	$37,257	Local	CVPRF	Year 1 Data analysis and report writing
2020					
Science & Monitoring					
Agreement	Research	$548,463	Local	CVPRF	Year 2 Science, and monitoring (water quality, nutrient chemistry, phytoplankton and zooplankton sampling) This includes $75,000 for hydrodynamic modeling and $30,000 for biogeochemistry analysis.
Labor	Modeling	$75,000	Reclamation–TSC	CVPRF	TSC will model 67 miles of mainstem Sac River with existing SRH-2D model for mixing & dilution (Yong Lai (TSC) &/or Jenna Paul – MP-700)
In-Kind Science	Research	$102,365	Local	IKS	Year 2 Science, and monitoring (water quality, nutrient chemistry, phytoplankton and zooplankton sampling)
Water Supply & Operations					
Agreement	Water Supply	$427,500	Local	CVPRF	Year 2 Water supply and operations $28/acre/per drainage cycle – up to 15,000 inundated acres drained, plus $7,500 in project management

Type	Name	Total	Agency	Fund	Description
Reporting					
Agreement	Reporting	$32,812	Local	CVPRF	Year 2 Data analysis and report writing
2021					
Science & Monitoring					
Agreement	Research	$568,788	Local	CVPRF	Year 3 Science, and monitoring (water quality, nutrient chemistry, phytoplankton and zooplankton sampling) This includes $42,400 for biogeochemistry analysis.
In-Kind Science	Research	$212,224	Local	IKS	Year 3 Science, and monitoring (water quality, nutrient chemistry, phytoplankton and zooplankton sampling)
Water Supply & Operations					
Agreement	Water Supply	$567,500	Local	CVPRF	Year 3 Water supply and operations $28/acre/per drainage cycle – up to 20,000 inundated acres drained, plus $7,500 in project management
Reporting					
Agreement	Reporting	$30,000	Local	CVPRF	Year 3 Data analysis and report writing

Measuring the Impact of Removing Predator Contact Points on Juvenile Salmon Survival

Define predator contact points, then determine if predator contact points exist. Hypothesis: Can CVPIA management actions modify the contact point in a manner that increases juvenile salmonid survival?

DCN:	AFRP2110
Classification:	Research, Monitoring, Modeling
Location:	North Delta & Sundial Bridge near Redding, CA
Funding Years:	2018 – 2022
Benefits Start Year:	2023
Priority:	SIT FY2020 Tech Memo: Fall Chinook – 1 Adaptively manage reduction/imp. Predator contact points
Partners:	NMFS, DAF Consultants, EBMUD, FWS, MWD, Natural Resource Scientists
Related Programs:	No Data.

Authority

Provision	Percentage
3406(g)	100%

Metrics

Name	Value	Units	Comment
Reduced model uncertainty	1	completion	Study will reduce SDM model uncertainty in determining what affects juvenile survival, focusing on 'Predator Contact Points' in association with setback levee on Bouldin Island.
number of contact points addressed	1	number of improvements	Reclamation District No. 756 will be implementing a $9.5 million set-back levee on Bouldin Island in 2018. We plan on identifying contact points in the Mokelumne River and around Bouldin Island and Webb Tract
reach-scale juvenile survival	5	percentage of fish	Increase in survival is predicted using the DSM parameter estimate for mortality per contact point (-0.0067). Assuming 5 contact points removed, we predict a 5/exp (-0.0067) = 5.0% increase in survival. Contact point restoration and post-restoration measures of juvenile survival will update the DSM parameter estimate.

Deliverables

Deliverables in all years of this project will be coordinated with the CVPIA Data Manager, CVPIA Science Coordinator, and CVPIA Fish Resource Area Coordinator.

The primary product of the research will be a conceptual model integrated into the current SIT Decision Support Model(s) for Chinook that better represents the role of predation on juvenile salmonid survival and production.

Date	Title
Dec. 2019	Year 1 data collection report
Dec. 2020	Baseline Monitoring
Dec. 2021	Year 3 data collection report
Dec. 2022	Contact Point Modification Report
Dec. 2023	Final Report

Project Management Team

Ian Smith – USBR-BDO – Project Management Team Leader – COR/GOR
Corey Phillis – MetWD
Allison Groom – MetWD
Mike Horn – USBR-TSC
Rod Wittler – USBR-CVPIA
Cyril Michelle – NMFS-SWFSC
JD Wikert – USFWS-Lodi

Narrative

A key uncertainty of the DSM is 'what affects juvenile salmonid survival.' Scientific disagreement exists regarding 1) what is a predator contact point and 2) can they be restored to increases survival? Our objective is to reduce these uncertainties with a replicated before-after control-impact experiment to measure changes in survival following restoration of predator contact points. Predation Event Recorders (PERs) will measure juvenile survival associated with DSM contact points. Contact points will then be removed or modified, and juvenile survival again measured to test whether restoring contact points can increase juvenile survival. There are 3 possible outcomes: 1) predation-events remain the same (or increase) at restored contact points, suggesting restoration has no effect; 2) predation-events decrease at restored contact points, but reach-scale survival does not change, suggesting restoring contact points simply redistributes predators; or 3) predation-events decrease at restored contact points, suggesting restoring contact points can reduce predation. So results can be generalized to other regions the project locations include delta (Bouldin Is and Webb Tract) and riverine habitats (Mokelumne and Sac. Rivers). FY19 activities include PER study in the delta associated with river lighting. FY20 activities may include lighted structure predation study in the upper Sacramento River near Redding, CA, pending additional funding.

Fall Chinook priority: adaptively manage reduction/improvement predator contact points. Winter-run PWT/SAIL: Reduce predation losses

Predation events will be estimated with PERs. Potential contact points and actions to restore, modify, or eliminate contact point will be identified (e.g., fill scour hole). We will identify 1 (Bouldin Is levee project) to six predator contact points, develop restoration actions and measures of survival post-restoration.

Biological objectives: increasing Abundance & Natural Productivity at Central Valley & Mokelumne River. Abundance metric: sum of all naturally-spawned juvenile abundance passing Chipps Island and the lowermost Mokelumne River RST. Natural Productivity: number of natural-origin juveniles per natural-origin adults passing Chipps Island and the lowermost Mokelumne River RST.

We predict each contact point improvement will increase juvenile survival by 1% based on DSM parameter estimates. Survival predictions will be updated following pre-restoration monitoring to reflect the measured predation-related mortality associated with 1) contact points in the DSM model inputs and 2) predator contact points identified by PER results. Predictions will be compared to measured changes in survival.

Project leverages a set-back levee restoration action on Bouldin Is.7. Implementation will reduce DSM uncertainty on the effect of contact points on survival.

Not implementing the charter means continued uncertainties in efficacy of restoring predator contact points to increase juvenile salmonid survival and missed opportunity for identifying beneficial fish impacts associated with levee setbacks in the Delta. There are no known stakeholder objections to this charter; landowner (MWD) is on PMT.

Data Management

The PMT Data Steward will coordinate with external partners and biannually with the CVPIA Data Manager on the transmission of long-term monitoring and other pertinent data defined by the SIT and the PMT per the 2020 Data Guidance.

Field data will be recorded on data sheets or directly into a recording device/computer and transferred into a computer spreadsheet or database. The PMT Data Steward will coordinate with the CVPIA Data Manager on the transmission of relevant and pertinent data defined by the SIT and the PMT per the 2020 Data Guidance. Field data, analyses, and reports will be stored and backed up on a PMT computer/server.

1. The key uncertainty in the DSM is what affects juvenile survival. The objective of this charter is to reduce uncertainty in what affects juvenile survival by restoring contact points associated with predation-related mortality. The charter will measure the change in reach-specific survival following the restoration actions taken to reduce predator-related mortality associated with contact points. Predation will be measured with Predation Event Recorders before and after contact points are restored. Additional monitoring will measure changes to biotic (e.g., predator density) and abiotic features (e.g., depth, flow) following restoration of contact points. Biological responses to the project, measured as through-reach survival, are expected in the first outmigration season following the restoration actions on the contact points. Physical responses can be expected immediately after completion of restoration of the contact points.

2. Long-term monitoring of the project will utilize existing monitoring infrastructure. Rotary Screw Traps in the Mokelumne River and the Chipps Island trawl provide data to estimate Natural Productivity and Abundance objectives at the watershed and valley scale. Project scale monitoring can be achieved with acoustic or PIT tagged fish released upstream of the project areas. Full response to the project will be expected in one salmon generation. The magnitude of the proposed project is uncertain, but likely to be small. However, the intent of the project is to reduce this uncertainty and provide an estimate of how many contact points would need to be removed to achieve a detectable signal at the population level.
3. Data will be provided to CVPIA as GIS and/or Excel data and maintained in relational databases.
4. The performance metrics are described above. Each of these performance metrics are derived from the DSM or means objectives and will be integrated into the monitoring plan during Phase I of the charter when the PMT will develop the study design, sampling protocol and potential suite of restoration actions for likely contact points.

Risks

Risk	Likelihood	Impact
This project has a high likelihood of successful implementation because substantial planning will be done by the PMT during the first year of the study. During the first year of the charter, the PMT will develop a study design. The PMT will develop a list of contact points from data previously collected by NOAA SWFSC and others and identify the restoration actions that could be taken to eliminate or improve the contact points.	1	1
Inability to obtain permits. The project cannot be implemented without compliance with applicable environmental clearance and public notice requirements. This project has a high likelihood of success because it involves an already approved set-back levee on Bouldin Island that can be considered as one restoration action for the charter. For any work in the Mokelumne River, EBMUD has a programmatic EIR that could cover some of the potential restoration actions to selected contact points.	2	2
Landowner access permission. This project has a high likelihood of successful implementation (overall low risk) because it involves a willing landowner, MWD, to provide access to Delta river channels for project data collection/monitoring and access for potential restoration actions to selected contact points. Likewise, in the Mokelumne River, EBMUD maintains positive working relationship with landowners and irrigators who routinely allow access for annual monitoring.	1	1
Insufficient Funding. We anticipate substantial funding on cost share from project partners, as well as implementation funding from CVPIA. If these funds fail to materialize, the project is likely to be less successful.	1	2

Cost Estimate

Year	Fund	Total	BOR	FWS	Local
2018	CVPRF	$642,733	$642,733	$0	$0
2018	MetWD	$800,694	$0	$0	$800,694
2019	CVPRF	$703,801	$703,801	$0	$0
2019	MetWD	$28,579	$0	$0	$28,579
2019	WRR	$91,676	$91,676	$0	
2020	CVPRF	$1,342,162	$1,342,162	$0	$0
2020	MetWD	$55,579	$0	$0	$55,579
2021	CVPRF	$543,979	$543,979	$0	$0
2022	CVPRF	$405,656	$405,656	$0	$0

Total Cost: $4,614,859

Internal Agency Resources Table

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
2018								
Management								
Agreement	Management	$10,600	1.00	0.00	$10,600	BOR	CVPRF	
Planning and Analysis								
Agreement	financial assistance agreement, if funded	$183,229	1.00	0.00	$183,229	BOR	CVPRF	
In-Kind Labor	In-kind planning & analysis	$9,194	1.00	0.00	$9,194	Local	Other	Anticipated cost share from NMFS, EBMUD, and MWD.
Reporting								
Agreement	Reporting	$21,370	1.00	0.00	$21,370	BOR	CVPRF	
Research								
Agreement	Research	$427,534	1.00	0.00	$427,534	BOR	CVPRF	Includes most of $135k for Sac. River Lighting
In-Kind Labor	In-kind research	$791,500	1.00	0.00	$791,500	Local	Other	Anticipated cost share from NMFS, EBMUD, and MWD.
2019								
Design								
Agreement	Design	$106,000	1.00	0.00	$106,000	BOR	CVPRF	
Environmental Compliance and Permitting								
Agreement	Environmental compliance	$84,800	1.00	0.00	$84,800	BOR	CVPRF	
Management								
Agreement	Management	$10,600	1.00	0.00	$10,600	BOR	CVPRF	
Planning and Analysis								
In-Kind Labor	In-kind planning & analysis	$28,579	1.00	0.00	$28,579	Local	Other	Anticipated cost share from NMFS, EBMUD, and MWD.
Agreement	Planning and analysis	$480,390	1.00	0.00	$480,390	BOR	CVPRF	
Reporting								
Agreement	Reporting	$22,011	1.00	0.00	$22,011	BOR	CVPRF	

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
Research								
Agreement	Sundial Bridge	$91,676	1.00	0.00	$91,676	BOR	Other	
2020								
Construction								
Agreement	Construction	$636,000	1.00	0.00	$636,000	BOR	CVPRF	
Management								
Agreement	Management	$10,600	1.00	0.00	$10,600	BOR	CVPRF	
Planning and Analysis								
In-Kind Labor	In-kind planning & analysis	$28,579	1.00	0.00	$28,579	Local	Other	Anticipated cost share from NMFS, EBMUD, and MWD.
Agreement	Planning and analysis	$205,268	1.00	0.00	$205,268	BOR	CVPRF	
Reporting								
Agreement	Reporting	$11,336	1.00	0.00	$11,336	BOR	CVPRF	
Research								
In-Kind Agreement	In-kind research	$27,000	1.00	0.00	$27,000	Local	Other	Anticipated cost share from NMFS, EBMUD, and MWD.
Agreement	Research	$478,958	1.00	0.00	$478,958	BOR	CVPRF	
2021 **Management**								
Agreement	Management	$10,600	1.00	0.00	$10,600	BOR	CVPRF	
Planning and Analysis								
Agreement	Planning and analysis	$510,028	1.00	0.00	$510,028	BOR	CVPRF	
Reporting								
Agreement	Reporting	$23,351	1.00	0.00	$23,351	BOR	CVPRF	
2022 **Management**								
Agreement	Management	$10,600	1.00	0.00	$10,600	BOR	CVPRF	
Planning and Analysis								
Agreement	Planning and analysis	$371,005	1.00	0.00	$371,005	BOR	CVPRF	
Reporting								
Agreement	Reporting	$24,051	1.00	0.00	$24,051	BOR	CVPRF	

Modeling Program

To manage, coordinate, plan and implement the CVPIA 3406(g) program.

DCN:	20INDP006
Classification:	Improvement, Administration
Location:	Central Valley wide, Central Valley Project Improvement Act
Funding Years:	2015 - 2022
Benefits Start Year:	2015
Priority:	1 Developing models and tools for ecosystem and water operations in Central Valley region is a CVPIA priority identified by the CALFED Bay Delta Program. This on-going program provides essential modeling supports for, including but not limited to, other CVPIA Programs. 17 different agencies including US FWS, CA FW, CA DWR utilize the models and tools developed and constantly updated by this CVPIA 3406 (g) program.
Partners:	FWS, USGS, CDFW, DWR
Related Programs:	CDFW, CVPCP, CVPIA b1, CVPIA b12, CVPIA b13, CVPIA b2, EWP, Interagency Ecological Program, NMFS, NMFS-RPAs, San Joaquin River Restoration Program, SWRCB, AFRP, BDCP, CALFED, California Drought Response

Authority

Provision	Percentage
3406 (g)	100.0%

Metrics

Name	Value	Units	Comment
Models and tools that supports ecosystem restoration and water operation decisions to reach the goal of fish doubling in the Central Valley region	1	number of models complete	1 Models and tools, developed by this program, vitally support CVPIA's meeting fish production and ecosystem restoration targets. The benefits of Ecosystem and Water Operation Modeling underlies with the core mission and vision of CVPIA. See more in the Program Priority Section.

Deliverables

Date	Title
Sep. 2020	1 D Hydrodynamic Modeling
Sep. 2020	2 D Hydrodynamic Modeling
Sep. 2020	Water Quality Modeling
Sep. 2020	CalSim Modeling

Date	Title
Sep. 2020	SIT Fisheries Modeling Support
Sep. 2021	Annual Report for FY 2020
Sep. 2020	Annual Work Plan for FY 2021
Sep. 2020	HEC-5Q Temperature Modeling
Sep. 2020	Modeling Projects Management for FY19

Deliverables in all years of this project will be coordinated with the CVPIA Data Manager, CVPIA Science Coordinator, and CVPIA Fish Resource Area Coordinator.

Project Management Team

Project Manager: Jobaid Kabir, Chief; MP-740
Asst. Project Manager: Junaid As-Salek
Modeler, MP-740
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Narrative

The Ecosystem Modeling effort is a continuing program that began in 1994 to develop models and tools to evaluate effects of alternative water management strategies, to improve scientific understanding of ecosystems.

In 1994, a Task Order Agreement namely— Sharing of Costs Agreement for Mitigation Projects Improvements (SCAMPI) has been entered into by the State of California, and by the United States for cost-sharing to support implementation of environmental restoration measures under CVPIA.

All studies and investigations shall take into account and be fully consistent with the fish, wildlife, and habitat protection and restoration measures required by the CVPIA. The CVPIA 3406(g) lists 9 subject areas for study and investigation, including the following:

1. Related water quality conditions and improvement alternatives, including improved1temperature prediction capabilities as they relate to storage.

2. Development and use of base flows and channel maintenance flows to protect and restore natural channel and riparian habitat values.
3. Implementation of operational regimes at State and Federal facilities to increase springtime flow releases, retain additional floodwaters, and assist in restoring both upriver and downriver riparian habitats.
4. Measures needed to restore anadromous fisheries to optimum and sustainable levels in accordance with the restored carrying capacities of Central Valley rivers, streams, and riparian habitats

Comprehensive San Joaquin Water Quality Model (SJRSIM), CalSim II, DSM2, ECOSIM, InSALMO, C2VSIM, CalSim 3, CalLite II and HydroGeoSphere models, are developed and being modified to incorporate recent changes in legislative requirements and water-environment.

Funding-

- CVPIA Restoration Funds
- Water & Related Resources
- In-kind 25% cost sharing by State Agencies

Benefits -

- Improved flow and water temperature
- Improved water quality
- Better management for anadromous fish species
- Better planning of water operations

Reclamation Program Lead is responsible for administration of the program and coordination of program activities, budget and work with Federal and State agencies with the following duties:

- Prepare SCAMPI contract, monitor the expenditure and in-kind support of the partner agencies.
- Develop PWS, objectives, and milestones of projects.
- Develop and maintain long term modeling plans and PMPs for modeling projects and update these regularly.
- Submit all CVPIA 3406 (g) requisition packages on time.
- Plan, and manage CVPIA 3406 (g) modeling budgets and schedules.
- Respond FOIA requests.
- Promote effective communications with all partner-agencies like FWS, DWR, CAFW,

NOAA, USGS, USACE, Municipal Utility Districts, with Reclamation modelers, Budget Analyst, CVPIA Administrators, Acquisition, Reclamation and DWR legal counselors, accountant

The Program is jointly implemented by the U.S. Fish and Wildlife Service (Service) and the Bureau of Reclamation (Reclamation). Program management and technical support are shared by both agencies, with the Reclamation primarily leading on program management as stated above and full technical support for modeling projects management and implementation.

Funding for the CVPIA 3406(g) maintains a core capability in support of a science-based approach for selecting CVPIA programs and projects.

Data Management

All modelling data and files will be kept in the Planning Division at Cottage Way Office, Sacramento. Information resulting from activities funded by this charter, including all program reports and any raw data, will be permanently housed at BOR's Interior Region 10, California Great Basin Office in Sacramento, and FWS's Pacific Southwest Regional Office in Sacramento.

Management of confidential data and response to FOIA requests will be handled according to DOI and Reclamation protocols.

The Project Management Team (PMT) Data Steward will coordinate with external partners and biannually with the CVPIA Data Manager on the transmission of long-term monitoring and other pertinent data defined by the Science Integration Team (SIT) and the PMT per the 2020 Data Guidance.

Field data will be recorded on data sheets or directly into a recording device/computer and transferred into a computer spreadsheet or database. The PMT Data Steward will coordinate with the CVPIA Data Manager on the transmission of relevant and pertinent data defined by the SIT and the PMT per the 2020 Data Guidance. Field data, analyses, and reports will be stored and backed up on a PMT computer/server.

Data produced by this project will be used in the development of a sub-module of the Science Integration Team's Salmon Decision Support Model(s). The Project Management Team Leader will coordinate with the CVPIA Science Coordinator on the development and submission of a SIT Decision Support Model (DSM) Modification Proposal (Using the standard proposal template), as well as ensure progress on completing the sub-module in cooperation with the Science Integration Team.

Risks

Risk	Likelihood	Impact
Adverse Stakeholders	1	3
Insufficient Field Data	2	2

Pre-Project and Post Project Monitoring Plans

CVPIA 3406 (g) Pre- and Post-Project Monitoring Plans (as of November 13, 2019)

CVPIA (g) Warrants	Modeling Projects	Pre- and Post-Project Monitoring Plans
(1) Comprehensive water budget of surface and groundwater supplies, considering all sources of inflow and outflow available over extended periods.	CalSim II, CalSim 3.0 CalLite, HGS, ANN, ECOSIM-W, C2VSIM and DSM2	DSM2 Particle Tracking Module Analysis and visualize the data. Removal of the VAMP cycle and related relocation of the DO code, assignment of eastside streams and Delta connectivity to the San Joaquin cycles. General code relating to coupling with the groundwater model at stream nodes, removal of the constant head boundary at the Delta.
(2) Related water quality conditions, including temperature dynamics related to storage	Upper Sacramento River Water Quality Model (SRWQM), San Joaquin Basin Temperature Model HEC-5Q	SRWQM and HEC-5Q for Shasta Dam raise and expansion project modelling.
(3) Surface-ground and stream-wetland interactions	HydroGeoSphere, CVHGSM (Central Valley Hydro GeoSphere Model), C2VSIM	Coordinating with CVPIA Monitoring and Data Management by providing database support for Juvenile and Adult platforms and developing GIS projects' database.
(4) Measures needed to restore anadromous fisheries to optimum and sustainable levels in accordance with the restored carrying capacities of Central Valley rivers, streams, and riparian habitats;	inSALMO	Providing technical support for Bay Delta Office & Central Valley Operations. Implementing Cost Sharing Agreement for Mitigation Projects with California DWR
(5) Development and use of base flows and channel maintenance flows to protect and restore natural channel and riparian habitat values;	RHEM	Building expertise in HEC-RAS for determining water quality & habitat parameters on the Sacramento River Chinook Salmon Coarse Resolution Decision Support Model.

CVPIA (g) Warrants	Modeling Projects	Pre- and Post-Project Monitoring Plans
(6) Implementation of operational regimes at State and Federal facilities to increase springtime flow releases, retain additional floodwaters, and assist in restoring both upriver and downriver riparian habitats;	CalSim II, CalSim 3.0, CalLite and ECOSIM-W	Documentation of CalSim3 data input processes to help Reclamation recreate rim inflows and CalSimHydro inputs to include components such as precipitation, land use, ET, and reservoir evaporation.
(7) Measures designed to reach sustainable harvest levels of resident and anadromous fish, including development and use of systems of tradeable harvest rights;	SIT DSM	Assisting CVPIA Science Integration Team (SIT) in using Chinook salmon lifecycle Decision Support Models (DSM), synthesizing data for DSM input, developing flow regimes for DSM Scenarios from CalSim II, CalSim 3, CalLite model outputs.
(8) Ecosystem modeling to identify opportunities to protect and restore wetland and upland habitats throughout the Central Valley;	inSALMO	Continue adaptation/ development of hydrologic, fish-population and water temperature models at varying spatial and temporal scales.
(9) Measures to enhance the firm yield of existing Central Valley Project facilities, including improved management and operations, conjunctive use opportunities, development of off-stream storage, levee setbacks, and riparian restoration.	CalSim II, CalSim 3.0, CalLite and ECOSIM-W	Assisting and coordinating with partner agencies in modeling fish behavior, habitat, temperature, water flow, salinity and other water quality parameters. Tulare basin initial development, including draft WBA and DU delineations, ET and consumptive use datasets, and connectivity as implemented in WRESL code.

Cost Estimate

Year	Fund	Total	BOR	FWS	DWR
2015	CVPRF	$721,529	$613,400	$108,129	$0
2015	SIK	$944,573	$0	$0	$944,574
2016	CVPRF	$606,531	$519,575	$86,953	$0
2016	SIK	$972,911	$0	$0	$972,911
2017	CVPRF	$538,720	$511,688	$27,032	$0
2017	SIK	$793,332	$0	$0	$793,332
2018	CVPRF	$600,000	$499,977	$100,023	$0
2018	SIK	$832,999	$0	$0	$832,999
2019	CVPRF	$650,000	$549,978	$100,022	$0
2019	SIK	$832,998	$0	$0	$832,998
2020	CVPRF	$700,000	$700,000	$0	$0
2020	SIK	$832,999	$0	$0	$832,999
2021	CVPRF	$700,000	$700,000	$0	$0
2021	SIK	$832,999	$0	$0	$832,999
2022	CVPRF	$700,000	$700,000	$0	$0
2022	SIK	$832,999	$0	$0	$832,999

Total Cost: $12,092,588

Internal Agency Resources Table

Type	Total	FTE	Agency	Fund	Description
2016					
Administration					
Labor	$46,405	0.20	FWS	CVPRF	Co-Lead for USFWS, coordinating program activities within the service as well as reviewing and development of water operations and fishery modeling tools.
Labor	$20,274	0.087	FWS	CVPRF	Coordinate fish model development and implementation
Labor	$21,955	0.15	BOR	CVPRF	Modeling of CalSim3.0 and CalSim II
Labor	$21,955	0.15	BOR	CVPRF	Develop, update, and implement modeling works related to CalSimII and RiverWare
Labor	$21,955	0.15	BOR	CVPRF	Development, update, and implementation of water quality and CalLite models
Labor	$24,394	.167	BOR	CVPRF	Supervisory Support: Oversee the modeling activities of Reclamation
Labor	$121,970	0.80	BOR	CVPRF	In-Depth Temperature Modeler: Modeler responsible for in-depth model code modification and documentation of HEC-5Q and other temperature model
Labor	$21,955	0.15	BOR	CVPRF	Modeler - CalSim3.0 coordination and using temperature model for CalSim.
Labor	$12,197	0.08	BOR	CVPRF	Modeler responsible for in-depth model code modification and documentation of CalSim3 and other water operation model
Direct Contribution	$11,098		BOR	CVPRF	Membership and participation in California Water and Environmental Modeling Forum (CWEMF) and other professional organizations, attend workshops etc., prepare publications and provide support for model application to stakeholders.
Labor	$20,274	0.087	FWS	CVPRF	Develop and review of water temperature model
Labor	$187,099	1.0	BOR	CVPRF	Program Manager, Project manager for the modeling projects and Program-Lead for Reclamation, coordinating program activities - Source: State Water Project Funds
In-Kind Labor	$282,375		DWR	SIK	C2VSIM Model Development & Application - Fund Source: State Water Project Funds
In-Kind Labor	$205,361		DWR	SIK	CalSim II Model Update & Application
In-Kind Labor	$248,518		DWR	SIK	CalSim 3.0 Model Development & Application - Source: State Water Project Funds
In-Kind Labor	$154,101		DWR	SIK	CalLite Model Development & Application - Source: State Water Project Funds
In-Kind Labor	$82,556		DWR	SIK	Development & Application of ANN Model - Source: State Water Project Funds

Type	Total	FTE	Agency	Fund	Description
Agreement[6]	$24,000		Local	CVPRF	To update the CalSim model with new water operation rules, maintain the model and improve the logics.
Labor[7]	$1,000	0.01	BOR	CVPRF	To award and manage the contract. CalSim contract and supporting works that will be performed by BOR Project Requisition. Local consultants will perform the work under a contract agreement.
Agreement[8]	$24,000		Local	CVPRF	To update the temperature and fisheries models. This Charter is for that portion of modeling support works that will be performed by the local consultants. The labor rate showing is actually the total contract amount that is being expected to be funded by CVP RF.
Labor[9]	$1,000	0.01	BOR	CVPRF	To award and manage the contract.
Agreement[10]	$24,000		Local	CVPRF	To update the CalLite model and CalLite GUI . This Charter is for that portion of modeling support works that will be performed by the local consultants. The labor rate showing is actually the total contract amount that is being expected to be funded by CVP RF.
Labor[11]	$1,000	0.01	BOR	CVPRF	To award and manage the contract.
2017					
Administration					
Labor	$11,842	0.05	BOR	CVPRF	Development, update, and implementation of water quality and CalLite models.
Labor	$2,253	0.01	FWS	CVPRF	Coordinate fish model development and implementation.
Labor	$2,253	0.01	FWS	CVPRF	Develop and review of water temperature model.
Labor	$11,842	0.05	BOR	CVPRF	Modeler responsible for in-depth model code modification and documentation of CalSim3 and other water operation model.
Labor	$71,050	0.3	BOR	CVPRF	Modeler responsible for in-depth model code modification and documentation of HEC-5Q and other temperature models.
Labor	$11,842	0.05	BOR	CVPRF	CalSim and Temperature Modeler.

[6] FY16 CalSim Technical Support Charter
[7] FY16 CalSim Technical Support Charter
[8] FY16 FY16 Temperature and Fisheries Model Technical Support Charter
[9] FY16 FY16 Temperature and Fisheries Model Technical Support Charter
[10] FY16 CalLite Technical Support Charter
[11] FY16 CalLite Technical Support Charter

Type	Total	FTE	Agency	Fund	Description
Labor	$2,368	0.01	BOR	CVPRF	Ground water and CalSim Modeler.
Labor	$11,842	0.05	BOR	CVPRF	Develop, update, and implement modeling works related to CalLite GUI.
Labor	$16,578	0.07	BOR	CVPRF	Oversee the modeling activities of Reclamation. (JK)
Labor	$22,527	0.1	FWS	CVPRF	Co-Lead for USFWS, coordinating program activities within the service as well as reviewing and the development of water operations and fishery modeling tools. (DH)
Labor	$201,309	0.85	BOR	CVPRF	Program lead for Reclamation, coordinating program activities within all agencies as well as reviewing and the development of water operations, ecosystem and fishery modeling tools. (JA)
In-Kind Labor	$162,973	n/a	DWR	SIK	CalLite Model Development & Application
In-Kind Labor	$277,747	n/a	DWR	SIK	CalSim 3.0 Model Development & Application
In-Kind Labor	$179,609	n/a	DWR	SIK	CalSim II Model Update & Application
In-Kind Labor	$173,003	n/a	DWR	SIK	C2VSIM Model Development & Application
Labor	$2,368	0.01	BOR	CVPRF	Modeling of Ground Water, Subsidence and Climate Change Effect. (KN)
Agreement[12]	$49,000	n/a	BOR	CVPRF	To QA QC of the CalLite GUI and extend the project performance period by 1 year.
Labor[13]	$1,562	1	BOR	CVPRF	To award and manage the contract
Agreement[14]	$19,085	n/a	BOR	CVPRF	To pay for the Solver license
Labor[15]	$1,000	1	BOR	CVPRF	To award and manage the Solver contract
Agreement[16]	$49,000	n/a	BOR	CVPRF	To update the models with new water operation rules, maintain the model and improve the logics
Labor[17]	$1,000	1	BOR	CVPRF	To award and manage the contract
Agreement[18]	$49,000	n/a	BOR	CVPRF	To update the models with new water operation rules, maintain the model and improve the logics.
Labor[19]	$1,000	1	BOR	CVPRF	To award and manage the contract
2018					
Planning and Analysis					

[12] FY17 CalLite GUI Project Extension & Modification Charter
[13] FY17 CalLite GUI Project Extension & Modification Charter
[14] FY17 CalSim Solver License Charter
[15] FY17 CalSim Solver License Charter
[16] FY17 CalSim, CalLite Temperature Modeling Support
[17] FY17 CalSim, CalLite Temperature Modeling Support
[18] FY17 CalSim, Fisheries, Temperature Modelling Support
[19] FY17 CalSim, Fisheries, Temperature Modelling Support

Type	Total	FTE	Agency	Fund	Description
Labor	$17,513	0.18	BOR	CVPRF	Updating and implementation of CalSim II model. Automatic documentation of CalSim model logic. (The labor rates are average of personnel involved.)
Labor	$22,377	0.23	BOR	CVPRF	Development, update and implementation of water quality and CalLite models. (The labor rates are average of personnel involved.)
Labor	$27,242	0.28	BOR	CVPRF	Develop, update and implement CalLite model and post processing tools. (The labor rates are average of personnel involved.)
Labor	$90,483	0.93	BOR	CVPRF	1D hydrodynamic modeling. (The labor rates are average of personnel involved.)
Direct Contribution	$5,242	n/a	BOR	CVPRF	Membership and participation in California Water and Environmental Modeling Forum (CWEMF) and other professional outreach activities, attend workshops etc., prepare publications and provide support for model application to stakeholders.
Labor	$48,647	0.50	BOR	CVPRF	2D hydrodynamic modeling to support SIT and BDO. (The labor rates are average of personnel involved.)
Agreement	$20,000	n/a	BOR	CVPRF	Temperature modeling contract / agreement
Labor	$9,758	0.04	FWS	CVPRF	Temperature modeling support
Labor	$23,350	0.24	BOR	CVPRF	Database development and support for fisheries program. (The labor rates are average of personnel involved.)
Labor	$19,755	1.00	BOR	CVPRF	To support modelling for SIT program.
Agreement	$20,000	n/a	BOR	CVPRF	CalSim Modeling Contract / Agreement
Labor	$4,879	0.02	FWS	CVPRF	CalSim II modeling support
Labor	$9,758	0.04	FWS	CVPRF	Provides water quality modeling support.
In-Kind Labor	$181,653	n/a	DWR	SIK	C2VSIM Model Development & Application
In-Kind Labor	$188,589	n/a	DWR	SIK	CalSim II Model Update & Application
In-Kind Labor	$291,634	n/a	DWR	SIK	CalSim 3.0 Model development & application.
In-Kind Labor	$171,122	n/a	DWR	SIK	CalLite WRIMS platform-based model development & application
Labor	$48,647	0.50	BOR	CVPRF	Program lead for Reclamation, coordinating program activities within all agencies as well as reviewing and the development of water operations, ecosystem and fishery modeling tools.
Labor	$5,917	0.05	BOR	CVPRF	Oversees the modeling activities of Reclamation.
Labor	$63,241	0.65	BOR	CVPRF	In-depth model code modification, automated calibration, and documentation of HEC-5Q and other temperature models in support of CIT, BDO and CVO. (The labor rates are average of personnel involved.)

Type	Total	FTE	Agency	Fund	Description
Labor	$87,564	0.90	BOR	CVPRF	In-depth model code modification and documentation of CalSim3 and other water operation models. (The labor rates are average of all personnel involved.)
Labor	$7,319	0.03	FWS	CVPRF	Co-Lead for USFWS, coordinating program activities within the service as well as reviewing and the development of water operations and fishery modeling tools.
Labor	$46,352	0.19	FWS	CVPRF	Develop and review of water temperature model
Labor	$21,956	0.09	FWS	CVPRF	2D HD model development and implementation. (The labor rates are average of personnel involved.)
2019					
Planning and Analysis					
Labor	$5,917	0.05	BOR	CVPRF	Oversees the modeling activities of Reclamation.
Labor	$7,319	0.03	FWS	CVPRF	Co-Lead for USFWS, coordinating program activities within the service as well as reviewing and the development of water operations and fishery modeling tools.
Labor	$48,647	0.50	BOR	CVPRF	2D hydrodynamic modeling to support SIT and BDO. (The labor rates are average of personnel involved.)
Labor	$44,755	0.46	BOR	CVPRF	To support modelling for SIT program. (The labor rates are average of personnel involved.)
Labor	$9,758	0.04	FWS	CVPRF	Provides water quality modeling support.
Labor	$9,758	0.04	FWS	CVPRF	Temperature modeling support
Agreement	$30,000	n/a	BOR	CVPRF	CalSim Modeling Contract/Agreement
Labor	$46,352	0.19	FWS	CVPRF	Develop and review of water temperature model
Labor	$63,241	0.65	BOR	CVPRF	In-depth model code modification, automated calibration, and documentation of HEC-5Q and other temperature models in support of CIT, BDO and CVO. (The labor rates are average of personnel involved.)
Labor	$87,564	0.90	BOR	CVPRF	In-depth model code modification and documentation of CalSim3 and other water operation models. (The labor rates are average of all personnel involved.)
Labor	$21,956	0.09	FWS	CVPRF	2D HD model development and implementation. (The labor rates are average of personnel involved.)
Labor	$27,242	0.28	BOR	CVPRF	Develop, update and implement CalLite model and post processing tools. (The labor rates are average of personnel involved.)
Labor	$48,647	0.50	BOR	CVPRF	Program lead for Reclamation, coordinating program activities within all agencies as well as reviewing and the development of water operations, ecosystem and fishery modeling tools.

Type	Total	FTE	Agency	Fund	Description
Agreement	$35,000	n/a	BOR	CVPRF	Temperature modeling contract/ agreement
Labor	$22,377	0.23	BOR	CVPRF	Development, update and implementation of water quality and CalLite models. (The labor rates are average of personnel involved
Labor	$90,483	0.93	BOR	CVPRF	1D hydrodynamic modeling. (The labor rates are average of personnel involved.)
Labor	$17,513	0.18	BOR	CVPRF	Updating and implementation of CalSim II model. Automatic documentation of CalSim model logic. (The labor rates are average of personnel involved.)
Direct Contribution	$5,242	n/a	BOR	CVPRF	Membership and participation in California Water and Environmental Modeling Forum (CWEMF) and other professional outreach activities, attend workshops etc., prepare publications and provide support for model application to stakeholders.
Labor	$23,350	0.24	BOR	CVPRF	Database development and support for fisheries program. (The labor rates are average of personnel involved.)
In-Kind Labor	$171,122	n/a	DWR	SIK	CalLite WRIMS platform based model development & application
In-Kind Labor	$291,634	n/a	DWR	SIK	CalSim 3.0 Model development & application.
In-Kind Labor	$188,589	n/a	DWR	SIK	CalSim II Model Update & Application
Labor	$4,879	0.02	FWS	CVPRF	CalSim II modeling support
In-Kind Labor	$181,653	n/a	DWR	SIK	C2VSIM Model Development & Application
2020					
Planning and Analysis					
Labor	$24,000	0.18	BOR	CVPRF	Updating and implementation of CalSim II model. Automatic documentation of CalSim model logic. (The labor rates are average of personnel involved.)
Labor	$25,000	0.23	BOR	CVPRF	Development, update, and implementation of water quality models. (The labor rates are average of personnel involved.)
Labor	$25,000	0.28	BOR	CVPRF	Develop, update and implement CalLite model and post-processing tools. (The labor rates are average of personnel involved.)
Labor	$70,000	1.75	BOR	CVPRF	1D hydrodynamic modeling. (The labor rates are average of personnel involved.)
Direct Contribution	$5,000	n/a	BOR	CVPRF	Membership and participation in California Water and Environmental Modeling Forum (CWEMF) and other professional outreach activities, attend workshops etc., prepare publications and provide support for model application to stakeholders.
Labor	$70,000	0.50	BOR	CVPRF	2D hydrodynamic modeling to support SIT and BDO. (The labor rates are average of personnel involved.)
Agreement	$75,000	n/a	BOR	CVPRF	CalSim and Temperature modeling contract / agreement

Type	Total	FTE	Agency	Fund	Description
Labor	$20,000	0.24	BOR	CVPRF	Database and GIS support for fisheries program. (The labor rates are average of personnel involved.)
Labor	$36,000	0.20	BOR	CVPRF	To support modeling for SIT program.
Agreement	$80,000	n/a	BOR	CVPRF	CalSim Modeling Contract/Agreement
In-Kind Labor	$181,653	n/a	DWR	SIK	C2VSIM Model Development & Application
In-Kind Labor	$188,589	n/a	DWR	SIK	CalSim II Model Update & Application
In-Kind Labor	$291,634	n/a	DWR	SIK	CalSim 3.0 Model development & application.
In-Kind Labor	$171,122	n/a	DWR	SIK	CalLite WRIMS platform-based model development & application
Labor	54,000	0.50	BOR	CVPRF	Program lead for Reclamation, coordinating program activities within all agencies as well as reviewing and the development of water operations, ecosystem and fishery modeling tools.
Labor	$6,000	0.05	BOR	CVPRF	Oversees the modeling activities of Reclamation.
Labor	$110,000	0.65	BOR	CVPRF	In-depth model code modification, automated calibration, and documentation of HEC-5Q and other temperature models in support of CIT, BDO and CVO. (The labor rates are average of personnel involved.)
Labor	$100000	0.90	BOR	CVPRF	In-depth model code modification and documentation of CalSim3 and other water operation models. (The labor rates are average of all personnel involved.)
2021					
Planning and Analysis					
Labor	$25,000	0.23	BOR	CVPRF	Development, update, and implementation of water quality models. (The labor rates are average of personnel involved.)
Labor	$25,000	0.28	BOR	CVPRF	Develop, update and implement CalLite model and post-processing tools. (The labor rates are average of personnel involved.)
Labor	$70,000	1.75	BOR	CVPRF	1D hydrodynamic modeling. (The labor rates are average of personnel involved.)
Direct Contribution	$5,000	n/a	BOR	CVPRF	Membership and participation in California Water and Environmental Modeling Forum (CWEMF) and other professional outreach activities, attend workshops etc., prepare publications and provide support for model application to stakeholders.
Labor	$70,000	0.50	BOR	CVPRF	2D hydrodynamic modeling to support SIT and BDO. (The labor rates are average of personnel involved.)
Agreement	$85,000	n/a	BOR	CVPRF	CalSim and Temperature modeling contract / agreement
Labor	$20,000	0.24	BOR	CVPRF	Database and GIS support for fisheries program. (The labor rates are average of personnel involved.)
Labor	$50,000	0.20	BOR	CVPRF	To support modeling for SIT program.

Type	Total	FTE	Agency	Fund	Description
Agreement	$80,000	n/a	BOR	CVPRF	CalSim Modeling Contract / Agreement
In-Kind Labor	$181,653	n/a	DWR	SIK	C2VSIM Model Development & Application
In-Kind Labor	$188,589	n/a	DWR	SIK	CalSim II Model Update & Application
In-Kind Labor	$291,634	n/a	DWR	SIK	CalSim 3.0 Model development & application.
In-Kind Labor	$171,122	n/a	DWR	SIK	CalLite WRIMS platform based model development & application
Labor	54,000	0.50	BOR	CVPRF	Program lead for Reclamation, coordinating program activities within all agencies as well as reviewing and the development of water operations, ecosystem and fishery modeling tools.
Labor	$6,000	0.05	BOR	CVPRF	Oversees the modeling activities of Reclamation.
Labor	$110,000	0.65	BOR	CVPRF	In-depth model code modification, automated calibration, and documentation of HEC-5Q and other temperature models in support of CIT, BDO and CVO. (The labor rates are average of personnel involved.)
Labor	$100000	0.90	BOR	CVPRF	In-depth model code modification and documentation of CalSim3 and other water operation models. (The labor rates are average of all personnel involved.)
2022					
Planning and Analysis					
Labor	$25,000	0.23	BOR	CVPRF	Development, update, and implementation of water quality models. (The labor rates are average of personnel involved.)
Labor	$25,000	0.28	BOR	CVPRF	Develop, update and implement CalLite model and post-processing tools. (The labor rates are average of personnel involved.)
Labor	$70,000	1.75	BOR	CVPRF	1D hydrodynamic modeling. (The labor rates are average of personnel involved.)
Direct Contribution	$5,000	n/a	BOR	CVPRF	Membership and participation in California Water and Environmental Modeling Forum (CWEMF) and other professional outreach activities, attend workshops etc., prepare publications and provide support for model application to stakeholders.
Labor	$70,000	0.50	BOR	CVPRF	2D hydrodynamic modeling to support SIT and BDO. (The labor rates are average of personnel involved.)
Agreement	$85,000	n/a	BOR	CVPRF	CalSim and Temperature modeling contract / agreement
Labor	$20,000	0.24	BOR	CVPRF	Database and GIS support for fisheries program. (The labor rates are average of personnel involved.)
Labor	$50,000	0.20	BOR	CVPRF	To support modeling for SIT program.
Agreement	$80,000	n/a	BOR	CVPRF	CalSim Modeling Contract / Agreement
In-Kind Labor	$181,653	n/a	DWR	SIK	C2VSIM Model Development & Application
In-Kind Labor	$188,589	n/a	DWR	SIK	CalSim II Model Update & Application

Type	Total	FTE	Agency	Fund	Description
In-Kind Labor	$291,634	n/a	DWR	SIK	CalSim 3.0 Model development & application.
In-Kind Labor	$171,122	n/a	DWR	SIK	CalLite WRIMS platform based model development & application
Labor	54,000	0.50	BOR	CVPRF	Program lead for Reclamation, coordinating program activities within all agencies as well as reviewing and the development of water operations, ecosystem and fishery modeling tools.
Labor	$6,000	0.05	BOR	CVPRF	Oversees the modeling activities of Reclamation.
Labor	$110,000	0.65	BOR	CVPRF	In-depth model code modification, automated calibration, and documentation of HEC-5Q and other temperature models in support of CIT, BDO and CVO. (The labor rates are average of personnel involved.)
Labor	$100000	0.90	BOR	CVPRF	In-depth model code modification and documentation of CalSim3 and other water operation models. (The labor rates are average of all personnel involved.)

Sacramento River – East Sand Slough Restoration

Improves juvenile rearing habitat at East Sand Slough side channel on the Sacramento River in Red Bluff.

DCN:	AFRP2113
Classification:	Habitat Improvement, Habitat Restoration
Location:	Sacramento River at Red Bluff, Sacramento Upper Mainstem
Funding Years:	2018 - 2021
Benefits Start Year:	2019
Priority:	SIT FY2020 Tech Memo: - Increase perennially inundated juvenile habitat, Sacramento River above the American River confluence - Increase seasonally inundated juvenile habitat at 2 yr freq., Sacramento River above American River confluence
Partners:	Sacramento River Forum, Tehama County RCD, USFS, City of Red Bluff, Glenn Colusa Irrigation District
Related Programs:	CDWR, NMFS

Authority

Provision	Percentage
(b)(13)	100%

Metrics

Name	Value	Units	Comment
Juvenile Rearing Habitat	9	acres	This is the estimated acres of low flow channel (2800 meters long X 12 meters wide). Floodplain habitat will be incrementally wetted at a range of flows and provide additional habitat.
Large juveniles produced	67000	number of fish	Estimate of large Chinook outmigrants at two fish per square meter of rearing habitat (SIT value).

Deliverables

Deliverables in all years of this project will be coordinated with the CVPIA Data Manager, CVPIA Science Coordinator, and CVPIA Fish Resource Area Coordinator.

Date	Title
Dec. 2019	Restoration site construction completed
Dec. 2020	Planting plan implemented.

Project Management Team

John Hannon – USBR-BDO
Jim Earley – USFWS-RBFO
Mike Berry – DWR
Ruth Goodfield – NMFS
Jenna Paul – USBR-MP-210

Narrative

1. Restoration at East Sand Slough side channel along the Sacramento River in Red Bluff. This area was annually inundated when Red Bluff Diversion Dam was in place. Now that the dam is open the channel is dry when flow is less than around 20,000 cfs. The project would establish a 1 3/4-mile-long low flow channel with incrementally inundated floodplain along the edges. Woody material would be added for cover. The area would be vegetated with appropriate riparian species. Due to the annual flooding of Lake Red Bluff most of the area is devoid of species besides annual grasses.
2. Provides rearing habitat in the Sacramento River at Red Bluff.
3. The project includes excavation of material through the channel to elevations providing perennial flow through. The excavated material would be recontoured at the site or into the main channel. The floodplain would be contoured to incrementally inundate vegetated habitat over the range of flows. Following construction appropriate riparian species would be planted. The project is through the center of the City of Red Bluff and on Forest Service land so appropriate public access and educational material would be incorporated.
4. Provides juvenile rearing habitat at an area downstream of the majority of spawning habitat and in an area where water temperatures are suitable for juvenile rearing year-round for all salmon and steelhead.
5. We predict that the project will result in larger juveniles out-migrating from this area of the river resulting in higher survival of those fish to the ocean (higher productivity from the upper Sacramento River) and ultimately higher returns of naturally produced fish from the upper Sacramento River.
6. The project has a large footprint relative to other projects proposed in the upper Sacramento River and thus is more costly and has a high potential biological benefit. Funding supports the full project through outreach, survey, design, construction, and monitoring. Participation of irrigation districts and other entities in construction will reduce costs and will be worked out in the design process.
7. Contributes to fundamental objective of providing juvenile rearing habitat along the migration corridor within an area with suitable water temperatures for year-round rearing to occur.
8. Focus is habitat improvement.
9. If not done the area will remain an open space, dry in summer and wetted when high flows occur. Partnership benefits will not be realized.
10. Red Bluff residents were disappointed when the RBDD dam gates were raised, changing the summertime lake-like conditions the community was accustomed to. Initial outreach has shown community interest in having a natural flowing channel through the area and other interest in having the lake back. Any stakeholder objections will be negotiated on a site-specific basis as they arise.

Project schedule could be accelerated with additional funding in FY18 if available.

Data Management

The PMT Data Steward will coordinate with external partners and biannually with the CVPIA Data Manager on the transmission of long-term monitoring and other pertinent data defined by the SIT and the PMT per the 2020 Data Guidance.

Field data will be recorded on data sheets or directly into a recording device/computer and transferred into a computer spreadsheet or database. The PMT Data Steward will coordinate with the CVPIA Data Manager on the transmission of relevant and pertinent data defined by the SIT and the PMT per the 2020 Data Guidance. Field data, analyses, and reports will be stored and backed up on a PMT computer/server.

1. Contract with DWR for design includes documentation of as-built conditions through survey or other means. Financial assistance agreement with CDFW for fisheries monitoring includes surveys of juvenile abundance and size at the project and control sites before and after implementation. Chico State is leading a study of growth at treatment and control sites in conjunction with other restoration sites. Long term trend monitoring is via the rotary screw traps at Red Bluff and the adult escapement surveys. The scale of projects is such that detecting population change attributable to projects will be difficult.
2. Center for data management yet to come.
3. Performance metrics are from the SDM fall-run model assumptions for juvenile rearing habitat capacity (2, 7, and 18 fish/m**2 for large, medium, and small fish respectively).
4. Data maintained by USBR and USFWS project managers and will be disseminated in annual reports.

Contacts: John Hannon at the Reclamation Bay Delta Office, and Jim Early at the USFWS Red Bluff Office.

Risks

Risk	Likelihood	Impact
Permits not obtained	1	3
Channel silts in	2	2
Landowner agreements not reached	1	3

Cost Estimate

Year	Fund	Total	BOR	FWS
2018	CVPRF	$100,000	$100,000	$0
2019	CVPRF	$3,538,000	$3,538,000	$0
2020	CVPRF	$1,600,000	$1,600,000	$0
2021	CVPRF	$800,000	$800,000	$0

Total Cost: $6,038,000

Internal Agency Resources Table

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
2018								
Implementation								
Agreement	Sacramento River Forum	$100,000	1.00	0.00	$100,000	BOR	CVPRF	Add funds to existing agreement to begin work on East Sand Slough restoration. Phase I of East Sand Slough project includes Outreach, Environmental Review, Permitting, restoration concepts.
2019								
Implementation								
Agreement	Sacramento River Forum	$3,538,000	1.00	0.00	$3,538,000	BOR	CVPRF	Phase 1 of construction of side channel/floodplain habitat improvement at East Sand Slough in Red Bluff. Cost to be refined during FY18.
2020								
Implementation								
Agreement	Sacramento River Forum	$1,600,000	1.00	0.00	$1,600,000	BOR	CVPRF	Complete construction, continue monitoring. Partner participation in construction may reduce cost substantially. Cost will be refined through the design process.
2021								
Implementation								
Agreement	FA agreement with Sacramento River Forum	$800,000	1.00	0.00	$800,000	BOR	CVPRF	Finish revegetation and continue monitoring.

Sacramento River Tisdale Weir Sturgeon and Salmonid Passage

Reducing or eliminating opportunities for fish stranding in the stilling basin and Tisdale bypass.

DCN: AFRP2106
Classification: Habitat Improvement, Fish Passage
Location: Tisdale Weir, Sacramento Lower Mainstem
Funding Years: 2019 - 2021
Benefits Start Year: 2021
Priority: SIT FY2020 Tech Memo:
- All Chinook Runs: Increase access to juvenile rearing habitat in Sutter and Yolo Bypasses.
Partners: CDFW, CDWR, NMFS, USBR, USFWS
Related Programs: CDFW, NMFS-RP

Authority

Provision	Percentage
(b)(1)	100%

Metrics

Name	Value	Units	Comment
Fish stranded	0	percentage of fish blocked	Reducing adult and juvenile stranding of SCS, WCS, sturgeon and lamprey by improving access to the Sutter Bypass West Borrow Canal and to the Sacramento River.
Passage Barrier Improved	1	number of actions	
Juvenile rearing habitat created	20,000	square feet	Juvenile habitat created in Tisdale Bypass

Deliverables

Deliverables in all years of this project will be coordinated with the CVPIA Data Manager, CVPIA Science Coordinator, and CVPIA Fish Resource Area Coordinator.

Date	Title
Sep. 2023	Final Report
Sep. 2020	Feasibility Study
Sep. 2021	Designs and Permits
Sep. 2022	Implementation and Construction

Project Management Team

Cesar Blanco, USFWS-CVPIA
Jim Early – USFWS-RBFO
Derek Rupert – USBR-NCAO

Narrative

This project was previously approved in the FY19 Annual Work Plan Charter to address adult stranding in the stilling basin immediately below the weir on the downstream side through fish passage and juvenile stranding and floodplain enhancement in the bypass.

The Tisdale Weir was identified as a FY18 priority for fall and spring Chinook salmon. Improving fish passage at Tisdale Weir would also improve the viability of the green sturgeon population. An FY18 priority is to 'Adaptively manage reduction/improvement predator contact points,' such as stranding in bypasses. Fall Chinook salmon are a positive SIT/PWT integrated priority through Multi-taxa benefit, Benefits T and E species and Contributes to model/information gaps as identified in table 14 of the SIT Tech memo for FY18.

The Tisdale Weir Multi-Benefit Flood Project has two elements; Element 1 addresses adult fish passage and Element 2 addresses juvenile fish stranding and habitat enhancement and connectivity. Element 1 has been moving forward and this proposal seeks to provide funding for Element 2, so that both elements are working together to accomplish the overall project objectives.

Isolated pools occur in the Tisdale Bypass for a period of time after flows recede. Stranding potential is the greatest between Tisdale Weir and the Reclamation Road Bridge. The Tisdale Bypass between the Reclamation Road Bridge and the Sutter Bypass has a low-flow channel on each side of the Bypass that connects to the West Borrow Canal of the Sutter Bypass. However, the potential stranding areas closest to the weir are not connected to these low-flow channels. Element 2 seeks connectivity from pools to channels.

Reducing or eliminating opportunities for fish to be stranded in the stilling basin and throughout the bypass would reduce the potential for take of protected species including winter-run Chinook. Green sturgeon will benefit by FY18 and FY20 SIT priority 'Reducing illegal harvest (poaching) of adults,' by eliminating stranding sites below the weir. Green sturgeon also have a positive SIT/PWT integrated priority of Progress towards numeric goals and Benefit of T and E species.

The project addresses AFRP Final Restoration Plan E15 for Butte Creek, 'Evaluate juvenile and adult Chinook salmon stranding in Sutter Bypass and behind Tisdale, Moulton, and Colusa weirs during periods of receding flows on the upper mainstem Sacramento River. p65' The project also supports NMFS's 2014 recovery plan for Central Valley salmonids, specifically Recovery Action SAR-1.12, 'In an adaptive management context, implement short- and long-term solutions to minimize the loss of adult Chinook salmon and steelhead in the Yolo bypass, and Colusa and Sutter-Butte basins p158.'

Data Management

The PMT Data Steward will coordinate with external partners and biannually with the CVPIA Data Manager on the transmission of long-term monitoring and other pertinent data defined by the SIT and the PMT per the 2020 Data Guidance.

Field data will be recorded on data sheets or directly into a recording device/computer and transferred into a computer spreadsheet or database. The PMT Data Steward will coordinate with the CVPIA Data Manager on the transmission of relevant and pertinent data defined by the SIT and the PMT per the 2020 Data Guidance. Field data, analyses, and reports will be stored and backed up on a PMT computer/server.

Field data such as fish passage or count data, and data used for habitat assessment or hydrologic modeling will be recorded on data sheets or directly to a laptop computer, and later transcribed into a computer database or spreadsheet program. These data as well as model runs, project designs, permits, and reports will be stored on a computer hard drive and backed up on an agency or consulting firm server. Copies will be made available to CVPIA.

Risks

Risk	Likelihood	Impact
This project has a high likelihood of successful implementation (overall low risk) because it is supported by CDFW. The project does have a high cost, necessitating phased implementation.	1	1

Cost Estimate

Year	Fund	Total	BOR	FWS	DWR	DFW
2019	CVPRF	$1,510,000	$0	$1,510,000	$0	$0
2019	SIK	$2,140,000	$0	$0	$2,100,000	$40,000
2020[20]	CVPRF	$0	$0	$0	$0	$0
2020	SIK	$5,000,000	$0	$0	$5,000,000	$0
2021	CVPRF	$1,800,000	$0	$1,800,000	$0	$0

Total Cost: $10,450,000

[20] The FY2019 funding amount of $1,510,000 included $1,060,000, which was the FY2020 allocated funding for this project.

Internal Agency Resources Table

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
2019								
Implementation								
In-Kind Labor	Operations and Maintenance of Tisdale Weir	$100,000	1.00	0.00	$100,000	DWR	SIK	Grading as part of O&M to benefit final construction of improved site.
Monitoring								
In-Kind Labor	Monitoring and fish rescues	$40,000	1.00	0.00	$40,000	DFW	SIK	CDFW contributed $20K to date and will continue to contribute monitoring of fish presence and stranding at the site.
Planning and Analysis								
Agreement	Planning and determining design needs	$450,000	1.00	0.00	$450,000	FWS	CVPRF	Needed to compile all information and determine design and phasing needs/requirements.
Agreement	Planning and determining design needs	$2,000,000	1.00	0.00	$2,000,000	DWR	SIK	Prop 1 funds in hand for addressing rehabilitation of weir infrastructure
Design								
Agreement	Design contract	$265,000	1.00	0.00	$265,000	FWS	CVPRF	
Environmental Compliance and Permitting								
Agreement	Environmental Compliance Documents and Permit Contracts	$795,000	1.00	0.00	$795,000	FWS	CVPRF	

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
2020								
Environmental Compliance and Permitting								
Agreement	Planning and determining design needs	$5,000,000	1.00	0.00	$5,000,000	DWR	SIK	Prop 1 funds in hand for addressing rehabilitation of weir infrastructure
2021								
Construction								
Agreement	Construction contract	$1,800,000	1.00	0.00	$1,800,000	FWS	CVPRF	

Sacramento River - Improve Spawning Habitat above Temperature Control Points

Includes Gravel Injection at Keswick Dam and instream gravel placement at downstream locations to the temperature control point.

DCN:	AFRP2114
Classification:	Habitat Improvement
Location:	Sacramento River Keswick to Clear Creek, Sacramento Upper Mainstem
Funding Years:	2018 - 2021
Benefits Start Year:	2019
Priority:	SIT FY2018 Tech Memo: - Winter Chinook – Upper Sacramento River above temperature control points, increase spawning habitat
Partners:	Western Shasta Resource Conservation District, ACID, Glenn Colusa Irrigation District, Sacramento River Forum

Authority

Provision	Percentage
(b)(13)	100%

Metrics

Name	Value	Units	Comment
Gravel injected or placed	20000	cubic yards	Volume can be adjusted to meet what the core team feels is reasonable. Injection is about $37/cubic yard (@1.5 ton/yard), and placement is around $42/cubic yard. Includes purchase, placement, and oversight.
Spawning Distribution	100	percentage of fish	Percent of fish spawning upstream of temperature compliance point
Survival	30	percentage of fish	Survival from egg to juvenile passage at Red Bluff

Deliverables

Deliverables in all years of this project will be coordinated with the CVPIA Data Manager, CVPIA Science Coordinator, and CVPIA Fish Resource Area Coordinator.

Date	Title
Sep. 2018	Injected and placed gravel
Sep. 2019	Injected and placed gravel
Sep. 2020	Injected and placed gravel
Sep. 2021	Injected and placed gravel

Project Management Team

John Hannon (USBR)
Jim Early (USFWS-Red Bluff)
Paul Zedonis (USBR-NCAO)
Mike Berry (DWR)
Ruth Goodfield (NMFS)

Narrative

1. The project includes Gravel Injection at Keswick Dam and instream gravel placement at downstream locations to the temperature control point. The primary downstream sites are Market Street adjacent to the ACID water intake facility, the Redding Riffle area near the Sundial Bridge, and the South Cypress riffle. Market Street placement will help replenish gravel between that point and Turtle Bay area. South Cypress placement will help replenish the area on down to the general downstream area of winter Chinook spawning and the temperature compliance point.
2. Core team priority = increase spawning habitat in the Sacramento River above temperature control points.
3. Keswick Dam site includes injection via end dumping gravel off the side of the Keswick office parking lot. Expected quantity = 15,000 tons.
4. Market Street site is an in-river gravel placement on the south side of the river downstream of the ACID dam. Expected quantity = 15,000 tons.
5. Redding Riffle site is an in-river gravel placement on the south side of the river upstream of the Sundial Bridge. Expected quantity = 10,000 tons.
6. South Cypress is and in-river gravel placement south of the Cypress Avenue Bridge. Expected quantity = 20,000 tons.
7. Requested funding could implement at three of these sites. This project has a flexible funding amount depending on the desire of the core team. Higher funding = more gravel, lower funding = less gravel, no funding = no gravel.
8. Addresses maintaining or increasing egg to fry survival by providing habitat in the reach of the river with the coolest water during winter-run spawning.
9. The predicted outcome of maintaining spawning habitat in areas nearest Keswick Dam is maintained or improved egg to fry survival for winter Chinook at a given temperature regime, particularly in the dryer years with insufficient cold water pool storage, in comparison with letting the habitat degrade. Effects of the high flows in 2017 on habitat are yet to be fully assessed, but the injection site at Keswick Dam is devoid of gravel as of summer 2017. Permits are largely in place, so most of the cost goes directly to gravel placed into the river and the oversight of that activity.
10. Gravel placement is cost-effective as minimal design is required, so most of cost goes into implementation. Permits are mostly in place. Will be additionally evaluating bringing the gravel removed from the dual purpose canal adjacent to RBDD.
11. Contributes to the fundamental objective of providing spawning habitat in up-river areas and fits in conjunction with projects focusing on juvenile rearing habitat.
12. Focused on implementation.
13. Stakeholders feel that this activity needs to be implemented each year. The need likely varies by year with varying annual hydrology. It's useful to maintain a stockpile at the Keswick injection

site so that when mobilization flows occur the material is there to replace the coarse material blocked by the dam. Reclamation is contributing a gravel budget study starting in FY18 through the Re-initiation of Consultation on Long-Term Water Operations.

14. No known stakeholder objections. Site-specific issues are addressed in the collaboration that goes into implementation.

Data Management

The PMT Data Steward will coordinate with external partners and biannually with the CVPIA Data Manager on the transmission of long-term monitoring and other pertinent data defined by the SIT and the PMT per the 2020 Data Guidance.

Field data will be recorded on data sheets or directly into a recording device/computer and transferred into a computer spreadsheet or database. The PMT Data Steward will coordinate with the CVPIA Data Manager on the transmission of relevant and pertinent data defined by the SIT and the PMT per the 2020 Data Guidance. Field data, analyses, and reports will be stored and backed up on a PMT computer/server.

1. In-river placement documented via aerial photography. Spawning distribution is monitored via roughly weekly aerial redd surveys during winter-run spawning (May through August) and less frequent surveys the rest of the year for the other runs. Underwater videography or acoustics will attempt to document spawning in deep water areas of the canyon reach. Gravel movement monitored via aerial photography after gravel mobilizing flow events.
2. Data management center yet to come.
3. Performance metrics = % of population spawning upstream of temperature compliance point and % of population estimated to be using placed gravel. Annual egg to Red Bluff survival is estimated by carcass surveys, hatchery fecundity data, and Red Bluff screw trap passage estimates.
4. Data maintained by USBR and USFWS project managers and will be disseminated in annual reports.

Risks

Risk	Likelihood	Impact
Permits not obtained	1	3
Truck falls into river; parking lot falls into river	1	3
Damage to ACID facilities	1	3

Cost Estimate

Year	Fund	Total	BOR	FWS
2018	CVPRF	$800,000	$800,000	$0
2019	CVPRF	$0[21]	$0	$0
2020	CVPRF	$1,600,000	$1,600,000	$0
2021	CVPRF	$800,000	$800,000	$0

Total Cost: $3,200,000

[21] FY2019 AWP allocation of $800,000 was unable to be obligated in FY2019 so funding was shifted to FY2020

Internal Agency Resources Table

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
2018								
Implementation								
Agreement	Financial Assistance Agreement with Western Shasta RCD (WSRCD) or similar	$800,000	1.00	0.00	$800,000	BOR	CVPRF	The RCD or similar entity can act quickly to purchase gravel and get it placed in cooperation with Reclamation and other agencies.
2019								
Implementation								
Agreement	Financial Assistance Agreement with WSRCD or similar entity	$0	1.00	0.00	$0	BOR	CVPRF	Gravel purchase, delivery, placement, and oversight. Completed project. Unable to obligate $800,000 in FY2019; Shifted to FY2020.
2020								
Implementation								
Agreement	FA agreement with WSRCD or similar entity	$1,600,000	1.00	0.00	$1,600,000	BOR	CVPRF	Gravel purchase, delivery, placement, and oversight. Completed project.
2021								
Implementation								
Agreement	FA agreement with WSRCD or similar entity	$800,000	1.00	0.00	$800,000	BOR	CVPRF	Gravel purchase, delivery, placement, and oversight. Completed project.

Sacramento River Salmonid Habitat Restoration

Implements a series of salmonid habitat improvement projects in the reach from Keswick Dam to Red Bluff area.

DCN:	AFRP2115
Classification:	Habitat Improvement, Habitat Restoration
Location:	Sac River Redding to Red Bluff, Sacramento Upper Mainstem
Funding Years:	2015 - 2020
Benefits Start Year:	2016
Priority:	SIT FY2018 Tech Memo: - Fall Chinook – Sacramento Mainstem below Bend Bridge, Improve/increase juvenile chinook rearing habitat - Winter Chinook – Upper Sacramento River above temperature control points, increase spawning habitat
Partners:	City of Anderson, CA, City of Redding, FWS, Glenn Colusa Irrigation District, Golden Gate Salmon Association, National Fish, and Wildlife Foundation, NMFS, Sacramento River Forum, Tehama County RCD, USACE, Western Shasta Resource Conservation District, CDFW, CDWR
Related Programs:	CDWR, NMFS, CDFW

Authority

Provision	Percentage
(b)(13)	100%

Metrics

Name	Value	Units	Comment
Rancho Breisgau Fish Production	30000	number of fish	Assumes approximately half of habitat is good rearing habitat and 2 large juveniles can be produced per square meter of suitable habitat (SIT value). COMPLETED 2018
Anderson River Park fish production	24000	number of fish	Assumes approximately half of habitat is good rearing habitat and 2 large juveniles can be produced per square meter of suitable habitat (SIT value) COMPLETED 2019
Shea Side Channels fish produced	10000	number of fish	Based on 2,000 square meters of spawning habitat prevented from dewatering and 10% survival to juveniles of these fish at this side channel location where stranding has been reduced and habitat improved.
Rancho Breisgau Juvenile Habitat	8	acres	Newly opened channel is 8,900 feet long by 40 feet wide. COMPLETED 2018
Anderson River Park Juvenile Habitat	6	acres	Approximately 8,000 linear feet of new side channel/floodplain habitat with an average width of 30 feet. COMPLETED 2019

Name	Value	Units	Comment
Shea Side Channels area improved	0	acres	Area of juvenile rearing habitat made perennially available.

Deliverables

Deliverables in all years of this project will be coordinated with the CVPIA Data Manager, CVPIA Science Coordinator, and CVPIA Fish Resource Area Coordinator.

Date	Title
Nov. 2015	NEPA document done
Dec. 2015	First-year project site completed
Sep. 2016	Second-year project site completed
May. 2017	North Tobiasson Rearing structures completed
Jan. 2018	Lake California side channel completed
Apr. 2018	Kapusta 1A side channel completed
Nov. 2019	Rio Vista side channel completed
Dec. 2019	Reading Island Side Channel phase II completed
Dec. 2020	Anderson River Park channels completed
Dec. 2020	South Cypress Side Channels completed
Dec. 2020	Shea Island Side Channel work completed
Dec. 2022	Rancho Breisgau side channel completed
Mar. 2021	East Sand Slough side channel completed

Project Management Team

John Hannon (USBR-BDO)
Jim Earley (USFWS – Red Bluff)
Mike Berry (DWR)
Ruth Goodfield (NMFS)
Paul Zedonis (USBR-NCAO)

Narrative

1. Implements the annual salmonid spawning and rearing habitat restoration projects on the Sacramento River in the reach from Keswick Dam to the Red Bluff area. Activities include side channel creation and enhancement, gravel placement, floodplain enhancement, woody material and boulder additions, and effectiveness monitoring. Monitoring includes river wide monitoring and site-specific monitoring before, during, and after implementation at treatment and control sites.
2. Addresses the core team priority of increasing juvenile salmonid rearing habitat in the Sacramento River. Benefits all four Chinook runs and CV steelhead.
3. Project sites are Anderson River Park side channels and floodplain (partial funding already in place), Shea Island/Levee (= the seasonally disconnected side channels north of Clear Creek), Rancho Breisgau (= disconnected side channel at mouth of Battle Creek). The programmatic permitting for Sacramento River sites allows flexibility in implementation such that if a project falls through another with the same goals can quickly be put in its place...this was the case with

Anderson River Park where South Cypress side channels and Tobiasson Rearing Structures became time-sensitive projects, so they moved in front of Anderson in priority. Funding can be flexible - reduced funding can still implement projects but fewer and/or smaller. The rearing habitat focus began in 2014 with the first rearing habitat focused project implementation in 2016 (Kapusta 1A and North Cypress). Approximately 17 project sites are identified between Keswick and Red Bluff and expected to continue implementation through 2022. Programmatic permitting is in place.

4. Supports CVPIA progress towards doubling goals for all four runs of Chinook salmon and CV steelhead in the Sacramento River and valley wide by increasing abundance and size of juveniles emigrating from the upper Sacramento River so that fish will survive at higher rates through the lower river.
5. We predict that juvenile salmonids will utilize the projects for rearing in higher densities than under existing conditions and achieve growth rates supportive of survival down the river resulting in greater productivity of the upper Sacramento River. The monitoring plan includes determining fish abundance and size and project sites and control sites and attempting to determine growth rates through a controlled growth study.
6. Each project sites includes partnerships with irrigation districts (GCID, ACID, River Garden Farms, and RD 108) and private landowners. Cooperation of private landowners is key (each site averages three different landowners) and has increased as projects have been implemented and received favorable responses from the community. Permitting is largely in place for all sites with only the final site-specific details yet to be coordinated. The funding goes to design, implementation, oversight, and effectiveness monitoring.
7. Provides juvenile rearing habitat in close proximity to spawning habitat so that fry have habitats where they can feed and grow prior to emigrating through areas of lower water quality, higher predator densities, and varied habitat suitability.
8. Ongoing interagency partnerships with irrigation districts and landowners could be jeopardized if the work is not implemented. The Northern California Water Agency has included these project sites on their Sacramento Valley Salmon Recovery Program. The irrigation districts (GCID, River Garden Farms) provide construction labor and equipment (~4 months for seven people with equipment plus per diem provided in 2016-17).
9. No stakeholder objections identified. Site-specific concerns are addressed through collaboration with the local stakeholders.

Data Management

The PMT Data Steward will coordinate with external partners and biannually with the CVPIA Data Manager on the transmission of long-term monitoring and other pertinent data defined by the SIT and the PMT per the 2020 Data Guidance.

Field data will be recorded on data sheets or directly into a recording device/computer and transferred into a computer spreadsheet or database. The PMT Data Steward will coordinate with the CVPIA Data Manager on the transmission of relevant and pertinent data defined by the SIT and the PMT per the 2020 Data Guidance. Field data, analyses, and reports will be stored and backed up on a PMT computer/server.

1. Contract with DWR for design includes documentation of as-built conditions through survey or other means.

2. Financial assistance agreement with CDFW for fisheries monitoring includes surveys of juvenile abundance and size at project sites and control sites before and after implementation. Chico State is leading a study of juvenile growth at treatment and control sites. The monitoring plan is available.
3. Long-term trend monitoring is via the rotary screw traps at Red Bluff and the adult escapement surveys. The scale of projects is such that detecting population change attributable to projects will be difficult.
4. Center for data management yet to come.
5. Performance metrics are from the SDM fall-run model assumptions for juvenile rearing habitat capacity (2, 7, and 18 fish/m^2 for large, medium, and small fish respectively).
6. Data maintained by USBR and USFWS project managers and will be disseminated in annual reports.

Risks

Risk	Likelihood	Impact
Flows and fish and wildlife timing windows do not allow for instream work to occur.	2	2
Complex permitting processes add time and cost.	2	2
Landowner agreements not reached	1	3

Cost Estimate

Year	Fund	Total	BOR	FWS
2015	CVPRF	$1,600,000	$1,600,000	$0
2016	CVPRF	$600,000	$600,000	$0
2017	CVPRF	$956,000	$956,000	$0
2018	CVPRF	$1,800,000	$1,800,000	$0
2019	CVPRF	$0[22]	$0	$0
2020	CVPRF	$4,000,000	$4,000,000	$0

Total Cost: $8,956,000

[22] FY2019 AWP allocation of $2,00,000 was unable to be obligated in time so funding was shifted to FY2020

Internal Agency Resources Table

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
2015								
Implementation								
Labor	Western Shasta Resource Conservation District	$1,600,000	1.00	0.00	$1,600,000	BOR	CVPRF	Implements an in-river project including side channel habitat and gravel.
2016								
Implementation								
Labor	Western Shasta Resource Conservation District	$600,000	1.00	0.00	$600,000	BOR	CVPRF	Implements an in-river project including side channel habitat and gravel.
2017								
Implementation								
Agreement	Western Shasta RCD	$956,000	1.00	0.00	$956,000	BOR	CVPRF	Implement annual salmonid spawning and rearing habitat improvement project to include design, env. compliance and permitting and pre- and post-project monitoring to determine effectiveness.
2018								
Implementation								
Agreement	Western Shasta RCD or other	$850,000	1.00	0.00	$850,000	BOR	CVPRF	Implements high priority Spawning and Rearing Habitat Enhancement Projects in the Shasta County area of the Sacramento River.
Agreement	Pacific States Marine Fisheries Commission	$300,000	1.00	0.00	$300,000	BOR	CVPRF	Financial assistance agreement for monitoring effectiveness of projects.

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
Agreement	Sacramento River Forum	$650,000	1.00	0.00	$650,000	BOR	CVPRF	Implements high priority side channel restoration project at Rancho Breisgau.
2019								
Implementation								
Agreement	Western Shasta Resource Conservation District and/or Sac River Forum	$0	1.00	0.00	$0	BOR	CVPRF	Financial Assistance Agreements for continuation of the projects. Unable to obligate $2M in FY2019. Shifted to FY2020.
2020								
Implementation								
Agreement	FA with WSRCD and/or Sac River Forum and others	$4,000,000	1.00	0.00	$4,000,000	BOR	CVPRF	Financial Assistance Agreements for project implementation. Includes permitting, survey, design, construction, and monitoring. Includes $2.0M from FY2019.

Stanislaus River: Migratory Corridor Restoration

A collaborative habitat restoration effort focused on shallow-water rearing and migratory habitats benefitting juvenile salmonids in the Stanislaus River corridor.

DCN:	AFRP2120
Classification:	Habitat Improvement, Habitat Restoration
Location:	Lower Stanislaus River, Stanislaus River
Funding Years:	2017 - 2020
Benefits Start Year:	2023
Priority:	SIT FY2020 Tech Memo This project works in close coordination with the (b)(13) provision, and other partners working further upstream on the Stanislaus River, to expand high quality migratory habitat downstream of Riverbank, and protect and enhance the natural production of salmonids in the system.
Partners:	Cramer Fish Sciences, USBR-BDO (Hannon)
Related Programs:	CVPIA (b)(1), CVPIA (b)(13), NMFS-RP, NMFS-RPAs

Authority

Provision	Percentage
(b)(13)	100%

Metrics

Name	Value	Units	Comment
Habitat Restored - Type	0	acres	
Habitat Restored - Type 2	0	acres	
Habitat Restored - Type 3	0	miles	
Habitat Action - Type 1	1	# actions	

Deliverables

Deliverables in all years of this project will be coordinated with the CVPIA Data Manager, CVPIA Science Coordinator, and CVPIA Fish Resource Area Coordinator.

Date	Title
Sep. 2020	Report - Conceptual Design Analysis
Jun. 2021	Report - Final Design
Jun. 2021	Final Report - Permitting
Dec. 2023	Final Project Report

Project Management Team

J.D. Wikert – USFWS
John Hannon – USBR-BDO

Narrative

This project is ongoing from FY2019. Additional funds cover monitoring, reporting, and outreach.

Previous Narrative:

1. Restore shallow water migratory habitat for juvenile salmonids on the Stanislaus River downstream of Riverbank. Potential sites have been identified, and landowners will be contacted to determine interest prior to developing conceptual designs. Future phases will implement restoration projects.
2. Project supports the SIT/Core Team priority: 'Stanislaus River, Improve/increase juvenile rearing habitat (floodplain)'.
3. Projects will provide crucial rearing habitat for out-migrating juvenile salmonids before they enter the San Joaquin River and Delta by developing restoration designs in collaboration with willing landowners, followed by construction of suitable projects.
4. The project addresses the Stanislaus River and CV wide doubling goals.
5. A single acre (a reasonably predictable project size) will provide habitat for up to 75000 juvenile Chinook Salmon (0.054 square meter/fry), as well as benefitting migrating steelhead. The implemented project will also provide possible refuge from predators for all juveniles migrating downstream.
6. One of the biggest challenges to implementing on-the-ground restoration is having willing (and enthusiastic) landowners. This process will identify those landowners that also have suitable property (minimum cut depth to achieve seasonally inundated habitat).
1. Working on multiple conceptual designs simultaneously will provide a reduction in overhead as permitting will be similar for multiple projects allowing for a more efficient regulatory process. Also, bang-for-the-buck will be determined by assessing multiple metrics for project designs (fish habitat/cut volume, tree impacts, etc.). Substantial on-the-ground implementation will occur in future phases.
7. The project supports the means objective of increasing the number of smolts produced, through enhancing growth opportunities and providing refuge from predators for migrating juveniles.
8. The project will benefit from some post-project monitoring designed to evaluate the differences between off-channel habitats restored in low gradient (sand bedded) versus higher gradient (gravel bedded) reaches, informing future decisions on locations for restoration.
9. Not continuing to implement the charter will result in continuing the long-term decline of salmonid production in the basin.
10. There are no known stakeholder objections to the charter. The project specifically calls for willing landowners, reducing the likelihood of project failure.

Data Management

The PMT Data Steward will coordinate with external partners and biannually with the CVPIA Data Manager on the transmission of long-term monitoring and other pertinent data defined by the SIT and the PMT per the 2020 Data Guidance.

Field data will be recorded on data sheets or directly into a recording device/computer and transferred into a computer spreadsheet or database. The PMT Data Steward will coordinate with the CVPIA Data Manager on the transmission of relevant and pertinent data defined by the SIT and

the PMT per the 2020 Data Guidance. Field data, analyses, and reports will be stored and backed up on a PMT computer/server.

1. Data will initially reside with the grantee and will include conceptual and engineered designs, hydraulic models, topographic data, and biological survey data. Data will be in appropriate formats (e.g. Excel, GIS).
2. Data collection will follow standardized protocols (including those developed by CAMP) as appropriate. Data will be shared CVPIA and with the Center for Data Management when appropriate. Data will be available after appropriate QA/QC and will not contain any PII from the landowners without their consent.
3. Monitoring will depend on implementation of individual projects and will be coordinated with the SIT.
4. The PMT Data Steward will coordinate with external partners and biannually with the CVPIA Data Manager on the transmission of long-term monitoring and other pertinent data defined by the SIT and the PMT per the 2020 Data Guidance.

Field data will be recorded on data sheets or directly into a recording device/computer and transferred into a computer spreadsheet or database. The PMT Data Steward will coordinate with the CVPIA Data Manager on the transmission of relevant and pertinent data defined by the SIT and the PMT per the 2020 Data Guidance. Field data, analyses, and reports will be stored and backed up on a PMT computer/server.

Risks

Risk	Likelihood	Impact
Landowner permission/access	1	2

Cost Estimate

Year	Fund	Total	BOR	FWS
2017	CVPRF	$445,200	$0	$445,200
2018	CVPRF	$842,700	$0	$842,700
2019	CVPRF	$408,100	$0	$408,100
2020	CVPRF	$159,000	$0	$159,000

Total Cost: $1,855,000

Internal Agency Resources Table

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
2017								
Design								
Agreement	new FWS financial assistance agreement, if funded	$100,000	1.00	0.06	$106,000	FWS	CVPRF	A grant or cooperative agreement will be completed with a qualified entity to design juvenile salmonid habitat improvements at priority sites with willing landowners in the lower Stanislaus River (downstream of Riverbank).
Environmental Compliance and Permitting								
Agreement	new FWS financial assistance agreement, if funded	$100,000	1.00	0.06	$106,000	FWS	CVPRF	A grant or cooperative agreement will be completed with a qualified entity to complete necessary environmental compliance and permitting documents related to juvenile salmonid habitat improvements in the lower Stanislaus River (downstream of Riverbank).
Inventory/ Reconnaissance								
Agreement	new FWS financial assistance agreement, if funded	$100,000	1.00	0.06	$106,000	FWS	CVPRF	A grant or cooperative agreement will be completed with a qualified entity to complete pre-project surveys related to juvenile salmonid habitat improvements in the lower Stanislaus River (downstream of Riverbank).
Management								
Agreement	new FWS financial assistance agreement, if funded	$20,000	1.00	0.06	$21,200	FWS	CVPRF	A grant or cooperative agreement will be completed with a qualified entity to identify willing landowners at priority sites, design and implement juvenile salmonid habitat improvements in the lower Stanislaus River (downstream of Riverbank).

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
Outreach								
Agreement	new FWS financial assistance agreement, if funded	$100,000	1.00	0.06	$106,000	FWS	CVPRF	A grant or cooperative agreement will be completed with a qualified entity to perform local outreach and education related to juvenile salmonid habitat improvements in the lower Stanislaus River (downstream of Riverbank).
2018								
Construction								
Agreement	new FWS financial assistance agreement, if funded	$475,000	1.00	0.06	$503,500	FWS	CVPRF	A grant or cooperative agreement will be completed with a qualified entity to implement juvenile salmonid habitat improvements in the lower Stanislaus River (downstream of Riverbank).
Design								
Agreement	new FWS financial assistance agreement	$150,000	1.00	0.06	$159,000	FWS	CVPRF	NA
Environmental Compliance and Permitting								
Agreement	new FWS financial assistance agreement	$150,000	1.00	0.06	$159,000	FWS	CVPRF	NA
Management								
Agreement	new FWS financial assistance agreement, if funded	$20,000	1.00	0.06	$21,200	FWS	CVPRF	A grant or cooperative agreement will be completed with a qualified entity to identify willing landowners at priority sites, design and implement juvenile salmonid habitat improvements in the lower Stanislaus River (downstream of Riverbank).
2019								
Construction								
Agreement	new FWS financial assistance agreement	$275,000	1.00	0.06	$291,500	FWS	CVPRF	NA

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
Management								
Agreement	new FWS financial assistance agreement, if funded	$10,000	1.00	0.06	$10,600	FWS	CVPRF	A grant or cooperative agreement will be completed with a qualified entity to identify willing landowners at priority sites, design and implement juvenile salmonid habitat improvements in the lower Stanislaus River (downstream of Riverbank).
Monitoring								
Agreement	new FWS financial assistance agreement, if funded	$100,000	1.00	0.06	$106,000	FWS	CVPRF	A grant or cooperative agreement will be completed with a qualified entity to monitor and assess effectiveness of recently implemented juvenile salmonid habitat improvements in the lower Stanislaus River (downstream of Riverbank).
2020								
Monitoring								
Agreement	Labor	$100,000	1.00	0.06	$106,000	FWS	CVPRF	Project associated monitoring
Outreach								
Agreement	Labor	$10,000	1.00	0.06	$10,600	FWS	CVPRF	Outreach to local community and landowners
Reporting								
Agreement	Labor	$40,000	1.00	0.06	$42,400	FWS	CVPRF	Project Reports

Stanislaus River Rotary Screw Trap Monitoring

Annual quantification of juvenile Chinook salmon production and the abundance of juvenile steelhead in the American River & Stanislaus River using rotary screw traps.

DCN:	AFRP2131
Classification:	Performance Monitoring, Performance Monitoring
Location:	Stanislaus River
Funding Years:	2017 - 2021
Benefits Start Year:	2017
Priority:	SIT Critical Monitoring Need - Monitoring of juvenile salmon production on the Stanislaus River provides fundamental data that are necessary to assess the biological response to habitat restoration activities in that CVP watershed.
Partners:	CDFW, Pacific States Marine Fisheries Commission
Related Programs:	Structured Decision Making

Authority

Provision	Percentage
(b)(15) CAMP	100%

Metrics

Name	Value	Units	Comment
count of fish produced	0	number of fish	The production or abundance of different life stages of juvenile salmon and steelhead are calculated on an annual basis based on monitoring data that are collected with rotary screw traps.

Deliverables

Deliverables in all years of this project will be coordinated with the CVPIA Data Manager, CVPIA Science Coordinator, and CVPIA Fish Resource Area Coordinator.

Date	Title
Annually	Annual Stanislaus River rotary screw trap report

Project Management Team

Cesar Blanco – USFWS-CVPIA

Narrative

The rotary screw trap monitoring activities in the Stanislaus River supply data that can be used to assess the biological response to habitat management activities in those watersheds. As such, they can be used to infer, at a watershed-level scale, how habitat restoration activities are affecting the number of juvenile Chinook salmon and steelhead in that river.

Data Management

The PMT Data Steward will coordinate with external partners and biannually with the CVPIA Data Manager on the transmission of long-term monitoring and other pertinent data defined by the SIT and the PMT per the 2020 Data Guidance.

Field data will be recorded on data sheets or directly into a recording device/computer and transferred into a computer spreadsheet or database. The PMT Data Steward will coordinate with the CVPIA Data Manager on the transmission of relevant and pertinent data defined by the SIT and the PMT per the 2020 Data Guidance. Field data, analyses, and reports will be stored and backed up on a PMT computer/server.

Risks

Risk	Likelihood	Impact
Low, unless funding distribution is delayed	1	2

Cost Estimate

Year	Fund	Total	BOR	FWS
2017	CVPRF	$223,050	$0	$223,050
2018	CVPRF	$221,300	$0	$221,300
2019	CVPRF	$231,200	$0	$231,200
2020	CVPRF	$225,000	$0	$225,000
2021	CVPRF	$231,750	$0	$231,750

Total Cost: $1,132,300

Internal Agency Resources Table

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
2017								
Monitoring								
Agreement	TBD	$223,050	1.00	0.00	$223,050	FWS	CVPRF	NA
2018								
Monitoring								
Agreement	TBD	$221,300	1.00	0.00	$221,300	FWS	CVPRF	NA
2019								
Monitoring								
Agreement	TBD	$231,200	1.00	0.00	$231,200	FWS	CVPRF	NA
2020								
Monitoring								
Agreement	F13AC00053	$225,000	1.00	0.00	$225,000	FWS	CVPRF	Project cost includes the 6% contract overhead cost.
2021								
Monitoring								
Agreement	F13AC00053	$231,750	1.00	0.00	$231,750	FWS	CVPRF	The 2021 project cost uses the prior year cost estimate (and therefore includes the 6% contract overhead cost) and includes a 3% inflation cost.

Sutter Bypass Weir 1 Restoration

Rehabilitation of weir structure and fish ladder at Weir 1, Sutter Bypass-West Borrow

DCN:	AFRP2107
Classification:	Habitat Improvement, Fish Passage
Location:	Butte Creek / Sutter Bypass WBC Weir 1, Butte Creek
Funding Years:	2017 - 2021
Benefits Start Year:	2021
Priority:	SIT FY2020 Tech Memo: - Increase access to juvenile rearing habitat in Sutter and Yolo Bypasses
Partners:	CDFW, DWR, FWS, NMFS
Related Programs:	NMFS-RPAs

Authority

Provision	Percentage
(b)(1)	100%

Metrics

Name	Value	Units	Comment
Habitat	90	miles	Access to 90 miles of holding and spawning habitat will be restored.

Deliverables

Deliverables in all years of this project will be coordinated with the CVPIA Data Manager, CVPIA Science Coordinator, and CVPIA Fish Resource Area Coordinator.

Date	Title
Sep. 2021	Environmental Permitting
Sep. 2023	Final Report
Sep. 2022	Construction

Project Management Team

Jim Early – USFWS-RBFO
Cesar Blanco – USFWS-CVPIA
Derek Rupert – USBR-NCAO

Narrative

This downstream-most weir in the Suter Bypass blocks Spring-run Chinook adults from 90 miles of holding and spawning habitat. This project was previously approved in the FY17 and 2018 Annual Work Plans based on the priorities described below. The SIT prioritized improving adult & juvenile

passage on Butte Creek and identified it as a high priority for FY2018. The project was also funded for planning and analysis in FY19. The project is currently undergoing regional and national approval and bidding process for hydraulic evaluation under Phase 1.

The project addresses AFRP Final Restoration Plan and CPAR actions:
E4) evaluate operational alternatives and establish operational criteria for Sutter Bypass Weir#1 p63, E9) evaluate alternatives to help fish passage, including the installation of a high water volume fish ladder on Sutter Bypass Weir #1 p64 and E15) Evaluate juvenile and adult Chinook salmon stranding in Sutter Bypass and behind Tisdale, Moulton, and Colusa weirs during periods of receding flows on the upper mainstem Sacramento River p65.

Butte Creek is one of the most productive streams in the Sacramento River Valley for federal and state listed spring-run Chinook salmon (SRCS). SRCS migrate through the Sutter Bypass to Butte Creek, navigating past several water control structures on their way to spawning areas in the Upper Butte Creek system. Months later, the juvenile salmon reverse this route on their way to the Pacific Ocean. The migration of anadromous fish, which includes (fall and spring) Chinook salmon and Central Valley steelhead, is impeded by the last remaining historic weir and ladder structure at Weir 1 in the Sutter Bypass. There is also potential for out-migrating juveniles to be impacted by contact and turbulence created by the defunct infrastructure that remains instream. Conceptually, it can be replaced by a natural fishway or channel.

Explanation of fish population metrics:
Spring-run Chinook salmon: Improvements to the weir can prevent delays in migration and reduce mortalities of adult spring-run Chinook salmon specific to low flow and water temperatures when delayed.

This project was funded in FY17 for $318,000 for a feasibility study.
This project was approved in FY19 for $350,000 for planning, design and analysis.

Data Management

The PMT Data Steward will coordinate with external partners and biannually with the CVPIA Data Manager on the transmission of long-term monitoring and other pertinent data defined by the SIT and the PMT per the 2020 Data Guidance.

Field data will be recorded on data sheets or directly into a recording device/computer and transferred into a computer spreadsheet or database. The PMT Data Steward will coordinate with the CVPIA Data Manager on the transmission of relevant and pertinent data defined by the SIT and the PMT per the 2020 Data Guidance. Field data, analyses, and reports will be stored and backed up on a PMT computer/server.

Short term objectives will monitor reduction in passage delays and upstream timing and distribution. Rotary screw traps and escapement surveys will measure overall population trends and long-term objectives.

Risks

Risk	Likelihood	Impact
restore fish passage	1	1

Cost Estimate

Year	Fund	Total	BOR	FWS
2017	CVPRF	$318,000	$0	$318,000
2018	CVPRF	$0	$0	$0
2019[23]	CVPRF	$1,622,000	$0	$1,622,000
2020	CVPRF	$212,000	$0	$212,000

Total Cost: $2,152,000

[23] The FY2019 funding amount of $1,622,000 included $1,272,000, which was the FY2020 allocated funding for this project. The $212,000 in FY20 is additional funding to cover previously unbudgeted expenses for permitting.

Internal Agency Resources Table

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
2017								
Environmental Compliance and Permitting								
Agreement	Grant or cooperative agreement or Interagency Agreement	$318,000	1.00	0.00	$318,000	FWS	CVPRF	Financial assistance agreement to complete compliance and permitting
2019								
Environmental Compliance and Permitting								
Agreement	Grant or cooperative agreement or contract	$350,000	1.00	0.00	$350,000	FWS	CVPRF	Financial assistance agreement to complete compliance and permitting
Implementation								
Agreement	Grant, cooperative agreement or contract	$1,272,000	1.00	0.00	$1,272,000	FWS	CVPRF	Financial assistance agreement to complete implementation and as-built performance monitoring at the site.
2020								
Environmental Compliance and Permitting								
Agreement	Environmental Compliance and Permitting	$212,000	1.00	0.00	$212,000	FWS	CVPRF	Agency Permitting and Environmental Consulting on CEQA / NEPA

Tracy Fish Facility Improvement Program

Annual Tracy Fish Facility Improvement Program (TFFIP)

DCN:	20INDP005
Classification:	Research, Infrastructure Improvement
Location:	Sacramento-San Joaquin Delta
Funding Years:	2020 - 2022
Benefits Start Year:	2020
Priority:	1 - Program Priority Comments: CVPIA (b)(4) metrics coincide with OCAP Biological Opinions
Partners:	Collaborative research partners, DWR and CalF&W.
Related Programs:	Crosscut with CVPIA (b)(1).

Authority

Provision	Percentage
(b)(4)	100%

Project Management Team

J. Carl Dealy, Project Manager, USBR-Tracy Office
Rene Reyes, Supervisory Biologist, Tracy Office
Zachery Sutphin, Biologist, USBR-TSC
Connie Svoboda, Hydrologist, USSBR-TSC
Allen Lindauer, Chief, Operation & Maintenance Division, Tracy Office

Metrics

Completion of RPAs

Deliverables

Deliverables in all years of this project will be coordinated with the CVPIA Data Manager, CVPIA Science Coordinator, and CVPIA Fish Resource Area Coordinator.

Date	Title
Dec. 2020	Accomplishments Report
Jan. 2021	Annual Report
EOFY	Reports from individual subprojects funded by this project. (see attached "Tracy Volume Series Report Status")

Narrative

This action consists of program administration and management support for the Tracy Fish Collection Facility Improvement Program. The program is implemented through an interdisciplinary

approach; competitive process for soliciting proposals; integration with the CVP Conservation Program; protection, restoration, and enhancement of federally listed species and habitats affected by the CVP. Management includes program support, environmental compliance, scientific review and publication, peer review management, management of all collaborative processes as well as web site management. Administrative support is primarily oversight on all funded projects, coordination with the Tracy Technical Team and may also include acquisitions as needed.

Implementation during FY 2020 & FY2021 includes:
FY 2020 Projects Tracy Fish Facility Improvement Program emphasis is similar to FY 2018, in order is as follows: 1) Predator Evaluations, particularly related to Fish Release Sites; 2) Predator removal methods; 3) Whole Facility Evaluation using two mark and recapture methods. Much of the work will involve collaborations with other federal and State agencies. Result will be published to the Tracy Research Website http://www.usbr.gov/mp/TFFIP.

Ancillary to the core research efforts identified above is the Tracy Fish Collection Facility (TFCF) bathymetric survey. The data from the survey will be used for the FY2020-21 CO2 mathematical modeling and other predator control investigations.

Additionally, there are three RAX Projects; RAX 612, Antioch Fish Release Site Rebuild, RAX 655 - TFCF Brannon Island FRS Replacement, and RAX 444, Water Velocity Control Upgrades Secondary Channel. All three of these projects fulfil Biological Opinion reasonable and prudent Actions.

Data Management

Data will be retained by the Tracy Fish Facility Improvement Program, SCCAO-Tracy. Finalized Study Plans, Tracy Series Reports, Tracy Technical Bulletins, Hydraulic Laboratory Technical Memos are maintained at Tracy Research Website http://www.usbr.gov/mp/tffip. Annual work plans and CVPIA program-level reports are maintained MPRO.

The PMT Data Steward will coordinate with external partners and biannually with the CVPIA Data Manager on the transmission of long-term monitoring and other pertinent data defined by the SIT and the PMT per the 2020 Data Guidance.

Field data will be recorded on data sheets or directly into a recording device/computer and transferred into a computer spreadsheet or database. The PMT Data Steward will coordinate with the CVPIA Data Manager on the transmission of relevant and pertinent data defined by the SIT and the PMT per the 2020 Data Guidance. Field data, analyses, and reports will be stored and backed up on a PMT computer/server.

Risks

No Data.

Cost Estimate

Year	Fund	Total	BOR	FWS
2020	WRR	$1,895,000	$1,895,000	$0
2020	CVPRF	$426,000	$426,000	$0
2021	WRR	$3,777,500	$3,777,500	$0
2021	CVPRF	$463,500	$463,500	$0
2022	WRR	$2,910,500	$2,910,500	$0
2022	CVPRF	$463,500	$463,500	$0

Total Cost: $9,936,000

Internal Agency Resources Table

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
2020								
Administration								
Agreement	TFFIP	$710,000	1.00	0.00	$710,000	BOR	WRR	Administration and Implementation of Program Priorities listed in narrative.
Agreement	TFFIP	$426,000	1.00	0.00	$426,000	BOR	CVPRF	Administration and Implementation of Program Priorities listed in narrative.
Contract	RAX612	$1,005,000	1.00	0.00	$1,005,000	BOR		Administration and Implementation of Project
Contract	RAX655	$105,000	1.00	0.00	$105,000	BOR		Administration and Implementation of Project
Contract	RAX444	$75,000	1.00	0.00	$75,000	BOR		Administration and Implementation of Project
2021								
Administration								
Agreement	TFFIP	$772,500	1.00	0.00	$772,500	BOR	WRR	
Agreement	TFFIP	$463,500	1.00	0.00	$463,500	BOR	CVPRF	Administration and Implementation of Program Priorities listed in narrative.
Contract	RAX612	$2,500,000	1.00	0.00	$2,500,000	BOR		Administration and Implementation of Project
Contract	RAX655	$330,000	1.00	0.00	$330,000	BOR		Administration and Implementation of Project
Contract	RAX444	$220,000	1.00	0.00	$220,000	BOR		Administration and Implementation of Project
2022								
Administration								
Agreement	TFFIP	$772,500	1.00	0.00	$772,500	BOR	WRR	
Agreement	TFFIP	$463,500	1.00	0.00	$463,500	BOR	CVPRF	Administration and Implementation of Program Priorities listed in narrative.
Contract	RAX612	$0	1.00	0.00	$0	BOR		Administration and Implementation of Project
Contract	RAX655	$1,350,000	1.00	0.00	$1,350,000	BOR		Administration and Implementation of Project
Contract	RAX444	$788,000	1.00	0.00	$788,000	BOR		Administration and Implementation of Project

2020 Annual Work Plan Public Draft

New Fisheries Charters

Central Valley Project Improvement Act
Title XXXIV of Public Law 102-575

Cosumnes River: Adult Escapement Monitoring

Cosumnes River Adult Escapement Monitoring

DCN: 20FHRP008
Classification: Monitoring
Location: Cosumnes River
Funding Years: 2017 - 2021
Benefits Start Year: 2017
Priority: Monitoring to track the impact of recently completed fish passage and spawning habitat restoration projects funded by CVPIA and the Service's National Fish Passage Program.
Partners: Fishery Foundation of California
Related Programs: NMFS-RP

Authority

Provision	Percentage
(b)(15)	100.0%

Metrics

Name	Value	Units	Comment
Population Assessment	2	number of reports	Project completes adult escapement and juvenile outmigration estimates annually.

Deliverables

Deliverables in all years of this project will be coordinated with the CVPIA Data Manager, CVPIA Science Coordinator, and CVPIA Fish Resource Area Coordinator.

Date	Title
Dec. 2017	FY17 Cosumnes River Escapement and Outmigration Annual Report
Dec. 2020	FY20 Cosumnes River Escapement and Outmigration Annual Report

Project Management Team

Paul Cadrett (USFWS)
Bernard Aguilar (CDFW)
Trevor Kennedy (Fishery Foundation)

Narrative

This ongoing project addresses the FY2020 SIT monitoring priorities of adult escapement estimates.

The quantitative prediction of the expected outcome of the management actions is the number of adult Chinook salmon and steelhead returning to the Cosumnes River.

This project monitors annual adult escapement, spawning, and juvenile outmigration estimate for the Cosumnes River. CVPIA and other project partners have contributed in the past to implementing passage projects that have made the entire naturally accessible portion of the river available, yet escapement, production and outmigration were not monitored for many years. This project not only provides a population and production estimate for the watershed, but also provides significant post-project monitoring for projects completed by CVPIA and many of our partners in the last decade.

Reclamation and the Service continue to explore opportunities to improve instream flow, groundwater recharge and channel pre-wetting opportunities in the Cosumnes River. Recent assessments of consumptive use from potential willing water sellers has limited the ability to continue working on the initial conceptual project. However, additional opportunities and operational changes are being explored.

Data Management

The PMT Data Steward will coordinate with external partners and biannually with the CVPIA Data Manager on the transmission of long-term monitoring and other pertinent data defined by the SIT and the PMT per the 2020 Data Guidance.

Field data will be recorded on data sheets or directly into a recording device/computer and transferred into a computer spreadsheet or database. The PMT Data Steward will coordinate with the CVPIA Data Manager on the transmission of relevant and pertinent data defined by the SIT and the PMT per the 2020 Data Guidance. Field data, analyses, and reports will be stored and backed up on a PMT computer/server.

All data collected as part of this project is stored by the Fishery Foundation of California and provided to CVPIA staff electronically. Both FFC and USFWS keep secure electronic backup copies of the data.

Risks

Risk	Likelihood	Impact
Availability of 'extra' CDFW screw-trap	1	3

Cost Estimate

Year	Fund	Total	BOR	FWS
2017	CVPRF	$63,600	$0	$63,600
2020	CVPRF	$63,600	$0	$63,600

Total Cost: $127,200

Internal Agency Resources Table

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
2017								
Monitoring								
Agreement	Cosumnes Escapement and Outmigration Grant	$60,000	1.00	0.06	$63,600	FWS	CVPRF	Grant provided to Fishery Foundation of California to complete escapement/ spawning surveys and operate the CDFW rotary screw-trap they have been loaned (used to be funded to operate but CDFW can no longer support that effort annually).
2020								
Monitoring								
Agreement	Cosumnes Escapement and Outmigration Grant	$60,000	1.00	0.06	$63,600	FWS	CVPRF	Grant provided to Fishery Foundation of California to complete escapement/spawning surveys and operate the CDFW rotary screw-trap they have been loaned (used to be funded to operate but CDFW can no longer support that effort annually).

Feather River: Salmonid Spawning Habitat Improvement Project

The placement, sorting, and harvesting of gravel and cobble (1/4”-5”) to restore spawning habitat in the Feather River.

DCN:	20FHRP002
Classification:	Habitat Improvement, Habitat Maintenance
Location:	Feather River
Funding Years:	2019 - 2020
Benefits Start Year:	2020
Priority:	FY2020 SIT Priority: Increase fall-run Chinook salmon spawning habitat, Feather River.
Partners:	CDFW, CDWR
Related Programs:	CDWR

Authority

Provision	Percentage
(b)(1)	100.0%

Metrics

Name	Value	Units	Comment
Spawning gravel	8,300	cubic yards	Depending on final site designs and constraints, 8,300 cubic yards of gravel will be placed in-river.
Spawning habitat	3	acres	Depending on final site designs and constraints, up to 2.6 acres of in-river spawning habitat will be created

Deliverables

Deliverables in all years of this project will be coordinated with the CVPIA Data Manager, CVPIA Science Coordinator, and CVPIA Fish Resource Area Coordinator.

Date	Title
Oct. 2021	FY21 Feather Spawning Habitat Project Annual Report
Oct. 2022	FY22 Feather Spawning Habitat Project Annual Report
Oct. 2023	FY23 Feather Spawning Habitat Project Annual Report
Oct. 2024	FY24 Feather Spawning Habitat Project Annual Report
Oct. 2020	FY20 Feather Spawning Habitat Project Annual Report

Narrative

This project addresses the 2020 SIT priority for fall-run Chinook salmon of increase spawning habitat, Feather River. Based on the CVPIA SDM, the Feather River has a 39.43 acre deficit of spawning habitat for fall-run Chinook salmon.

Quantitative prediction of expected outcome: For purposes of testing the CVPIA DSMs, completion of this charter is expected to provide an additional 10,521 square meters of spawning habitat.

The proposed project is to strategically place 8,300 cubic yards of optimal sized salmon spawning gravel at 2-3 locations in the Feather River between RM 63 to 67. The project will be designed using a Feather River-specific Habitat Suitability Model to optimize depth, flow, and velocity at each location. Gravel will be placed on top of the existing substrate to build the gravel depth to at least 18 inches, with the ultimate goal of placing gravel to optimize spawning habitat based on model predictions. Redd mapping and hydraulic modeling will be conducted before the project to document existing use and to inform the design of each new feature. Three years of post-project redd mapping will be performed to document use of the newly restored sites and to validate model predictions. The project will build on CDWR's implementation of a Gravel Supplementation and Improvement Project in 2014 and 2017 to further expand the available spawning habitat for fall-run Chinook salmon in the Feather River.

Data Management

The PMT Data Steward will coordinate with external partners and biannually with the CVPIA Data Manager on the transmission of long-term monitoring and other pertinent data defined by the SIT and the PMT per the 2020 Data Guidance.

Field data will be recorded on data sheets or directly into a recording device/computer and transferred into a computer spreadsheet or database. The PMT Data Steward will coordinate with the CVPIA Data Manager on the transmission of relevant and pertinent data defined by the SIT and the PMT per the 2020 Data Guidance. Field data, analyses, and reports will be stored and backed up on a PMT computer/server.

CDWR collects and manages all data related to this project and provides electronic copies to CVPIA staff. Secure electronic data backups will be retained by CDWR and USFWS. Additionally, data and analyses will be provided to CVPIA Fisheries.

Risks

Risk	Likelihood	Impact
Obtaining permits	1	1
Gravel availability.	1	1

Cost Estimate

Year	Fund	Total	BOR	FWS	DWR
2020	SIK	$150,000	$0	$0	$150,000
2020	CVPRF	$1,060,000	$0	$1,060,000	$0
2022	SIK	$50,000	$0	$0	$50,000
2023	SIK	$50,000	$0	$0	$50,000
2024	SIK	$50,000	$0	$0	$50,000

Total Cost: $1,360,000

Internal Agency Resources Table

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
2020								
Environmental Compliance and Permitting								
In-Kind Labor	Environmental compliance and permitting	$100,000	1.00	0.00	$100,000	DWR	SIK	Environmental compliance and permitting
Implementation								
Agreement	Feather River Spawning Gravel Improvement Grant	$1,000,000	1.00	0.06	$1,060,000	FWS	CVPRF	Financial Assistance Agreement that will fund in channel placement of spawning gravel.
Monitoring								
In-Kind Labor	Pre-project monitoring	$50,000	1.00	0.00	$50,000	DWR	SIK	Redd mapping
2022								
Monitoring								
In-Kind Labor	Post-project monitoring	$50,000	1.00	0.00	$50,000	DWR	SIK	Redd mapping
2023								
Monitoring								
In-Kind Labor	Post-project monitoring	$50,000	1.00	0.00	$50,000	DWR	SIK	Redd mapping
2024								
Monitoring								
In-Kind Labor	Post-project monitoring	$50,000	1.00	0.00	$50,000	DWR	SIK	Redd mapping

Feather River/Sutter Bypass - Nelson Slough Floodplain Habitat

The proposed project will substantially increase available floodplain habitat in the lower Feather River corridor through Nelson Slough and contribute to improved quality of juvenile salmonids rearing habitat through increased production and availability of food resources.

DCN:	20FHRP007
Classification:	Habitat Improvement, Fish Passage
Location:	Nelson Slough - Feather River/Sutter Bypass, Sacramento Lower Mainstem
Funding Years:	2020 - 2023
Benefits Start Year:	2020
Priority:	SIT FY2020 Tech Memo: All Chinook Runs - Increase access to juvenile rearing habitat in Sutter and Yolo Bypasses. An Action Priority 1 in the Recovery Plan for Winter and Spring-run Chinook salmon and Steelhead is to restore and maintain riparian and floodplain ecosystems along both banks of the Sacramento River to provide a diversity of habitat types including riparian forest, gravel bars and bare cut banks, shady vegetated banks, side channels, and sheltered wetlands, such as sloughs and oxbow lakes.
Partners:	CDFW, USFWS
Related Programs:	CVPIA b1, NMFS-RP

Authority

Provision	Percentage
(b)(1)	100.0%

Metrics

Name	Value	Units	Comment
Floodplain Enhancement	3,000	acres	

Deliverables

Deliverables in all years of this project will be coordinated with the CVPIA Data Manager, CVPIA Science Coordinator, and CVPIA Fish Resource Area Coordinator.

Date	Title
Dec. 2021	Nelson Slough Salmonid Floodplain Habitat Improvement Feasibility Study

Project Management Team

Paul Cadrett (USFWS)
Tanya Shea (CDFW)
Jason Kindopp (DWR)

Narrative

The proposed project completes a feasibility study to develop and evaluate potential restoration actions at the Nelson Slough Wildlife Area to increase the frequency with which floodplain habitat is inundated in the Sutter Bypass.

The project would be located on CDFW property at the confluence of the lower Feather River corridor and the Sutter Bypass near Nelson Slough.

The project could include lowering and widening an existing slough within setback levees in the lower Feather River corridor downstream of Highway 99 and tying this into the Sutter Bypass; creating multiple swales within the area; and/or lowering the floodplain terrace. This would allow Feather River basin water to flow into the Sutter Bypass with much greater frequency than under current conditions, thereby connecting remnant floodplain in the lower Feather River corridor with existing floodplain in the Sutter Bypass. The project could increase floodplain habitat available to Feather, Yuba, and Bear River salmonids by 3,000 to 5,000 acres. Additional floodplain inundation resulting from this project could provide rearing benefits to Sacramento River origin juvenile winter and spring-run Chinook salmon, juvenile Butte Creek spring-run Chinook salmon in the Sutter Bypass as well as to Feather River basin spring-run Chinook salmon. Currently, River Partners has been awarded funds through the Wildlife Conservation Board to conduct native riparian plantings at this site. These two efforts could be coupled together to further enhance the existing and newly created floodplain habitat.

The Peterson, Coarse Resolution model Report, 2014 (DSM) suggests that supporting juvenile Chinook size at emigration can be beneficial to the outcome of a greater number of returning adults. Post project monitoring may help improve or validate the hypothesis of the DSM.

Data Management

The PMT Data Steward will coordinate with external partners and biannually with the CVPIA Data Manager on the transmission of long-term monitoring and other pertinent data defined by the SIT and the PMT per the 2020 Data Guidance.

Field data will be recorded on data sheets or directly into a recording device/computer and transferred into a computer spreadsheet or database. The PMT Data Steward will coordinate with the CVPIA Data Manager on the transmission of relevant and pertinent data defined by the SIT and the PMT per the 2020 Data Guidance. Field data, analyses, and reports will be stored and backed up on a PMT computer/server.

All Study related documents will be stored on the U.S. Fish and Wildlife Service Red Bluff and Lodi FWO Websites at:
https://www.fws.gov/redbluff/afrp.html
https://www.fws.gov/lodi/anadromous_fish_restoration/afrp_documents.htm

Risks

Risk	Likelihood	Impact
Land Ownership, Permission and Access	1	1

Cost Estimate

Year	Fund	Total	BOR	FWS
2020	CVPRF	$265,000	$0	$265,000
2021	CVPRF	$424,000	$0	$424,000
2022	CVPRF	$2,120,000	$0	$2,120,000

Total Cost: $2,809,000

Internal Agency Resources Table

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
2020								
Inventory/ Reconnaissance								
Agreement	Feasibility Study	$265,000	1.00	0.00	$265,000	FWS	CVPRF	Agreement will fund a feasibility study to determine effort for floodplain restoration
2021								
Planning and Analysis								
Agreement	Planning and Analysis	$424,000	1.00	0.00	$424,000	FWS	CVPRF	This phase will evaluate the feasibility study and conduct planning and design.
2022								
Implementation								
Agreement	Construction and Implementation	$2,120,000	1.00	0.00	$2,120,000	FWS	CVPRF	Redesigning and constructing floodplain and habitat features

Stanislaus River: Restoration at Kerr Park

The project will restore seasonal inundation to approximately 10 acres of floodplain habitat located at Kerr Park (rm 43), with additional in-channel enhancement.

DCN:	20FHRP003
Classification:	Habitat Improvement, Habitat Restoration
Location:	Stanley Wakefield Wilderness Area (Kerr Park) on the Stanislaus River
Funding Years:	2020 - 2024
Benefits Start Year:	2022
Priority:	SIT FY20 Priorities: - Increase perennially inundated juvenile habitat, Stanislaus River (Fall-run Chinook) - Maintain spawning habitat in the CVP streams (all Chinook runs) - Increase spawning habitat, Stanislaus River (Spring-run Chinook)
Partners:	Augustine Planning & Associates, City of Oakdale, Cramer Fish Sciences
Related Programs:	CALFED, CVPIA b1, CVPIA b13, NMFS-RP, NMFS-RPAs

Authority

Provision	Percentage
(b)(13)	100.0%

Metrics

Name	Value	Units	Comment
Spawning riffle creation (gravel augmentation)	7	acres	Approximately 7 acres of instream spawning habitat restored. Metric (acres restored) was chosen based on the information submitted to the CDFW FRGP for Phase I (Project Design).
Seasonally inundated floodplain habitat	21	acres	Roughly 21 acres of floodplain habitat restored. Metric (acres restored) was chosen based on the information submitted to the CDFW FRGP for Phase I (Project Design).
Fish reared	0	number of fish	21 acres = 84,983 sq meters. 0.054 sq m/fry = ~1,573,750 juvenile salmon

Deliverables

Deliverables in all years of this project will be coordinated with the CVPIA Data Manager, CVPIA Science Coordinator, and CVPIA Fish Resource Area Coordinator.

Date	Title
Sep. 2022	Site Implementation
Oct. 2021	Environmental Compliance Docs & Permits

Date	Title
Dec. 2020	Monitoring Plan
Sep. 2025	Final Project Report
Oct. 2021	Project Design

Project Management Team

J.D. Wikert, USFWS - Lodi
Kirsten Sellheim
Rocko Brown
Jesse Anderson
Joe Merz – Cramer Fish Sciences
Bryan Whitemyer – City of Oakdale

Narrative

Phase II of the Stanley Wakefield Wilderness Area Restoration Project (Kerr Park) will build upon the currently CDFW funded 100% project design plans to rehabilitate salmonid spawning and rearing habitat on the Stanislaus River. The project will benefit listed steelhead and Chinook Salmon. Phase I (already funded) will yield baseline data and analysis for 100% design plans. Phase II will complete a project monitoring plan and environmental permitting. Phase III will consist of restoration of up to 28 acres of channel, floodplain and upland habitats. Phase IV will implement post-project evaluation (to inform the SIT SDM and improve future project implementation), data analysis, and reporting.

Goals:

- Augment, rehabilitate, and enhance productive Stanislaus River juvenile salmonid rearing and adult spawning habitat;
- Enhance long-term juvenile salmonid access to floodplain habitat;
- Reduce main channel predatory fish habitat;
- Address goals of existing plans (see below) and work with existing restoration efforts;
- Improve community participation in habitat.

The project will address CVPIA goals (FRP A2), CVPIA Call for Proposals (Chinook Salmon: Maintain spawning habitat in CVP streams & Increase perennially inundated juvenile habitat in the Stanislaus River; Chinook Salmon Monitoring: Juvenile tributary survival). The project addresses abundance (FRP doubling goal), productivity, and life-history diversity metrics for the Stanislaus River and the Central Valley. It also directly addresses the OCAP RPA III.2.1 and RPA III.2.2, and NMFS CV Salmonid Recovery Plan (2.10: 8.2, 48.1, 48.2, 52.3, 59.3). The project addresses the most limiting factor for the watershed: availability of juvenile rearing habitat and will construct long-term floodplain habitat. The project will assess whether the juvenile survival and growth estimates for low gradient floodplains are appropriate for higher gradient gravel-bedded off-channel habitats. The project will include *O. mykiss* utilization of restored floodplain and in-channel habitats (Tables 13 & 16, SIT FY2020 Tech memo).

Phase II will excavate perched floodplain (~21 acres), will create 3-4 spawning riffles/rearing habitat (~7 acres), and reduce habitat for predatory fish. 21 acres of floodplain habitat provides rearing for

41,000-155,000 fry, and 7 acres of in-stream gravel provides spawning habitat for up to 2,200 redds and rearing for 12,000-41,000 parr. The project also removes 7 acres of predator habitat.

The majority of funding will go to implementation of on the ground restoration of the habitat. Part of the funding will go towards required environmental permitting and compliance. Phases II+ will leverage the deliverables produced from Phase I, which has already been funded by the 2018 CDFW FRGP program. Future funding will provide post-project evaluation to inform the SIT DSM in collaboration with the SIT.

Failure to implement the project will continue the decline of native salmonid populations and waste CDFW FRGP program grant money.

There are no known stakeholder objections, and the landowner, The City of Oakdale, is an enthusiastic partner, and a 2018 CDFW FRGP grant recipient for the design and engineering of the project. Funding this charter will continue to recruit more willing landowners to participate in restoration projects, especially since the project will occur in a popular public park and include a valuable outreach/education component.

Data Management

The PMT Data Steward will coordinate with external partners and biannually with the CVPIA Data Manager on the transmission of long-term monitoring and other pertinent data defined by the SIT and the PMT per the 2020 Data Guidance.

Field data will be recorded on data sheets or directly into a recording device/computer and transferred into a computer spreadsheet or database. The PMT Data Steward will coordinate with the CVPIA Data Manager on the transmission of relevant and pertinent data defined by the SIT and the PMT per the 2020 Data Guidance. Field data, analyses, and reports will be stored and backed up on a PMT computer/server.

Short-term objectives specific monitoring will include biological monitoring for fish and macro-invertebrates as deemed appropriate by the PMT. These will likely be similar in nature to post-project investigations conducted on previous projects, modified to enhance understanding based on current and past evaluations.

Objectives include providing rearing habitat for up to 41,000-155,000 Chinook Salmon fry and 12,000-41,000 parr the first spring following construction via floodplain lowering. These values were obtained based on territory size estimates from the Emigrating Salmonid Habitat Estimation (ESHE) model (https://fishsciences.shinyapps.io/sacramento-eshe/). Objectives also include providing spawning habitat for up to 2,200 redds (based on an assumption that each redd requires approximately 12.4 m2 (https://flowwest.shinyapps.io/rearing-habitat/).

The project does not require long-term trend monitoring. Many of these projects are necessary to provide a detectable trend at the Caswell RST site. Confidence intervals at the Caswell RST are often high (>4,000 juvenile Chinook), resulting in a low ability to detect restoration results. Given in-river survival estimates of 0.9446 per river mile (Stanislaus SEP Model), only 1,352 of the starting (10,522) juveniles should pass the Caswell RST. The median survival estimate at Caswell for 1996-2012 is

105,821 juveniles (range 8,000 to 2,000,000). Assuming a 20% change is detectable, ~20,000 more juveniles would have to pass Caswell, requiring ~15 more 5 acre projects. Of course, this assumes that large changes in flow are not the primary factor influencing juvenile passage at Caswell.

Are performance metrics related to or derived from the DSM or means objectives (Peterson, Coarse Resolution Model Report, 2014), and integrated into the monitoring plan?
Project monitoring will utilize appropriate standardized protocols and where available, any CVPIA data management standards, including submittal to Center for Data Management when available. Post-project monitoring should offer an opportunity to calibrate both juvenile growth and survival parameters (higher vs lower gradient) and will be conducted in collaboration with SIT to ensure maximum usefulness to the DSM.

Performance metrics include amount of juvenile rearing habitat which relates to juvenile abundance, life history diversity, and productivity. Costs are based on recent similar projects and are offset by an existing grant providing engineered design.

Risks

Risk	Likelihood	Impact
Landowner backs out	1	2

Cost Estimate

Year	Fund	Total	BOR	FWS	Local
2020	Local	$341,036	$0	$0	$341,036
2020	CVPRF	$361,400	$0	$361,400	$0
2022	CVPRF	$2,374,400	$0	$2,374,400	$0

Total Cost: $3,076,836

Internal Agency Resources Table

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
2020								
Design								
Agreement	Design	$341,036	1.00	0.00	$341,036	Local	Other	Phase I is being funded by the 2018 FRGP, and will ultimately produce 100% design plans for the project
Environmental Compliance and Permitting								
Agreement	Environmental Compliance and Reporting	$175,000	1.00	0.06	$185,500	FWS	CVPRF	Development of environmental documents; submission and coordination for environmental permits
Monitoring								
Agreement	Monitoring	$135,943	1.00	0.06	$144,100	FWS	CVPRF	Development of monitoring plan; continued pre project monitoring; pre project monitoring summary
Reporting								
Agreement	Reporting	$30,000	1.00	0.06	$31,800	FWS	CVPRF	Management of project activities, including construction. Reporting for project progress and various deliverables.
2022								
Construction								
Agreement	Construction	$2,150,000	1.00	0.06	$2,279,000	FWS	CVPRF	Construction for restoration project; weekly construction summary; as-built surveys
Reporting								
Agreement	Reporting	$90,000	1.00	0.06	$95,400	FWS	CVPRF	Management of project activities, including construction. Reporting for project progress and various deliverables.

Sacramento River Salmonid Habitat Improvement - Keswick to Red Bluff

Implements the top priority habitat improvements along the Sacramento River between Keswick and Red Bluff.

DCN:	20FHRP004
Classification:	Habitat Improvement, Habitat Restoration
Location:	Sacramento River, Sacramento Upper Mainstem
Funding Years:	2019 - 2025
Benefits Start Year:	2021
Priority:	SIT FY2020 Tech Memo: - Increase perennially inundated juvenile habitat, Sacramento River above the American River confluence - Increase seasonally inundated juvenile habitat at 2-yr freq., Sacramento River above American River confluence - Increase spawning habitat, Upper Sacramento River
Partners:	City of Anderson, CA, City of Red Bluff, City of Redding, CSU Chico, Glenn Colusa Irrigation District, Golden Gate Salmon Association, Pacific States Marine Fisheries Commission, RD 108, River Partners, Sacramento River Forum, Trout Unlimited, USBR, USFS, USFWS, Western Shasta Resource Conservation District, CDFW, CDWR
Related Programs:	See Partners

Authority

Provision	Percentage
(b)(13) Gravel	100.0%

Metrics

Name	Value	Units	Comment
Shea Adult Chinook	1,105	# fish	territory estimates consistent with SIT salmon lifecycle model inputs
Shea Juvenile Chinook	189,800	# fish	territory estimates consistent with SIT salmon lifecycle model inputs
Kapusta 1B Juvenile Chinook	81,561	# fish	territory estimates consistent with SIT salmon lifecycle model inputs
Kapusta Island Juvenile Chinook	130,827	# fish	territory estimates consistent with SIT salmon lifecycle model inputs
Battle Creek Levee juvenile Chinook	112,500	# fish	Add a zero to the end of the fish number. territory estimates consistent with SIT salmon lifecycle model inputs
Anderson River Park Juvenile Chinook	331,710	# fish	territory estimates consistent with SIT salmon lifecycle model inputs

Name	Value	Units	Comment
Reading Island Phase II	386,380	# fish	territory estimates consistent with SIT salmon lifecycle model inputs
South Cypress Juvenile Chinook	386,250	# fish	territory estimates consistent with SIT salmon lifecycle model inputs
South Cypress Adult Chinook	1,287	# fish	territory estimates consistent with SIT salmon lifecycle model inputs
East Sand Slough Juvenile Chinook	532,500	# fish	territory estimates consistent with SIT salmon lifecycle model inputs

Deliverables

Deliverables in all years of this project will be coordinated with the CVPIA Data Manager, CVPIA Science Coordinator, and CVPIA Fish Resource Area Coordinator.

Date	Title
May. 2020	Anderson River Park completed
May. 2020	South Cypress side channel completed if USBR approves bridge
May. 2020	Reading Island side channel completed
May. 2021	Shea Side Channel completed
May. 2021	East Sand Slough completed
May. 2022	Kapusta sites completed

Project Management Team

John Hannon (USBR-BDO)
Jim Earley (USFWS – Red Bluff)
Mike Berry (DWR)
Ruth Goodfield (NMFS)
Paul Zedonis (USBR-NCAO)

Narrative

Implements prioritized juvenile rearing habitat improvements in the Keswick to Red Bluff reach of the river. Projects are side channel enhancement and creation and floodplain expansion.

The following table describes the projects including the proposed management actions.

Project	Type	Rearing Acres	Spawning Acres	Total Juveniles	Adult Chinook
Top Priority					
Shea Island	side channel	2.5	1.7	189,800	1,105
Kapusta 1B	side channel	1.1		81,561	
Kapusta Island	side channel	1.7		130,827	
Battle Creek Levee	floodplain	15.0		1,125,000	
Tier 1					

Project	Type	Rearing Acres	Spawning Acres	Total Juveniles	Adult Chinook
Top Priority					
South Shea	gravel injection			0	
Anderson RP Ph 1-3	side channel	4.4		331,710	
Reading Island Ph 2	side channel	5.2		386,380	
South Cypress	side channel	5.2	1.98	386,250	1,287
East Sand Slough	side channel	7.1		532,500	
Chinook potential from territory estimates consistent with SIT salmon lifecycle model inputs					
Tier 2					
Wyndham	connect a pond	1.42		106,763	
Tobiasson Island	side channels	1.56		117,270	
I-5	side channel	0.36	3.00	27,114	1950
Dog Island	side channel	1.22		91,511	
Tier 3					
Cow Creek	side channel	1.17		88,122	
China Garden	side channel	1.13		84,732	
Battle Creek Floodplain	floodplain	50.0		3,750,000	
Jellys Ferry	side channel	2.26		169,465	

The project adds new juvenile rearing habitat in the upper Sacramento River to increase productivity and increase adult production.

All funding goes towards the high priority projects selected by the upper Sacramento River Restoration Interagency Advisory Technical Group (IATG). Prioritized based on biological benefit, engineering feasibility, and cost effectiveness.

The project increases Chinook production based on DSM priority actions.

The interagency group and stakeholders, IATG, have been developing these projects over the past four years. The impact of a delay, reduced or non-funding of this project would be loss in momentum and reduced potential to double anadromous fish production on the largest river in the Central Valley.

There are no known stakeholder objections to the project proposal

Data Management

The PMT Data Steward will coordinate with external partners and biannually with the CVPIA Data Manager on the transmission of long-term monitoring and other pertinent data defined by the SIT and the PMT per the 2020 Data Guidance.

Field data will be recorded on data sheets or directly into a recording device/computer and transferred into a computer spreadsheet or database. The PMT Data Steward will coordinate with the CVPIA Data Manager on the transmission of relevant and pertinent data defined by the SIT and

the PMT per the 2020 Data Guidance. Field data, analyses, and reports will be stored and backed up on a PMT computer/server.

Associated data housed by USBR Bay Delta Office and available on request.

Risks

Risk	Likelihood	Impact
Landowner agreements not reached	1	3
Permits not obtained	2	2
New habitat washed out	2	2

Cost Estimate

Year	Fund	Total	BOR	FWS
2020	CVPRF	$4,114,450	$4,114,450	$0
2020	WRR	$1,000,000	$1,000,000	$0
2021	CVPRF	$2,000,000	$2,000,000	$0
2022	CVPRF	$5,935,550	$5,935,550	$0

Total Cost: $13,050,000

Internal Agency Resources Table

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
2020								
Construction								
Agreement	Local non-profit	$2,000,000	1.00	0.00	$2,000,000	BOR	CVPRF	Additional funding to add acres improved for additional benefit, capacity for ~200,000 juveniles
Agreement	Local non-profit	$1,000,000	1.00	0.00	$1,000,000	BOR	WRR	Adds to area of habitat improved to provide capacity for ~100,000 more juveniles
Agreement	Local non-profit	$1,264,450	1.00	0.00	$1,264,450	BOR	CVPRF	Adds to habitat area improved to provide capacity for 300,000 additional juveniles.
Agreement	Local non-profit	$500,000	1.00	0.00	$500,000	BOR	CVPRF	Feasibility analysis for Tier 2 and Tier 3 projects to focus on implementation in future years. Landowner agreements, engineering analysis.
Agreement	PSMFC	$350,000	1.00	0.00	$350,000	BOR	CVPRF	Effectiveness monitoring of habitat improvements. Includes monitoring treatment and control sites before and after implementation for habitat quality and fish use.
2021								
Construction								
Agreement	Local non-profit entity	$2,000,000	1.00	0.00	$2,000,000	BOR	CVPRF	FA agreement for planning, permitting, design, construction, and monitoring. May be multiple recipients.
2022								
Construction								
Labor	USBR labor	$200,000	1.00	0.00	$200,000	BOR	CVPRF	USBR biologists, resource specialists, engineers, surveyors working on these projects.
Agreement	mod to 2020 recipient	$3,735,550	1.00	0.00	$3,735,550	BOR	CVPRF	
Agreement	Local non-profit	$2,000,000	1.00	0.00	$2,000,000	BOR	CVPRF	Continues to implement high priority habitat improvements.

Sacramento River Salmonid Habitat Improvement - Red Bluff to Feather River

Implements top priority habitat improvements between Red Bluff and Feather River

DCN:	20FHRP005
Classification:	Habitat Improvement, Habitat Restoration
Location:	Sac River - Red Bluff to Feather River, Sacramento Lower Mainstem
Funding Years:	2019 - 2024
Benefits Start Year:	2021
Priority:	SIT FY2020 Tech Memo: - Increase perennially inundated juvenile habitat, Sacramento River above the American River confluence - Increase seasonally inundated juvenile habitat at 2-yr freq., Sacramento River above American River confluence - Adaptively manage juvenile habitat restoration to allow the evaluation of the effect of habitat restoration on wild juvenile Chinook salmon survival in the Sacramento River
Partners:	City of Red Bluff, CSU Chico, Glenn Colusa Irrigation District, Golden Gate Salmon Association, Pacific States Marine Fisheries Commission, RD 108, River Garden Farms, River Partners, Sacramento River Forum, Trout Unlimited, CDFW, CDWR
Related Programs:	CDWR, NMFS

Authority

Provision	Percentage
(b)(1)	100.0%

Metrics

Name	Value	Units	Comment
La Barranca juvenile Chinook	350,839	# fish	territory estimates consistent with SIT salmon lifecycle model inputs
McClure juvenile Chinook	250,808	# fish	territory estimates consistent with SIT salmon lifecycle model inputs
Foster juvenile Chinook	196,579	# fish	territory estimates consistent with SIT salmon lifecycle model inputs
Mooney juvenile Chinook	59,313	# fish	territory estimates consistent with SIT salmon lifecycle model inputs
Blethen juvenile Chinook	194,322	# fish	territory estimates consistent with SIT salmon lifecycle model inputs
Altube juvenile Chinook	111,847	# fish	territory estimates consistent with SIT salmon lifecycle model inputs
Flynn juvenile Chinook	67,786	# fish	territory estimates consistent with SIT salmon lifecycle model inputs

Name	Value	Units	Comment
Blackberry juvenile Chinook	176,243	# fish	territory estimates consistent with SIT salmon lifecycle model inputs
Oklahoma juvenile Chinook	128183	# fish	territory estimates consistent with SIT salmon lifecycle model inputs
Rearing Habitat	3	acres	2.68 acres is the average habitat value of all the projects listed here. Range = 0.79 - 4.68 acres.

Deliverables

Deliverables in all years of this project will be coordinated with the CVPIA Data Manager, CVPIA Science Coordinator, and CVPIA Fish Resource Area Coordinator.

Date	Title
Oct. 2021	First site permitted and ready to construct
Mar. 2022	additional sites depend on level of funding allocated
Mar. 2022	First site constructed

Project Management Team

John Hannon (USBR-BDO)
Jim Earley (USFWS – Red Bluff)
Mike Berry (DWR) Ruth Goodfield (NMFS)
Paul Zedonis (USBR-NCAO)

Narrative

Salmonid habitat improvement projects in the upper mid reach of the Sacramento River - Red Bluff to Feather River. Types are side channel habitat improvement and creation, floodplain expansion, and rock revetment removal.

All of these are side channel projects at sites of historic channels now cut off from flows at the most habitat limiting low flow levels. Activities are excavation of material to create perennial rearing habitat and additions of woody material and boulders where appropriate. Incrementally inundated floodplain habitat will be incorporated at sites where the opportunity arises. Projections of fish numbers are territory estimates consistent with SIT salmon lifecycle model inputs.

The following table describes the projects including the proposed management actions.

Project	Rearing Acres	Juveniles
Tier 1		
Mooney	0.79	59,313
Blethen Island	2.59	194,342
Blackberry Island	2.35	176,243
Tier 2		
La Barranca	4.68	350,839
Oklahoma Island	1.71	128,183

Project	Rearing Acres	Juveniles
McClure Creek	3.34	250,808
Foster Island	2.62	196,579
Tier 3		
Altube Island	1.49	111,847
Flynn Unit	0.90	67,786

The projects increase juvenile rearing habitat productivity in the middle Sacramento River reach to move closer to the CVPIA doubling goal.

In FY19 the IATG expanded the scope of its proposed activities, based on SIT priorities, to working in this reach of the river. The 3406(b)(1) authority applies below Red Bluff on the Sacramento River. Coordination has occurred within the interagency group and needs to be expanded to the local communities and counties close to the projects.

There are no known objections. Landowner (USFWS) access may be an issue. Conflicts will be addressed by the appropriate restoration team members as they arise.

Data Management

The PMT Data Steward will coordinate with external partners and biannually with the CVPIA Data Manager on the transmission of long-term monitoring and other pertinent data defined by the SIT and the PMT per the 2020 Data Guidance.

Field data will be recorded on data sheets or directly into a recording device/computer and transferred into a computer spreadsheet or database. The PMT Data Steward will coordinate with the CVPIA Data Manager on the transmission of relevant and pertinent data defined by the SIT and the PMT per the 2020 Data Guidance. Field data, analyses, and reports will be stored and backed up on a PMT computer/server.

Data housed at USBR Bay Delta Office and CVPIA master database.

Risks

Risk	Likelihood	Impact
Lack of landowner agreements	2	2
Unable to get permits	2	2

Cost Estimate

Year	Fund	Total	BOR	FWS
2020	CVPRF	$3,950,000	$3,950,000	$0
2020	WRR	$1,000,000	$1,000,000	$0
2021	CVPRF	$2,600,000	$2,600,000	$0
2022	CVPRF	$2,000,000	$2,000,000	$0

Total Cost: $9,550,000

Internal Agency Resources Table

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
2020								
Implementation								
Agreement	Local non-profit	$1,200,000	1.00	0.00	$1,200,000	BOR	CVPRF	Permitting, design, implementation, and monitoring of second high priority project among Mooney, Blethen, and Blackberry Island.
Labor	USBR labor	$100,000	1.00	0.00	$100,000	BOR	CVPRF	USBR biologists, resource specialists, engineers, surveyors working on the project.
Agreement	Local non-profit	$1,400,000	1.00	0.00	$1,400,000	BOR	CVPRF	Design, permitting, and implementation of top priority project among Mooney Unit, Blethen Island, and Blackberry Island.
Agreement	Local non-profit	$1,000,000	1.00	0.00	$1,000,000	BOR	WRR	Adds additional habitat improvement work at tier 1 priority sites.
Agreement	Local non-profit	$600,000	1.00	0.00	$600,000	BOR	CVPRF	Third site from among Mooney, Blethen, and Blackberry Island. Includes permitting, design, implementation, monitoring.
Agreement	Local non-profit concerned with fish and wildlife enhancement	$650,000	1.00	0.00	$650,000	BOR	CVPRF	Includes the up-front surveys, landowner coordination, and engineering feasibility analysis for top priority habitat improvement sites in this reach. Tier 1 = Mooney, Blethen, Blackberry, Tier 2 = La Barranca , Oklahoma Island, McClure Creek, Foster Island Tier 3 = Altube Island, Flynn Unit
2021								
Implementation								
Agreement	Local non-profit	$2,600,000	1.00	0.00	$2,600,000	BOR	CVPRF	Continued implementation of top priority habitat projects.
2022								
Implementation								
Labor	Local non-profit	$2,000,000	1.00	0.00	$2,000,000	BOR	CVPRF	Continues to implement highest priority habitat improvement projects.

Sacramento River Tributaries Non-Natal Rearing Evaluation and Restoration

Confirm current non-natal use and existing/potential habitat in tributaries along upper Sac River. Identify access issues. Plan and implement restoration on tributaries.

DCN:	20FHRP006
Classification:	Research, Monitoring, Habitat Improvement, Habitat Restoration Minor Sacramento Tributaries
Funding Years:	2020 - 2024
Benefits Start Year:	2021
Priority:	SIT FY2020 Tech Memo: - Winter Run Chinook - Increase access to non-natal tributaries to open habitat in Upper and Upper Mid Sacramento Aug-March All Chinook Runs and Steelhead: Adaptively manage juvenile habitat restoration to allow the evaluation of the effect of habitat restoration on wild juvenile Chinook Salmon survival in the Sacramento River; - Steelhead: Adaptively manage tributary flows, habitat, and/or temperatures to increase the frequency of anadromy
Partners:	NMFS, NRCS, Pacific States Marine Fisheries Commission, River Partners, Sacramento River Forum, Tehama County RCD, Western Shasta Resource Conservation District, CDFW, Family Water Alliance
Related Programs:	Sacramento River Restoration Interagency Advisory Technical Group (IATG)

Authority

Provision	Percentage
(b)(13)	100.0%

Metrics

Name	Value	Units	Comment
Non-natal habitat increase	56,000	square feet	Juvenile rearing habitat increased due to restoration
Habitat assessment	20	number of reports	20 of the most promising streams identified by Maslin (1999) for non-natal rearing.
Juvenile fish habitat use	5	number of fish	Number of fish per square meter which is the density of fish directly observed using restored fish habitat.

Deliverables

Deliverables in all years of this project will be coordinated with the CVPIA Data Manager, CVPIA Science Coordinator, and CVPIA Fish Resource Area Coordinator.

Date	Title
Sep. 2020	Completed study plan
Sep. 2021	Completed annual study report
Sep. 2022	Preliminary restoration project identification
Sep. 2022	Completed annual study report
Mar. 2023	Completed environmental documents and permits, final design, and bid documents
Sep. 2023	Completed conceptual designs
Sep. 2023	Completed annual study report
Sep. 2025	Completed restoration actions
Sep. 2026	Final report

Project Management Team

Tricia Bratcher, CDFW
Matt Johnson, CDFW

Narrative

Non-natal rearing of juvenile Chinook salmon (*Oncorhynchus tshawytscha*) was documented in several intermittent tributaries to the Sacramento River by Maslin and others between 1996 and 1999. Their data showed that juvenile chinook rearing in non-natal tributaries grew faster and were heavier for their length than those rearing in the mainstem Sacramento River. Faster growing fish smolt earlier, and may enter the delta earlier in the year, before low water and pumping degrade rearing habitat. Optimal rearing conditions in the tributaries exist from approximately December through March. By April, conditions may be less favorable as temperatures rise to intolerable levels, and piscivorous fishes enter tributaries to spawn. Juvenile chinook entering the tributaries early in the year, such as winter and spring run, probably derive the most benefit from tributary rearing.

This project will revisit at least 20 of the tributaries (contingent on access permission) thought to be of highest use and potential for restoration by Maslin (1999) in the Upper Sacramento River between Keswick Dam and the Tehama/Butte County boundary to establish (1) extent of juvenile fish use by run and/or species, ; (2) barriers to fish, including impacts of stage levels on the inundation of tributaries by the Sacramento River; (3) potential restoration actions; (4) restoration action; and (5) associated monitoring. The Project will look primarily at existing habitat but will also verify juvenile fish presence/use at appropriate times, as it has been at least 20 years since the Maslin study. Beyond using the info provided by Maslin, we will assess a tributary's "potential" (based upon habitat data collection, stage levels/connectivity to the River, streamflow, acres/miles of potential habitat creation, etc.) for creating additional habitat and prioritize restoration actions. This has not been done before on this scale. If a site/stream is warranted, this will be followed by conceptual designs; final designs; env. documents and permits; construction; and post-project monitoring.

The project directly addresses CVPIA/Final Rest. Plan and 2014 NMFS Recovery goals and actions for the Upper Sacramento River AND Miscellaneous tributaries by identifying baseline non-natal rearing levels and how habitat improvement can increase juvenile fish use of tributaries/increase production. The project will increase rearing habitat for all 4 races of Chinook, and steelhead, and it supported by the SIT and the NMFS Recovery Plan. It will gather information needed to further

refine the DSM and directly addresses FY20 SIT/CT priorities for juvenile rearing (All Runs, Table 18 in the SIT memo, rearing habitat) and winter-run Chinook non-natal rearing needs (Table 18, SIT memo), as well as contribute to the body of knowledge on juvenile use for all runs and steelhead (SIT memo, Table 15). The project will address metric data needs in the realm of juvenile non-natal rearing and health/outmigration success. It will have short-term objective monitoring measures tied to restoration actions but also will provide long-term objective monitoring needs relative to successful management of instream habitat and inundation levels needed on tributaries (from Sacramento River) to provide for juvenile non-natal rearing. It can be used to further understand if and where limiting factors exist for juvenile fish populations as they migrate downstream and how they can be improved. The impacts of NOT doing the proposal will be a loss of opportunity to restore critical habitat for juvenile fish and the uncertainty of what restoration actions are needed, why, and where. There are no known stakeholder objections to the project. Collaboration via the CVPIA b(13) process on the Upper Sacramento River has created a cooperative working relationship on Upper Sacramento River restoration, as has the decades of monitoring by USFWS, CDFW, and others on the River.

Data Management

The PMT Data Steward will coordinate with external partners and biannually with the CVPIA Data Manager on the transmission of long-term monitoring and other pertinent data defined by the SIT and the PMT per the 2020 Data Guidance.

Field data will be recorded on data sheets or directly into a recording device/computer and transferred into a computer spreadsheet or database. The PMT Data Steward will coordinate with the CVPIA Data Manager on the transmission of relevant and pertinent data defined by the SIT and the PMT per the 2020 Data Guidance. Field data, analyses, and reports will be stored and backed up on a PMT computer/server.

A study plan incorporating adaptive management principles is one of the deliverables. Performance metrics are derived from SIT priorities, as well as the data needed for and/or associated with the Decision Support Model effort. "Naturally produced juveniles per natural spawner" and "juvenile diversity index" (Peterson 2014) will be used to refine juvenile rearing observations, densities, etc. The project will contribute to information needed on juvenile biomass (SIT FY20 memo) as it relates to habitat quantities—previous work on Clear Creek has quantified the effect of certain habitat improvement changes.

The project has both short-term objective-specific monitoring elements by providing real time input on habitat condition, as well as long-term trend monitoring elements, as the project can be used to assess trends if/when habitat expansion occurs via a change in operations, restoration, etc. Restored tributaries can also be assessed in the future as it relates to overall fish production.

Program Priority and Comments (Page 1 on the charter)
AFRP Final Rest. Plan, Upper Sacramento River Action 1 (CVP flow regulation/instream flow needs).
AFRP Final Rest. Plan, Upper Sacramento River Action 2 (Develop flow regime to address dewatering and stranding).
AFRP Final Rest. Plan, Misc. tributaries, Action 1 (expand usable rearing habitat)

AFRP Final Rest. Plan, Misc. tributaries, Action 5 (replace bridge/ford combinations to expand usable habitat)
AFRP Final Rest. Plan, Misc. tributaries, Action 6 (Install siphons on irrigation systems to expand habitat)

All Project documents will be stored at www.fws.gov/redbluff/

Risks

Risk	Likelihood	Impact
Access/willingness of owners (Family Water Alliance offered to partner on this)	2	2

Cost Estimate

Year	Fund	Total	BOR	FWS
2020	CVPRF	$397,500	$0	$397,500
2021	CVPRF	$0	$0	$0
2022	CVPRF	$262,000	$0	$262,000
2023	CVPRF	$0	$0	$0
2024	CVPRF	$2,606,000	$0	$2,606,000

Total Cost: $3,265,500

Internal Agency Resources Table

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
2020								
Inventory/ Reconnaissance								
Agreement	3 year agreement	$397,500	1.00	0.00	$397,500	FWS	CVPRF	Fisheries, geomorphology and engineering data collection for three years.
2022								
Design								
Agreement	Agreement	$156,000	1.00	0.00	$156,000	FWS	CVPRF	Restoration action designs
Environmental Compliance and Permitting								
Agreement	Agreement	$106,000	1.00	0.00	$106,000	FWS	CVPRF	Environmental documents and permits
2024								
Implementation								
Agreement	Agreement	$2,500,000	1.00	0.00	$2,500,000	FWS	CVPRF	Implementation of restoration actions such as culvert replacement, barrier removal, or habitat enhancement.
Monitoring								
Agreement	Performance evaluation study	$106,000	1.00	0.00	$106,000	FWS	CVPRF	Evaluation of restoration actions based on fish habitat use, geomorphology, stream flow, passage, or riparian vegetation, depending on the action.

Stanislaus River: Spawning, Side-Channel, and Floodplain Habitat Enhancement Project

Complete design for 2 restoration project site(s), followed by design/planning/implementation to restore spawning/rearing (side-channel) salmon habitats.

DCN:	20FHRP009
Classification:	Habitat Improvement, Habitat Restoration
Location:	Lower Stanislaus River, Stanislaus River
Funding Years:	2019 - 2024
Benefits Start Year:	2020
Priority:	SIT FY2020 Tech Memo: - Increase spawning habitat, Stanislaus River (spring-run) - Maintain spawning habitat in the CVP streams (all-runs) - Increase perennially inundated juvenile habitat, Stanislaus River (fall-run).
Partners:	Cramer Fish Sciences
Related Programs:	CALFED, CVPIA b1, CVPIA b13, NMFS-RP, NMFS-RPAs

Authority

Provision	Percentage
(b)(13)	100.0%

Metrics

Name	Value	Units	Comment
Gravel Augmentation	8,300	cubic yards	1.5 acres were excavated at HB 1, which yielded 89,775 cubic feet of spawning gravel that was placed in the main channel. We assumed that at least 3.7 acres will be excavated which is 2.5 times the acreage at HB 1, so multiplied HB 1 gravel by 2.5 (i.e., 89,775 cubic feet * 2.5 = 224,437.5 cubic feet/27 = 8,312.5 cubic yards, rounded down). The calculation assumes similar excavation depth and similar composition of excavated material as HB 1. The expected amount of material for placement will be refined through development of conceptual plans for each site, and the design for the selected site.
Habitat Restored (Side Channel)	0.75	acres	2,200 ft long X 15 ft wide = 0.75 acres that could support 56,208 fry.
Habitat Created - Juvenile Rearing (In-channel)	0.70	acres	About 0.28 acres of rearing bench habitat was created at HB 1 by placing gravel along the stream margin. Given the greater area of expected excavation, this would translate to an expected 0.7 acres (0.28*2.5) of juvenile rearing habitat created in the main channel that could support 52,461 fry.

Name	Value	Units	Comment
Habitat Restored - Floodplain	1.0	acres	This is a minimum based on preliminary conceptual designs. The actual area will be determined through the design and permitting process with the goal of maximizing the amount of suitable spawning gravel yielded and perennial rearing habitat created. Based on SIT assumption of 27% suitability of the total 3.7 floodplain acres created, this project is expected to yield 1 acre (4047 m^2) of suitable floodplain habitat. The average territory size for fry identified by the SIT is 0.054 m^2/fry so the floodplain created by this project would be expected to support 75,944 fry.
Gravel Augmentation Site	1	number of actions	We anticipate being able to incorporate a permanent gravel augmentation site in the final design. Reclamation desires to add gravel, and to date these efforts have largely been limited to just below Goodwin Dam due to accessibility (private lands and road restrictions).
Spawning Habitat	100	percentage of fish	As described for the previous metric, we expect ~225,000 cubic feet of spawning gravel to be generated by excavation to generate perennial side-channel and seasonal floodplain rearing habitats. If we assume 5 ft. of material may be needed to get to appropriate spawning depths, this equates to ~45,000 sq. ft. (1 acre) of spawning habitat created by the proposed project. Since not all available habitat would be expected to be used, assumed 50% occupancy so ~22,500 sq. ft. Each spawning pair needs ~216 sq. ft. (Burner 1951), so this restoration effort is expected to provide habitat for at least 100 pairs of Chinook salmon. NOTE: These calculations were for the main channel (assumed no new spawning in the side channel) so this is a conservative estimate from that perspective. In the side channel alone at HB 1 we saw 20-40 redds per year. Redd surveys have been conducted annually by FISHBIO since 2007 through funding provided by Tri Dam and the Oakdale and South San Joaquin Irrigation Districts (Districts). This long-term monitoring effort provides more than 10 years of baseline data to describe use of the proposed project area prior to gravel addition, spawning distribution, and rates of redd superimposition over a broad range of spawner abundance. Continued monitoring will track changes in use of the project area and potential changes in spawning distribution and rates of redd superimposition.

Deliverables

Deliverables in all years of this project will be coordinated with the CVPIA Data Manager, CVPIA Science Coordinator, and CVPIA Fish Resource Area Coordinator.

Date	Title
Sep. 2023	Annual Summary Report - Activity and Fiscal Update
Sep. 2022	Annual Summary Report - Activity and Fiscal Update
Sep. 2024	Annual Summary Report - Activity and Fiscal Update
Sep. 2024	Final Report
Jan. 2020	Report - Restoration Site Conceptual Design(s)
Jun. 2020	Construction Design - 60%
Jun. 2021	Construction Design - Basis of Design
Jun. 2021	Permit Report - Completed Permits for 2021
Feb. 2022	Summary Report - Construction ('as-built')
Jun. 2021	Report - Restoration Monitoring Plan
Dec. 2024	Final Report

Project Management Team

J.D. Wikert – USFWS
John Hannon – John Hannon
Andrea Fuller – FISHBIO
Chris Hammersmark – CBEC

Narrative

The project expands the successful Honolulu Bar Floodplain Enhancement Project offering long-term spawning and rearing habitat benefits for Chinook salmon and steelhead. Phase I restored 2.4 acres of salmonid spawning and rearing habitat in 2012. We will develop conceptual plans for Phase II (upstream and on the opposite bank from HB I) and Lovers Leap (about 3 miles upstream), two of the largest and most accessible projects identified in the spawning reach of the Stanislaus River. The project will create spawning, perennial rearing (in-channel and side-channel), and seasonal rearing (floodplain) habitat under contemporary flows. Material excavated will be used onsite for instream restoration, saving money and reducing air pollution, greenhouse gas, fossil fuel use, and road damage. Project objectives include: increasing spawning habitat (> 1 acre); creating perennial side-channel rearing habitat; restoring functional floodplain (>3.7 acres); and restoring native vegetation. We plan to include access for gravel augmentation in perpetuity. Benefit to cost will be determined for each site and the highest value project will be implemented. The conceptual design for the alternate site will be available for future implementation via CVPIA or other funding sources.

The project addresses FY20 Priorities for Chinook salmon (maintain spawning habitat in CVP streams), Spring-run (Increase spawning habitat, Stanislaus River), and Fall-run (increase perennially inundated juvenile habitat in the Stanislaus River). The project also supports NMFS Recovery Plan actions, the AFRP FRP (Stan A2), and OCAP BO RPAs. It addresses the fundamental objectives of abundance, productivity, life history diversity, and spatial structure by increasing spawning habitat, which is currently limiting, and by increasing perennial and seasonal rearing habitats for successful

juvenile rearing. In-channel restoration will reduce available habitat for non-native predatory fish. As noted in the metrics section, we anticipate a minimum of 8,300 cy of gravel added to support 100 spawning pairs of salmon. These additional spawning pairs would produce ~550,000 eggs, and assuming 25% egg-to-fry survival, a potential increase of ~137,5000 fry produced. The 3.7 acres of floodplain and 1.45 acres of perennial rearing habitat (side and main channel) could support 184,663 fry. Totals will vary based on final design. Additionally, this restoration will benefit riparian plant and animal species through creating suitable elevations and seeding/replanting with native species for native pollinators. We have developed a monitoring plan (see Data Management) to detect physical and biological responses to the restored habitat. We will collaborate with the SIT to identify additional parameters to improve the DSM. Costs are informed by previous efforts, and nearly 2/3 of the funding requested is for on-the-ground restoration. We anticipate long-term benefits from gravel augmentation, perennial side-channel, and floodplain construction, and creation of a long-term gravel augmentation access.

OID provided cost-share in the past, and we are pursuing non-CVPIA funds for this project, but do not yet have a firm commitment of funds. The majority of monitoring (for cumulative population level effects) has been, and is expected in the future to be, provided by ongoing annual agreements between FISHBIO and the Districts for lifecycle monitoring. This ongoing monitoring program includes redd surveys that will document the number of spawning pairs using the added gravel. The program also includes weir and rotary screw trap monitoring to inform stock-recruit analyses to quantify cumulative response to management actions.

Data Management

The PMT Data Steward will coordinate with external partners and biannually with the CVPIA Data Manager on the transmission of long-term monitoring and other pertinent data defined by the SIT and the PMT per the 2020 Data Guidance.

Field data will be recorded on data sheets or directly into a recording device/computer and transferred into a computer spreadsheet or database. The PMT Data Steward will coordinate with the CVPIA Data Manager on the transmission of relevant and pertinent data defined by the SIT and the PMT per the 2020 Data Guidance. Field data, analyses, and reports will be stored and backed up on a PMT computer/server.

CVPIA data reporting and sharing guidelines will be followed as applicable. Project designs and as-built survey results will be included in a basis of design report prepared by cbec. Data from pre-project surveys and post-project monitoring will be entered into a database and stored on a computer and backed up to a server within the relevant consulting firm. All data will be shared with the Bureau of Reclamation Bay Delta Office and US Fish and Wildlife Service Lodi Office.

Short-term, objective-specific monitoring is planned to detect physical and biological responses to the restored habitat that can inform the DSMs. To quantify the success of the project in meeting physical design criteria, we will implement: as-built survey of implemented project; continuous water level and temperature monitoring; transect and longitudinal profile surveys or topographic surveys in years following implementation; and surficial sediment characterization. The quantitative objective is to ensure the project was built as designed and is providing the desired habitat types and quality, and to allow the correlation of physical condition to fish utilization. Vegetation will be monitored with

visual observations and permanent photo points to document plant development metrics (e.g., number of species per plant community type; percent survival by species; and percent absolute cover).

The quantitative objective is to recruit 100 spawning pairs annually, as measured during fall redd surveys. Redd surveys have been conducted annually by FISHBIO since 2007 through funding provided by Tri Dam, OID, and SSJID. This long-term monitoring effort provides more than 10 years of baseline data to describe use of the proposed project area prior to gravel addition, spawning distribution, and rates of redd superimposition over a broad range of spawner abundance. Continued, in-kind redd surveys conducted as part of the Districts' lifecycle monitoring program will document increased use of the project area and potential changes in spawning distribution and rates of redd superimposition.

The District's lifecycle monitoring program also provides long-term counts of female spawners from weir operation and juvenile outmigrant abundance estimates from the Oakdale rotary screw trap. Used together these data provide a baseline stock-recruit relationship for juveniles produced per female spawner. This relationship reflects habitat availability and suitability, and currently indicates that there is not enough spawning habitat to support the CVPIA doubling goal. Continued, in-kind rotary screw trap and weir monitoring will provide the data to evaluate changes in the stock-recruit relationship from the collective implementation of all habitat restoration and other actions over time. While the project will contribute to increasing juvenile production at the population level, the project-specific contribution is not likely to be detected in the stock-recruit analysis given that other actions are expected to be implemented over the next several years, many years are needed to confidently detect change, and the expected change in juvenile production may not be large enough to detect given the confidence intervals surrounding the rotary screw trap estimates. The ability to detect a response from restoration may also be affected by the number of escaping adults observed. Presence and relative abundance of juvenile Chinook salmon and steelhead using the newly created side-channel and floodplain areas will be documented by direct sampling (remote cameras, snorkel surveys, seining, electrofishing, fyke nets) in. As these will be newly created, baseline usage of these locations is zero. Invertebrate assemblage monitoring will be conducted with objective is to quantify a response in the salmonid food resources on the floodplain.

Risks

Risk	Likelihood	Impact
Permitting	1	2
Landowner Coordination	1	2

Cost Estimate

Year	Fund	Total	BOR	FWS
2020	CVPRF	$530,530	$0	$530,530
2021	CVPRF			
2022	CVPRF	$1,235,960	$0	$1,235,960

Total Cost: $1,766,490

Internal Agency Resources Table

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
2020								
Administration								
Agreement	Agreement	$20,000	1.00	0.06	$21,200	FWS	CVPRF	
Design								
Agreement	Agreement - Conceptual Design for Project	$210,000	1.00	0.06	$222,600	FWS	CVPRF	
Environmental Compliance and Permitting								
Agreement	Agreement - Permitting	$237,000	1.00	0.06	$251,220	FWS	CVPRF	
Reporting								
Agreement	Agreement - Reporting	$33,500	1.00	0.06	$35,510	FWS	CVPRF	
2022								
Administration								
Agreement	Agreement	$30,000	1.00	0.06	$31,800	FWS	CVPRF	
Construction								
Agreement	Agreement - Construction	$1,007,000	1.00	0.06	$1,067,420	FWS	CVPRF	
Monitoring								
Agreement	Agreement - Monitoring	$97,000	1.00	0.06	$102,820	FWS	CVPRF	
Reporting								
Agreement	Agreement - Reporting	$32,000	1.00	0.06	$33,920	FWS	CVPRF	

Tuolumne River: River Mile 44 Spawning and Rearing Habitat Restoration

Tuolumne River - River Mile 44 Spawning and Rearing Habitat Restoration. Project consists of floodplain grading, floodplain reconnection, gravel processing, and in-channel gravel injection using processed floodplain material.

DCN:	20FHRP001
Classification:	Habitat Improvement, Habitat Restoration
Location:	Bobcat Flat East, Tuolumne River
Funding Years:	2015 - 2020
Benefits Start Year:	2016
Priority:	This on-going project will be complete in 2020. It follows the successful Bobcat Flat restoration project immediately downstream and with the same project partners. The earlier project has shown significant use by adult and juvenile salmonids during spawning and rearing periods and provides highly productive floodplain habitat for juvenile salmonids.
Partners:	Tuolumne River Conservancy
Related Programs:	NMFS-RP, CVPIA b1

Authority

Provision	Percentage
(b)(1)	100.0%

Metrics

Name	Value	Units	Comment
Floodplain Improvement	3	acres	Preliminary conceptual design indicates approximately 3 acres of improved floodplain habitat.
Juveniles utilizing reconnected floodplain rearing habitat	25	percentage of fish	We anticipate increasing floodplain access to 25% of the local production.
Adults utilizing improved spawning habitat	50	percentage of fish	We anticipate increasing spawning habitat availability by 25% and documenting a 50% increase in spawning use in the project reach.
Riparian Corridor Improvements	1	miles	Placeholder; awaiting designs

Deliverables

Deliverables in all years of this project will be coordinated with the CVPIA Data Manager, CVPIA Science Coordinator, and CVPIA Fish Resource Area Coordinator.

Date	Title
Jun. 2017	Environmental Documents and permits
Jun. 2017	Project Designs
Sep. 2018	Construction Summary Report
Sep. 2020	Annual Report

2020 Narrative:

An additional $53,000 is requested to complete environmental permitting. Costs for permitting have expanded considerably over recent years. No CVPIA funding is sought for implementation.

2018 Narrative:

Funding is requested to develop engineering plans and acquire necessary permits. Future funding will be requested to excavate an elevated floodplain to allow it to become inundated at river flows of 1,000 to 2,500 cfs. Excavated cobble will be screened on site to produce roughly 40,000 cubic yards of coarse sediment mix of ¼ to 4-inch material to be placed in the river channel. The project will enhance floodplain and river connectivity, provide off-channel rearing habitat, promote sustainable riparian plant communities, and restore in-stream salmonid spawning and rearing habitat. Estimated increases in habitat resulting from this project include 3 acres of floodplain and four acres of in-stream spawning and rearing habitat.

This project has been developed based on the successful Bobcat Flat Restoration Project (immediately downstream) and is on property owned by the same entities. The landowners and local neighbors are extremely supportive of these efforts and are actively seeking additional funding and in-kind support to ensure high quality projects are completed and monitored.

Links to CVPIA Core Team FY17 priorities:
- Fall-run Chinook: Based on the priorities identified by the SIT, the Core Team agrees that the following are priorities for fall-run Chinook Salmon:

- Improve Juvenile Rearing Habitat - Sacramento, Yuba, Feather, American, Calaveras, Mokelumne, Merced, Tuolumne, Stanislaus and San Joaquin Rivers and the Delta;

Data Management

The PMT Data Steward will coordinate with external partners and biannually with the CVPIA Data Manager on the transmission of long-term monitoring and other pertinent data defined by the SIT and the PMT per the 2020 Data Guidance.

Field data will be recorded on data sheets or directly into a recording device/computer and transferred into a computer spreadsheet or database. The PMT Data Steward will coordinate with the CVPIA Data Manager on the transmission of relevant and pertinent data defined by the SIT and the PMT per the 2020 Data Guidance. Field data, analyses, and reports will be stored and backed up on a PMT computer/server.

Risks

Risk	Likelihood	Impact
Environmental compliance related to riparian vegetation removal/restoration (same process that was permitted at Bobcat Flat will be proposed here)	1	1

Cost Estimate

Year	Fund	Total	BOR	FWS
2016	CVPRF	$137,800	$0	$137,800
2017	CVPRF	$626,163	$0	$626,163
2018	CVPRF	$243,800	$0	$243,800
2019	CVPRF	$3,180	$0	$3,180
2020	CVPRF	$53,000	$0	$53,000

Total Cost: $1,063,943

Internal Agency Resources Table

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
2016								
Design								
Agreement	Agreement # TBD	$130,000	0.45	0.06	$62,010	FWS	CVPRF	Design concepts will be discussed among agreement recipient and CDFW partners in Region 4. Designs will be reviewed at various pre-arranged check-in points and will precede permit application submission.
Environmental Compliance and Permitting								
Agreement	Agreement # TBD	$130,000	0.45	0.06	$62,010	FWS	CVPRF	Permits will be obtained once designs are sufficiently advanced.
Management								
Agreement	Agreement # TBD	$130,000	0.10	0.06	$13,780	FWS	CVPRF	Agreement Management and Deliverables
2017								
Construction								
Agreement	Agreement # TBD	$568,000	1.00	0.06	$602,080	FWS	CVPRF	First year construction activities including floodplain grading and gravel excavation, sorting, and in-stream installation.
Management								
Agreement	Agreement # TBD	$568,000	0.04	0.06	$24,083	FWS	CVPRF	Agreement Management
2018								
Construction								
Agreement	Agreement # TBD	$200,000	1.00	0.06	$212,000	FWS	CVPRF	Second and final year construction activities, barring unforeseen permitting delays or unfavorable environmental conditions.

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
Management								
Agreement	Agreement # TBD	$200,000	0.15	0.06	$31,800	FWS	CVPRF	Agreement Management
2019								
Management								
Agreement	Agreement # TBD	$20,000	0.15	0.06	$3,180	FWS	CVPRF	Agreement Management
2020								
Environmental Compliance and Permitting								
Agreement	Permitting	$50,000	1.00	0.06	$53,000	FWS	CVPRF	

2020 Annual Work Plan Public Draft

Unfunded Charters

Central Valley Project Improvement Act
Title XXXIV of Public Law 102-575

Stanislaus River: Large Scale Gravel Augmentation

Conduct large-scale gravel augmentation, in Goodwin Canyon and other spawning reaches, to support FRCS, SRCS, and steelhead early-life histories.

Classification:	Habitat Improvement, Habitat Restoration
Location:	Goodwin Canyon, Stanislaus River
Funding Years:	2020 - 2025
Benefits Start Year:	2022
Priority:	This proposal supports the overall goal of improving habitat to yield naturally reproducing self-sustaining populations. This project would support the following priorities identified by the SIT for FY20: 1.) Increase perennially inundated juvenile habitat, Stanislaus River (Fall-run Chinook) 2.) Maintain spawning habitat in the CVP streams (all Chinook runs) 3.) Increase spawning habitat, Stanislaus River (Spring-run Chinook)
Partners:	USBR, CDFW, Cramer Fish Sciences, FWS, Oakdale Irrigation District
Related Programs:	BDCP, CALFED, CVPIA b1, CVPIA b13, NMFS-RP, NMFS-RPAs

Authority

Provision	Percentage
(b)(13)	100.0%

Metrics

Name	Value	Units	Comment
Spawning Habitat Created	1500	redds/sq. meter	Up to 150,000 square meters could be directly improved from initial gravel placement. Assuming a redd size of 9 sq. meters this could support over 1,500 Chinook Salmon.
fry	162037	completion	Space for 162,037 additional fry to rear (@0.054 square meter per fry).
b12: Spawning gravel placed cu yds	50000	cubic yards	Approximately 15' depth of gravel placed in canyon to be dispersed by flow.
rearing habitat - fry	4	miles	4 miles of juvenile rearing habitat (6.4km)

Deliverables

Deliverables in all years of this project will be coordinated with the CVPIA Data Manager, CVPIA Science Coordinator, and CVPIA Fish Resource Area Coordinator.

Date	Title
Dec. 2024	Final Report - Post-project Monitoring
Jun. 2021	Initial Report (Pre-project Planning): Sediment Budget
Sep. 2023	Annual 'As-Built' Report/Survey: Post Gravel Augmentation(s)
Sep. 2024	Annual 'As-Built' Report/Survey: Post Gravel Augmentation(s)

Date	Title
Sep. 2025	Annual 'As-Built' Report/Survey: Post Gravel Augmentation(s)
Sep. 2026	Annual 'As-Built' Report/Survey: Post Gravel Augmentation(s)
Dec. 2024	Final Report - Sediment Budget

Project Management Team

FWS - (JD Wikert)
USBR (John Hannon, Elissa Buttermore)
CFS (Rocko Brown, Jesse Anderson)

Narrative

This project will develop and implement large-scale gravel augmentation on the Stanislaus River below Goodwin Dam (and refreshing multiple sites downstream). The project will create additional spawning and rearing habitat, mitigate warm summer temperatures (through providing thermal refugia via hyporheic flow), and increase macroinvertebrate production. The project will develop a sediment budget to guide initial and future gravel injections and provide robust monitoring to inform the SIT DSM and future project planning and design.

Small (b)(13) gravel projects in the canyon have mobilized and created spawning and rearing habitat downstream of injection sites. Recent monitoring regularly documents spring running Chinook adults and collects juveniles sized appropriately to be spring-run origin. The project offers an opportunity to help develop a self-sustaining spring-run Chinook population (NMFS Recovery Plan). The sediment budget will develop a scientific basis for gravel augmentation targets, satisfy stakeholder concerns related to downstream impacts, identify the residual sediment deficit, and develop a maintenance volume.

We will augment 50,000 cubic yards of gravel and cobble over 3-4 years using dump trucks and/or a sluice system as in previous projects. The project will restore up to 4 miles of instream channel, providing spawning area for over 1,500 Chinook pairs (0.9 m/red) and provide in-channel rearing for up to 2.7 million fry (0.054 m2 per fry). The project will replenish previously constructed riffles throughout the spawning reach. Our main effort will occur in Goodwin Canyon (colder temperatures, large capacity to accommodate gravel, high gradient to mobilize gravel). The project will address CVPIA goals (FRP A2), CVPIA Call for Proposals (Chinook: Maintain spawning habitat in CVP streams & Increase perennially inundated juvenile habitat in the Stanislaus River; Spring-Run: Increase spawning habitat, Stanislaus River; Chinook Monitoring: Juvenile tributary survival). The project addresses abundance (FRP doubling), productivity, and life-history diversity metrics for the Stanislaus River and the Central Valley. It also directly addresses the OCAP RPA III.2.1 and RPA III.2.2, and NMFS CV Salmonid Recovery Plan (2.10: 8.2, 48.1, 48.2, 52.3, 59.3). The project addresses the most limiting factor for the watershed: availability of juvenile rearing habitat and added gravel will provide long-term benefit by creating additional spawning and rearing habitat as it mobilizes downstream.

We will develop a monitoring plan in collaboration with the SIT and will inform the DSM by providing data to refine model parameters (gravel mobilization, fish utilization, thermal effects), and will inform management through assessing project costs.

We anticipate this project to be very cost effective as this is the only viable methodology to restore habitat in the inaccessible areas of Goodwin Canyon. The proposed costs are based on recently completed gravel augmentation projects. The project leverages clean spawning gravel from DFW reducing costs.

Most funding will go toward on the ground restoration (and permitting). USBR is in the process of improving the bridge over OID's south-side canal to accommodate gravel trucks (complete ~March 2020).

Failure to implement results in reduced habitat and declining salmonid populations. It is likely impossible to recover spring-run in the watershed without a large-scale effort to restore alluvial habitat within the canyon. USBR will continue to fail to meet 2009 NMFS BO RPA III.2, violating the Endangered Species Act.

There are no known stakeholder objections. OID is supportive.

Data Management

The PMT Data Steward will coordinate with external partners and biannually with the CVPIA Data Manager on the transmission of long-term monitoring and other pertinent data defined by the SIT and the PMT per the 2020 Data Guidance.

Field data will be recorded on data sheets or directly into a recording device/computer and transferred into a computer spreadsheet or database. The PMT Data Steward will coordinate with the CVPIA Data Manager on the transmission of relevant and pertinent data defined by the SIT and the PMT per the 2020 Data Guidance. Field data, analyses, and reports will be stored and backed up on a PMT computer/server.

Short term monitoring will focus on sediment transport relative to flow. Additional monitoring will attempt to assess benefits to local temperature (Ock and Kondolf 2012) using temperature loggers. Ongoing DFW surveys would document utilization of gravel by spring-running Chinook Salmon, and Rotary Screw Trapping at Caswell will provide evidence of juvenile spring-run production.

Long term-monitoring could entail assessing the budget for future annual gravel additions and will assist with acquiring information to obtain necessary permits for future projects. This would be developed in collaboration with the SIT after successful evaluation of the sediment budget. Data would be collected using standardized methods and follow CVPIA protocols where appropriate.

Metrics were calculated using parameters from the DSM.

Contact J.D. Wikert for data.

Risks

Risk	Likelihood	Impact
Loss of access to priority gravel placement sites. This risk is mitigated by collaborating with OID to design and build a new bridge to accommodate dual trailer gravel haulers.	1	1

Cost Estimate

Year	Fund	Total	BOR	FWS
2020	CVPRF	$265,000	$0	$265,000
2021	CVPRF			
2022	CVPRF	$2,226,000	$0	$2,226,000

Total Cost: $2,491,000

Internal Agency Resources Table

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
2020								
Environmental Compliance and Permitting								
Agreement	Agreement - Permitting	$150,000	1.00	0.06	$159,000	FWS	CVPRF	
Research								
Agreement	Grant or Agreement	$100,000	1.00	0.06	$106,000	FWS	CVPRF	Funding for sediment budget analysis.
2022								
Construction								
Agreement	Agreement or Contract	$2,000,000	1.00	0.06	$2,120,000	FWS	CVPRF	
Reporting								
Agreement	Grant or Agreement	$50,000	1.00	0.06	$53,000	FWS	CVPRF	Report summarizing gravel distribution and mobility and providing a sediment budget for the canyon.
Research								
Agreement	Grant or Agreement	$50,000	1.00	0.06	$53,000	FWS	CVPRF	Funding for post-project assessment of gravel distribution in the canyon.

Monitoring Chinook salmon smolt out-migration in the Sacramento River in April and May Using Acoustic Telemetry

Multi-year study of Chinook salmon smolt out-migration survival in the Sacramento River using acoustic telemetry. The out-migration of hatchery and natural-origin Chinook salmon smolts tagged and released in April and May in the Upper Sacramento River will be monitored using an acoustic receiver array to identify high-mortality zones and to relate smolt survival to a suite of covariates, including flow, temperature, route selection, and water year type.

Classification:	Research, Reconnaissance
Location:	Sacramento River: Redding to Colusa, Sacramento Lower Mainstem
Funding Years:	2020 - 2029
Benefits Start Year:	2020
Priority:	1 - The FY20 SIT Memo identifies that improving out-migration survival for all four runs of juvenile Chinook in the upper Sacramento River is a priority. The FY20 SIT Memo also recommends identify high mortality zones, including predator contact points, for all four races of juvenile Chinook salmon on the upper Sacramento River. Pulse flows, Upper Sacramento River Oct-Dec (until May in dry- below normal years)
Partners:	CDFW, NMFS, USBR, USFWS
Related Programs:	CVPIA b1, NMFS-RP

Authority

Provision	Percentage
(b)(15) CAMP	100.0%

Metrics

Name	Value	Units	Comment
Improve Survival	1	number of fish	This evaluation will be used to determine where high losses of Chinook salmon smolt out-migrating in April and May are occurring and to better understand relationships between environmental conditions and out-migration survival in the Sacramento River

Deliverables

Date	Title
Dec. 2021	Bi-Annual Report
Dec. 2023	Bi-Annual Report
Dec. 2025	Bi-Annual Report
Dec. 2027	Bi-Annual Report
Dec. 2029	Bi-Annual Report

Narrative

Recent acoustic tagging studies using hatchery and natural-origin Chinook salmon smolts have shown high mortality occurring in the main-stem Sacramento River between river miles 206 and 144 (roughly Hamilton City to Colusa). However, specific information describing proximate sources and mechanisms of mortality is lacking. Based on rotary screw trap monitoring conducted 1996 through 2010, peak out-migration of spring-run Chinook salmon smolts from Deer and Mill Creek's occurs mid-April through mid-May. These populations represent two of the three remaining viable, independent populations of Central Valley spring-run Chinook salmon. In addition, Coleman National Fish Hatchery (CNFH) releases most of their annual production (approx.13 million fish) of fall-run Chinook salmon smolts in the month of April. CNFH fall-run Chinook mitigate for salmon habitat lost to Shasta dam, and contribute significantly to sport and commercial salmon industries. Obtaining sufficient data on smolt survival in the Sacramento River is needed inform water operations decisions and to provide the AFRP with guidance to design and fund successful restoration projects. Key areas of interest for investigators include identification of high-mortality zones and causation (predation, water quality, etc.), and environmental conditions that result in high or low survival, including flow, temperature, and turbidity.

We propose to implement an acoustic tagging study designed to evaluate spring (April and May) smolt out-migration survival over a multi-year period. A governing Science Technical Team will identify targeted study objectives based on annual conditions, including water year type and Shasta Reservoir storage. Study objectives include evaluating flow management actions such as pulse flows, focused telemetry monitoring at suspected predator contact points (bridge pilings, diversion structures, etc.) and identification of high-mortality zones within upper, middle, and lower Sacramento River regions.

An extensive array of acoustic receivers will be deployed in the main-stem Sacramento River during the study period. Additional receivers will be placed in focused areas of interest (ex. upstream and downstream of diversion structures). When available, natural-origin smolts will be tagged and released. However, we anticipate primarily using CNFH smolts as surrogates due to currently depressed populations of natural-origin spring and fall-run Chinook stocks. Up to 600 smolts will be tagged and released annually. Release group size, timing, and location(s) will be determined annually by the Science Technical Team and based on annual study objectives.

The FY20 SIT Memo identifies that improving out-migration survival for all four runs of juvenile Chinook in the upper Sacramento River is a priority. The FY20 SIT Memo also recommends identify high mortality zones, including predator contact points, for all four races of juvenile Chinook salmon on the upper Sacramento River.

Data Management

We expect that the data gathered during this multi-year period will provide managers with guidance needed to prescribe appropriate flow actions and habitat remedies based on sound science. www.fws.gov/redbluff/afrp.html

Risks

Risk	Likelihood	Impact
Tagging of CNFH Chinook salmon smolts	1	1
Tagging of natural-origin Chinook salmon smolts	1	1

Cost Estimate

Year	Fund	Total	BOR	FWS
2020	CVPRF	$232,320	$0	$232,320
2021	CVPRF	$200,520	$0	$200,520
2022	CVPRF	$200,520	$0	$200,520

Total Cost: $633,360

Internal Agency Resources Table

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
2020								
Management								
Labor	Labor	$50,000	1.00	0.00	$50,000	FWS	CVPRF	Financial assistance to Southwest Science Center for acoustic tagging, and data analysis
Research								
Equipment or Materials	JSAT Receivers	$31,800	1.00	0.00	$31,800	FWS	CVPRF	6 JSATS Receivers @ $5000.00 each
Equipment or Materials	Surgical Supplies	$1,060	1.00	0.00	$1,060	FWS	CVPRF	Misc. surgical supplies including sutures, scalpels, and forceps.
Equipment or Materials	JSATS Tags	$149,460	1.00	0.00	$149,460	FWS	CVPRF	Acoustic tagging and monitoring and maintenance of equipment 600 tags per season @ $235 per tag.
2021								
Management								
Labor	Labor	$50,000	1.00	0.00	$50,000	FWS	CVPRF	Financial assistance to Southwest Science Center for acoustic tagging, and data analysis
Research								
Equipment or Materials	JSATS Tags	$149,460	1.00	0.00	$149,460	FWS	CVPRF	Acoustic tagging and monitoring and maintenance of equipment 600 tags per season @ $235 per tag.
Equipment or Materials	Surgical Supplies	$1,060	1.00	0.00	$1,060	FWS	CVPRF	Misc. surgical supplies including sutures, scalpels, and forceps.
2022								
Management								
Labor	Labor	$50,000	1.00	0.00	$50,000	FWS	CVPRF	Financial assistance to Southwest Science Center for acoustic tagging, and data analysis
Research								
Equipment or Materials	JSATS Tags	$149,460	1.00	0.00	$149,460	FWS	CVPRF	Acoustic tagging and monitoring and maintenance of equipment 600 tags per season @ $235 per tag.
Equipment or Materials	Surgical Supplies	$1,060	1.00	0.00	$1,060	FWS	CVPRF	Misc. surgical supplies including sutures, scalpels, and forceps.

Dye Creek/Shasta Boulevard Bridge Crossing Project

The Dye Creek/Shasta Boulevard Bridge Crossing Project entails the design, permitting, environmental impact analysis and construction of an improved crossing of Shasta Boulevard over Dye Creek.

Classification:	Improvement, Fish Passage
Location:	Dye Creek Shasta Boulevard, Miscellaneous Sacramento Tributaries
Funding Years:	2019 - 2022
Benefits Start Year:	2020
Priority:	1 - This proposal aligns with the following SIT FY20 priority for Winter-run Chinook Salmon: Increase access to non-natal tributaries to open up habitat in Upper and Upper Mid Sacramento Aug-March
Partners:	USFWS, CDFW, Tehama County RCD
Related Programs:	CVPIA b1, NMFS-RP

Authority

Provision	Percentage
(b)(1) AFRP	50.0%

Metrics

Name	Value	Units	Comment
Low water crossing	1	number of improvements	Project would eliminate low water fish passage impediment and undersized culverts to benefit CV Steelhead and Non-natal rearing Winter Chinook Salmon

Deliverables

Date	Title
Oct. 2020	Semi Annual Progress Report
Apr. 2021	Semi Annual Progress Report
Oct. 2021	Semi Annual Progress Report
Apr. 2022	Semi Annual Progress Report
Oct. 2022	Final Project Report

Project Management Team

Jon Barrett, Project Manager
Phone: 530-727-1280 x 102
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Patricia Bratcher, Fish Biologist
Phone: 530-945-4261
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Barry O' Regan, P.E.
Discipline: Principle Engineering
Phone: 916-403-5900
email: boregan@ksninc.com
Role: Civil Engineer KSN, Inc

Narrative

The Dye Creek/Shasta Boulevard Bridge Crossing Project will implement an improved fish passage under Shasta boulevard road crossing of Shasta Boulevard over Dye Creek. The California Wildlife Conservation Board (WCB) is funding $375,000.00 to complete 100% engineering designs, CEQA/NEPA environmental analysis and all permits required to implement construction of a raised road crossing over Dye Creek along Shasta Boulevard.

The current crossing structure has been identified as a passage barrier to Federally listed Steelhead (*Oncorhynchus mykiss*), and potentially Juvenile Spring, Fall and Winter run Chinook Salmon (*Oncorhynchus tshawytscha*) Chinook Salmon from intermittent non-natal rearing habitat between the stream's lower reach and mouth along the Sacramento River to its upper watershed located within The Nature Conservancy's Dye Creek Preserve.

This proposal to implement this project is in line with the 2020 SIT Technical Memo. The SIT tech memo identified using BACI design methodologies for restoration effectiveness monitoring, increasing access to non-natal tributaries in the upper and upper mid Sacramento River which have been shown to be beneficial for multiple runs of juvenile salmonids, identify survival and eliminate the likelihood of juvenile stranding in intermittent streams. This project seeks to address all of these elements.

This proposal will serve as a pilot project to refine methodologies for the larger Central valley wide Non-natal rearing study proposed for 2020.

The project will implement a monitoring design that will clearly demonstrate the effect of the management actions on wild juvenile Chinook Salmon survival through:

A BACI (Before After Control Impact Study) design to identify changes from pre-project conditions to post project restoration.

Measure how many fish of which runs (through genetics) are present before and after.
Identify survival characteristics (i.e. PIT tags, arrays, etc) to determine movement and access or standing levels.

Funding is requested for Pre/Post Monitoring for 2020 and Implementation for 2021.

AFRP working Paper Volume 3:
Miscellaneous Sacramento River Tributaries
Action 5: Replace bridge/ford combinations with bridges or larger culverts.
Objective: Expand the usable habitat in some tributaries.
Location: Central Valley reaches of rearing tributaries that have bridge/ford crossings.
Some rearing tributaries have low road crossings, usually constructed of concrete with small culverts so that low flows pass through the culverts at high velocity and higher flows spill over the road bed (e.g., Elder Creek by TCC, Dye Creek at Shasta Boulevard.) The high velocity and turbulence of water passing through these culverts prevent juvenile Chinook salmon from migrating further upstream, sometimes blocking access to miles of channel suitable for rearing.

This proposal would implement the project designed under the WCB grant.
Deliverables in all years of this project will be coordinated with the CVPIA Data Manager, CVPIA Science Coordinator, and CVPIA Fish Resource Area Coordinator.

Data Management

Data will be maintained and reports submitted to USFWS at https://www.fws.gov/redbluff/afrp.html. The PMT Data Steward will coordinate with external partners and biannually with the CVPIA Data Manager on the transmission of long-term monitoring and other pertinent data defined by the SIT and the PMT per the 2020 Data Guidance.

Field data will be recorded on data sheets or directly into a recording device/computer and transferred into a computer spreadsheet or database. The PMT Data Steward will coordinate with the CVPIA Data Manager on the transmission of relevant and pertinent data defined by the SIT and the PMT per the 2020 Data Guidance. Field data, analyses, and reports will be stored and backed up on a PMT computer/server.

This project will support efforts of improving access for non-natal rearing juvenile Chinook salmon as identified in the SIT FY20 Call for Project Proposals. Recent studies by Phillis C.C., Anna M. Sturrock, Rachel C. Johnson and Peter K. Weber 2018 Endangered winter-run Chinook salmon rely on diverse rearing habitats in a highly altered landscape; has highlighted the importance of Sacramento River Tributaries for non-natal rearing of Winter Chinook. Additionally, studies conducted from 1996-2000 by Maslin et al. CSU Chico on Intermittent Streams as Rearing Habitat for Sacramento River Chinook Salmon identified Dye Creek as an important stream for non-natal rearing of all runs of Chinook.

Data produced by this project will be used in the development of a sub-module of the Science Integration Team's Salmon Decision Support Model(s). The Project Management Team Leader will coordinate with the CVPIA Science Coordinator on the development and submission of a SIT DSM Modification Proposal (Using the standard proposal template), as well as ensure progress on completing the sub-module in cooperation with the Science Integration Team.

Risks

Risk	Likelihood	Impact
Cost Share not approved	1	1

Cost Estimate

Year	Fund	Total	BOR	FWS	DFW
2020	Other	$401,000	$0	$0	$401,00
2020	CVPRF	$30,000		$30,000	
2021	CVPRF	$373,000	$0	$373,000	$0

Total Cost: $804,000

Internal Agency Resources Table

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
2020								
Administration								
Agreement	Ca Wildlife Conservation Board	$44,415	1.00	0.00	$44,415	DFW	Other	WCB Grant for Wildlife Corridor and Fish Passage Program
Environmental Compliance and Permitting								
Agreement	Ca Wildlife Conservation Board	$330,585	1.00	0.00	$330,585	DFW	Other	WCB Grant for Wildlife Corridor and Fish Passage Program
Monitoring								
	Project Pre/Post Monitoring	$30,000	1.0	0.00	$30,000	FWS	CVPRF	Pre/Post Monitoring
Management								
Agreement	Ca Wildlife Conservation Board	$26,000	1.00	0.00	$26,000	DFW	Other	WCB Grant for Wildlife Corridor and Fish Passage Program
2021								
Implementation								
Agreement	Implementation and Construction	$373,000	1.00	0.00	$373,000	FWS	CVPRF	Project implementation of as built 100% design

Battle Creek Stream Surveys and Temperature Monitoring

Monitor the distribution of adult spring and winter Chinook spawning, along with water temperatures, streamflow, and egg-to-fry survival.

Classification:	Performance Monitoring, Habitat Restoration
Location:	40.356282, -121.175144, Battle Creek
Funding Years:	2019 - 2023
Benefits Start Year:	2019
Priority:	1 - FY20 monitoring priorities: Water temperature statistics; egg to fry survival; adult population estimates; juvenile tributary survival; and, hatchery origin adult returning. Evaluate FY20 science-based priorities including: Improve adult and juvenile passage on Battle Creek.
Partners:	PG&E, USBR, Battle Creek Working Group, CDFW, NMFS
Related Programs:	AFRP

Authority

Provision	Percentage
(b)(1) AFRP	100.0%

Metrics

Name	Value	Units	Comment
Egg to fry survival	100	percentage of fish	Identify redds to determine the percentage of fish that successful spawned and survived to emergence
Water quality	46	miles	Water temperatures within the Battle Creek Watershed
Spawning habitat	46	miles	Suitable habitat for spring and winter-run Chinook Salmon within the Battle Creek Restoration Project area
Juvenile and adult survival	100	percentage of fish	Survival rates of diverse juvenile and adult life-history strategies
Hatchery Influence	1500	number of fish	Genetically analyze tissue samples to determine hatchery influence on the Battle Creek spring-run populations, and identify the run of chinook necessary for population abundance estimates

Deliverables

Date	Title
Sep. 2021	2020 Battle Creek Adult Report
Sep. 2022	Final Report - Otolith Microchemistry and Life-history analysis
Sep. 2022	Final Report - Genetic Analysis
Sep. 2022	2021 Battle Creek Adult Report

Date	Title
Sep. 2023	2022 Battle Creek Adult Report

Narrative

This program monitors the spatial and temporal distribution of adult spring (and potential winter-run) Chinook Salmon spawning within the Battle Creek Restoration Project area. Environmental factors that affect the survival of adult and juvenile spring Chinook are also monitored. Bio-samples (tissue and ololith samples) are collected from adult carcasses that are encountered. This monitoring is not funded through RPA monitoring, but is essential for adaptive management of the Battle Creek watershed and population estimates used by the SIT SDM. This project has been previously funded by Iron Mountain Mine Trustee council, which no longer has funding and we seek funds for FY20-23.

Adult escapement and juvenile production monitoring, funded by the BOR evaluates overall performance of the Restoration Project but does not provide important information needed to adaptively manage the Restoration Project to maximize the recovery of listed salmonids. The Adaptive Management Plan for the Battle Creek Salmon and Steelhead Restoration Project requires that we understand the distribution of salmonids within the Project's boundaries and collect environmental data at those locations. The redd distribution survey will provide this information for spring and winter-run Chinook salmon and contribute greatly to the long-term success of the project. Environmental data collected through this project informs management decisions and is used to evaluate the success of restoration actions.

Results from the redd distribution snorkel surveys will be analyzed and presented in an annual reports. Results will also be presented at regular meetings of the Adaptive Management Technical Team and be a significant part of the annual Adaptive Management Report as required under the Battle Creek Memorandum of Understanding. Staff with expertise in GIS will analyze and present data in a geographic spatial format. Water temperatures will be modeled for each individual redd to estimate temperature effects on egg incubation. Redd count data will be combined with adult escapement and juvenile production estimates to produce survival metrics such as "number of redds created per adult female" and "number of juveniles produced per redd." Environmental data (e.g., flow, water temperatures, snow pack, climate, etc.) will be analyzed for correlation with survival metrics to inform the adaptive management process.

Genetic and otolith analyses will provide information on the life history of the fish that return to Battle Creek and provide information on whether the Wildcat Dam removal and instream flow alterations increased the returns. Genetic, otolith, and scale samples have been collected from carcasses found during our snorkel surveys. A contract would be executed between RBFWO and the National Marine Fisheries Service for otolith analysis. The otoliths could be used to determine the stream of origin and the juvenile residency at the various locations along their emigration to the ocean. The genetic samples would be analyzed for Genetic Stock Identification by the FWS Abernathy Fish Technology Center. These biological samples (genetics and otoliths) have been collected on stream surveys funded by IMM and CDFW. While some of our previously collected genetic samples have been analyzed (2001-2014), otoliths have not.

Data Management

This project follows the monitoring protocol outlined in the Battle Creek Adaptive Management Plan, which includes population, habitat, and passage objectives. This monitoring meets the following priorities listed in FY20 call for charters: egg to fry survival and adult population estimates. In addition, this project includes a otolith microchemistry and genetics component, which will help to inform questions regarding the following monitoring priorities: juvenile tributary survival; hatchery origin adult returning; and, hatchery origin influence reproduction.

All Battle Creek data are stored in a database maintained by USFWS staff at the Red Bluff Fish and Wildlife Office. Annual reports are available on the RBFWO website. Additionally, all data and associated project documents (permits and reports) will be stored on a computer hard drive and backed up on an agency server. Final reports completed by other entities will also be posted on the RBFWO website and data stored on the agency server.

Risks

Risk	Likelihood	Impact
Work is not completed because of lack of funding	2	2

Cost Estimate

Year	Fund	Total	BOR	FWS
2020	CVPRF	$509,284	$0	$509,284
2021	CVPRF	$250,837	$0	$250,837
2022	CVPRF	$253,423	$0	$253,423

Total Cost: $1,013,543

Internal Agency Resources Table

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
2020								
Monitoring								
Labor	Fish Biologist	$243,957	0.96	0.06	$248,251	FWS	CVPRF	Estimate reproductive success of adult spring and winter-run Chinook that have immigrated into the Battle Creek Restoration Project area, recover biological information from carcasses encountered during surveys, and collect environmental data.
Research								
Agreement	Otolith and Water Microchemistry	$107,341	1.00	0.00	$107,341	FWS	CVPRF	Contract with NMFS and UC Davis to complete otolith microchemistry analyses on otoliths collected from adults that returned and successfully spawned in Battle Creek
Agreement	Genetic Analysis	$153,692	1.00	0.00	$153,692	FWS	CVPRF	Contract with FWS Abernathy Fish Technology Center to analyze tissue samples and continue with previous efforts to develop baseline information for returning adults to Battle Creek.
2021								
Monitoring								
Labor	Fish Biologist	$243,957	0.97	0.06	$250,837	FWS	CVPRF	Estimate reproductive success of adult spring and winter-run Chinook that have immigrated into the Battle Creek Restoration Project area, recover biological information from carcasses encountered during surveys, and collect environmental data.
2022								
Monitoring								
Labor	Fish Biologist	$243,957	0.98	0.06	$253,423	FWS	CVPRF	Estimate reproductive success of adult spring and winter-run Chinook that have immigrated into the Battle Creek Restoration Project area, recover biological information from carcasses encountered during surveys, and collect environmental data.

Supplementation of marine derived nutrients in High Elevation Central Valley Spring Run Streams

Increase the physical condition and survival of wild Central Valley Spring run juveniles by supplementation of marine-derived nutrients into their natal streams.

Classification:	Improvement, Other Habitat Restoration
Location:	High elevation Deer Creek sites with truck access, Deer Creek
Funding Years:	2019 - 2022
Benefits Start Year:	2020
Priority:	2 - SIT Priority for improving habitat for juvenile Spring-run Chinook in Deer Creek. Tier 1 Monitoring Priority (Juvenile tributary survival)
Partners:	CDFW, Pacific States Marine Fisheries Commission
Related Programs:	AFRP

Authority

Provision	Percentage
(b)(1) AFRP	100.0%

Metrics

Name	Value	Units	Comment
Stream miles monitored	32	miles	This project will improve the productivity and carrying capacity of perennially inundated Spring run rearing habitat in Deer Creek. The results can be applied to other Spring run tributaries with depressed populations, such as Mill, Battle, and Clear Creeks.
Juvenile condition increased	1	condition	This project will increase the condition and robustness of Spring run juveniles in a before-after-control-impact study design
Juvenile population increased	300000	number of fish	This project will increase rearing habitat capacity and the number of fish surviving to outmigration.

Deliverables

Date	Title
Sep. 2022	Annual report
Sep. 2023	Annual report
Sep. 2021	Annual report

Narrative

This project intends to increase the productivity of rearing habitat for juvenile Spring run Chinook salmon in the upper Deer Creek watershed by supplementation of marine-derived nutrients (MDN) near that of historic population levels.

There is a strong positive correlation observed in freshwater survival and condition factor of migrating juvenile Chinook. It is possible that Spring run juveniles rearing in high elevation streams such as Mill and Deer Creeks can benefit from supplementation of marine-derived nutrients in an effort to compensate for the loss of food abundance as a result of sustained low numbers of spawning adult salmon. This deficit of marine-derived nutrition can negatively influence the overall productivity of the rearing habitat of their natal stream, and in turn reduce the carrying capacity of these watersheds.

Restoration of Chinook salmon populations to historic levels are capped by the carrying capacity of the ecosystems upon which they depend. Supplementation of marine-derived nutrients may help increase the productivity of natal spring run tributaries to allow for an increased carrying capacity of juvenile fish, closer to that of historic levels.

This project plans to supplement Deer Creek with 2,000 – 3,000 Chinook salmon carcasses obtained from Coleman National Fish Hatchery, at six locations within the current spawning range of wild Spring run Chinook for three consecutive years. Condition factor will be measured from juvenile Spring run salmon collected at rotary screw traps in lower Deer Creek. This data will be compared to historic condition factors collected in Deer Creek from 2002-2018. Deer Creek data will also be compared to condition factors collected from Spring run juveniles collected in rotary screw traps on Mill Creek, which will serve as a control for this study. Before-After-Control-Impact (BACI) test will be used to compare data collect from each group.

The work for this project will be conducted through a cooperative agreement with USFWS and PSMFC with assistance from CDFW.

SIT Tech memo priorities:

1. Spring run - Increase perennially inundated juvenile habitat, Deer Creek – study and food supplementation enhances the benefits created by additional habitat and increased stream flows.
2. All runs - Adaptively manage juvenile habitat restoration to allow the evaluation of the effect of habitat restoration on wild juvenile Chinook salmon survival in the Sacramento River. Deer Creek is a key spring-run stream, as well as a key tributary/watershed for steelhead and fall-run Chinook.

This project meets NMFS CV Spring run Recovery plan objective for Deer Creek DEC-2.12 and DEC-2.8 (Action Priority 2).

Data Management

Project addresses the SIT Priority of Juvenile Tributary Survival. The project has both short- and long-term monitoring elements. STOS monitoring will include fish response to food augmentation. Condition factor will be measured from juvenile Spring run salmon collected at rotary screw traps in lower Deer Creek. This data will be compared to historic condition factors collected in Deer Creek from 2002-2018. Deer Creek data will also be compared to condition factors collected from Spring run juveniles collected in rotary screw traps on Mill Creek (the CONTROL). Before-After-Control-Impact (BACI) test will be used to compare data collect from each group.

Performance metrics associated with juvenile survival and instream habitat quality are related to DSM and Peterson (2014) elements and are integrated into the monitoring plan.
The final reports for this project will be available at:
http://www.calfish.org/Programs/ProgramIndex/CDFGUpperSacRiverBasinSalmonidMonitoring/tabid/222/Default.aspx

Risks

Risk	Likelihood	Impact
Annual snowpack and rainfall will determine river stage and annual opportunity for data collection.	2	1

Cost Estimate

Year	Fund	Total	BOR	FWS
2020	CVPRF	$75,000	$0	$75,000

Total Cost: $75,000

Internal Agency Resources Table

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
2020								
Implementation								
Agreement	Agreement with PSFMC	$75,000	1.00	0.00	$75,000	FWS	CVPRF	Three-year agreement with SFMC

Effect of Dam Operations on Upper Sacramento River Winter Chinook Habitat

Evaluate and quantify the effect that managed flow regimes have on Juvenile Winter run Chinook salmon habitat in the Upper Sacramento River.

Classification:	Research, Instream Flows
Location:	Upper Sacramento River, Sacramento Upper Mainstem
Funding Years:	2020 - 2024
Benefits Start Year:	2020
Priority:	2 - SIT Priority for 1) All runs - Increase perennially inundated juvenile habitat, Sacramento River above the American River confluence; 2) All runs - Adaptively manage juvenile habitat restoration to allow the evaluation of the effect of habitat restoration on wild juvenile Chinook salmon survival in the Sacramento River, by determining optimal channel elevation for restoration projects.
Monitoring Priority:	juvenile in-channel rearing habitat. This project also meets 2014 NMFS CV Salmon and Steelhead Recovery Plan objective for Sacramento River mainstem, SAR-1.4 (Action Priority 1): Develop and implement a river flow management plan for the Sacramento River downstream of Shasta and Keswick dams that considers the effects of climate change and balances beneficial uses with the flow and water temperature needs of winter-run Chinook salmon, spring-run Chinook salmon, and steelhead. The flow management plan should consider the importance of instream flows as well as the need for floodplain inundation.
Partners:	CDFW, Pacific States Marine Fisheries Commission
Related Programs:	No Data.

Authority

Provision	Percentage
(b)(1) AFRP	75.0%
(b)(2) Dedicated Yield	25.0%

Metrics

Name	Value	Units	Comment
Amount of juvenile rearing habitat	500000	square feet	Evaluation will establish current habitat availability and changes resulting from flow management.

Deliverables

Date	Title
Sep. 2021	Annual Report
Sep. 2022	Final Report

Narrative

The purpose of this study is to examine the effect that Central Valley Project operations have on designated critical habitat of winter-run Chinook salmon (*Oncorhynchus tshawytscha*) (winter-run) in the upper Sacramento River. Specifically, this study intends to evaluate and quantify reductions in the amount of suitable habitat available to the egg to fry life-stage of juvenile winter-run following flow reductions in the fall and early winter months that are related to operational changes of Shasta Reservoir.

Typical operation of Shasta Reservoir and the flow of the Sacramento River from Keswick Dam includes a reduction (ramping down) of high summer flows at the end of irrigation season. Beginning in the early fall, flows are decreased following a ramping rate based on end of September Shasta Reservoir storage levels, the protection of shallow-water winter-run redds, salinity in the Delta, and fall agricultural demands (NMFS, 2011). Flow reductions continue until a current minimum base flow of 3,250 cfs is reached (typically between December and March), and this base flow is typically maintained through the winter unless flows are increased for Shasta Reservoir flood control.

This study will investigate any impacts to fry-stage and fry-stage juvenile winter-run habitat due to flow reductions that occur from August to February by mapping areas lost to juvenile rearing during drops in river flows. This time period reflects both critical operational changes in Shasta Reservoir portion of Central Valley Project operations, as well as critical life stage for winter-run in the Sacramento River. There will also be (co)incidental information on impacts to fry-stage juvenile fall-run Chinook habitat as the study period overlaps the timing of fall-run emergence/fry stage and the typical maintenance of a minimum base flow of 3,250 cfs into March in dry to normal years.

The work for this project will be conducted through a cooperative agreement with USFWS and PSMFC with assistance from CDFW.

Data Management

The final reports for this project will be available at: http://www.calfish.org/Programs/ProgramIndex/CDFGUpperSacRiverBasinSalmonidMonitoring/tabid/222/Default.aspx and at the Red Bluff FWO office.

A study plan is one of the deliverables. Performance metrics are derived from SIT priorities (e.g. juvenile rearing habitat), as well as the data needed for and/or associated with the Decision Support Model effort.

The project will contribute to information needed on juvenile biomass (SIT FY20 memo) as it relates to habitat quantities—previous work on Clear Creek has quantified the effect of certain

(instream) habitat improvement changes…creating additional habitat for juvenile fish can pull upon that experience to assess level of benefit.

The project has both short-term objective-specific monitoring elements by providing real time input on habitat condition, as well as long-term trend monitoring elements. The project can be used to assess trends if/when habitat expansion occurs via a change in operations, restoration, etc. and level of fish response. Restored areas can also be assessed in the future as it relates to overall fish production, potentially via methods such as snorkeling of JSAT technology.
Contact information: Ryan Revnak and Doug Killam, Region 1 CDFW Jim Earley USFWS.

Risks

Risk	Likelihood	Impact
Lack of range of flows to analyze	1	2
Funding reductions	1	2

Cost Estimate

Year	Fund	Total	BOR	FWS
2020	CVPRF	$95,400	$0	$95,400

Total Cost: $95,400

Internal Agency Resources Table

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
2020								
Research								
Agreement	Agreement	$15,900	1.00	0.00	$15,900	FWS	CVPRF	Analyze spatial data and quantify the amount of habitat at each flow.
Agreement	Agreement	$79,500	1.00	0.00	$79,500	FWS	CVPRF	Collect GIS and spatial habitat data throughout the year, during four different flow regimes and at multiple sites

Develop a Methodology for Rockwad Habitat Design

Establishes a simplified design procedure for rockwad habitat through hydrodynamic modeling, physical experiments, and fish behavior algorithms. Full installation of rockwad habitat design planned in future charter.

Classification:	Improvement, Refugia
Location:	Sacramento-San Joaquin basin, Delta (throughout), Sacramento Upper Mainstem
Funding Years:	2019 - 2021
Benefits Start Year:	2019
Priority:	1 - Increase perennially inundated juvenile habitat, Sacramento River above the American River confluence; increase seasonally inundated habitat at 2-yr. frequency, Sacramento River above American River confluence; increase rearing habitat in Central Delta, Delta; increase perennially inundated juvenile habitat, Lower San Joaquin River
Partners:	TSC, USACE, USFWS
Related Programs:	Reclamation S&T

Authority

Provision	Percentage
3406 (g)	60%
Science & Technology (USBR-Denver)	40%

Metrics

Name	Value	Units	Comment
Rockwad Design Guidelines	0	N/A	To be established with hydrodynamic modeling and fish behavior algorithms
Juvenile Rearing Habitat	0	acres	To be determined with hydrodynamic modeling and fish behavior algorithms

Deliverables

Date	Title
Sep. 2022	Technical Memorandum of Design Procedures
Mar. 2020	Hydrodynamic Modeling Plan
Sep. 2021	Progress Report

Deliverables in all years of this project will be coordinated with the CVPIA Data Manager, CVPIA Science Coordinator, and CVPIA Fish Resource Area Coordinator.

Project Management Team

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Narrative

1. This project develops a design method for creating juvenile habitat using rockwads. A rockwad is a tree trunk (with root cluster) anchored to a large boulder. The boulder and root mass provide velocity and predator refugia, allowing juveniles to safely rest and eat during their emigration. Key elements in the design process include hydrodynamic simulations, physical models, and fish behavior algorithms. Full implementation of a rockwad design planned in a future charter.
2. Increase perennially inundated juvenile habitat, Sacramento River above the American River confluence. The proposed design method is also applicable on other rivers.
3. A prototype rockwad will be graphically rendered in AutoCAD using structure from motion (SfM) and terrestrial LiDAR scanning techniques. Then it will be placed into a large flume, where the velocity field can be evaluated. The physical modeling in the flume will provide the calibration and validation data for 2D and 3D numerical models. These models include Sedimentation and River Hydraulics—Two-Dimensional (SRH-2D) and Unsteady and Unstructured Reynolds Averaged Navier-Stokes (U2RANS), respectively. Both SRH-2D and U2RANS will be used to simulate the hydraulic conditions around the rockwad within the geometry of the flume. The hydrodynamic model results will be imported into the Eulerian- Lagrangian Agent Method (ELAM) tool to evaluate fish behavior around the rockwad. As 3D modeling is impractical on the reach scale, a simplifying relationship will be developed between SRH-2D and U2RANS models. Following these physical and numerical results of a single rockwad, SRH-2D models will be developed along a study reach with several alternative rockwad placement patterns. These models will be evaluated with ELAM to identify the most successful rockwad quantity, sizes, and arrangements as indicated by the fish behavior algorithm.

4. Increases juvenile habitat in the Sacramento River, San Joaquin River, and Delta system by providing a new design methodology.
5. The product of this charter will be a technical memorandum describing a simplified design procedure for rockwad habitat. We predict that the availability of this design document will increase the construction of rockwad habitats in the Sacramento River, San Joaquin River, and Delta System. In the long term, we predict that these projects will lead to a more continuous sequence of velocity and predator refugia, and as a result, the size and survival rates of out-migrating juveniles will increase.
6. The majority of the funding for this project will support physical and numerical modeling tasks. While the physical experiments are a main cost driver, they benefit the project by ensuring that the models produce results consistent with field conditions. This project is intended as an investment, as the resulting technical memorandum will provide a streamlined approach for future habitat work. Cost-saving opportunities include: anticipated funding from Reclamation's Science and Technology Program and choosing study reach based on the availability of bathymetric data.
7. The fundamental objective of this project is to increase the availability of habitat for out-migrating juveniles. This design approach is intended to reduce mortality from disease (stress), predation, and inadequate feeding opportunities. Methods will be tested using the fish behavior algorithms to verify that proposed rockwads are utilized by juveniles.
8. This project will provide estimates of velocity and predator habitat along a study reach. In a future charter, the rockwad habitat design will be implemented, and monitoring data will be available to import into DSM.
9. This project is fundamental to reducing the mortality rate of out-migrating juveniles. If not implemented, the shortage of velocity and predator refugia will continue to limit the success of juvenile emigration.
10. No stakeholder objections at this time.

Data Management

1. The objective of this research is to develop a method for increasing velocity and predator habitat with the anticipated result of increasing juvenile out-migration success. Expected findings include the amount of habitat area provided by a single rockwad, as well as design recommendations for placement patterns to achieve optimum habitat gain. Full implementation of the resulting rockwad design is planned in a future charter. Long-term pre- and post-project monitoring plans will be presented in that charter.

2. The PMT Data Steward will coordinate with external partners and biannually with the CVPIA Data Manager on the transmission of long-term monitoring and other pertinent data defined by the SIT and the PMT per the 2020 Data Guidance.

   Field data will be recorded on data sheets or directly into a recording device/computer and transferred into a computer spreadsheet or database. The PMT Data Steward will coordinate with the CVPIA Data Manager on the transmission of relevant and pertinent data defined by the SIT and the PMT per the 2020 Data Guidance. Field data, analyses, and reports will be stored and backed up on a PMT computer/server.

Hydrodynamic models, AutoCAD drawings, and progress reports will be archived in the Design and Construction Branch in the Mid-Pacific Regional Office (MPRO). Fish behavior models and physical model results will be archived by the USACE's Engineer Research and Development Center (ERDC). Design procedures will be published in a technical memorandum available on USBR internet site.

Data produced by this project may be used in the development of a sub-module of the Science Integration Team's Salmon Decision Support Model(s). The Project Management Team Leader will coordinate with the CVPIA Science Coordinator on the development and submission of a SIT DSM Modification Proposal (using the standard proposal template), as well as ensure progress on completing the sub-module in cooperation with the Science Integration Team.

3. Contact: Jenna Paul (USBR-MPRO), Dave Smith (USACE-ERDC), Mark Gard (USFWS)

Risks

Risk	Likelihood	Impact
3D Rendering of rockwad not compatible with hydrodynamic model	2	2
Inter-agency collaboration challenges	1	2

Cost Estimate

Year	Fund	BOR	FWS	Total
2020	CVPRF	$290,000	$0	$290,000
2020	S&T	$155,000	$0	$155,000
2021	CVPRF	$110,000	$0	$110,000
2021	S&T	$70,000	$0	$70,000
2022	S&T	$25,000	$0	$25,000

Total Cost: $650,000

Internal Agency Resources Table

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
2020								
Management								
Labor	Project Manager/ Engineer	$10,000	1	0	$10,000	BOR	CVPRF	Manage project through inter-office coordination, scheduling, reporting, budget monitoring, and other miscellaneous tasks.
Research								
Agreement	Ecologist	$150,000	1	0	$150,000	BOR	CVPRF	Simulate a variety of natural flow conditions in a large flume with prototype rockwad. Measure velocity field and other hydraulic data around prototype rockwad. Anticipated cost share with S&T Program.
Agreement	Ecologist	$70,000	1	0	$70,000	BOR	S&T	
Research								
Labor	Drafting Technician	$40,000	1	0	$40,000	BOR	CVPRF	Develop point clouds of a prototype rockwad with Structure from Motion (SfM) and Terrestrial LiDAR Scanning techniques. Render a 3D solid of the rockwad in AutoCAD.
Research								
Labor	Hydraulic Engineer	$50,000	1	0	$50,000	BOR	CVPRF	Develop 3D hydrodynamic model (U2RANS) to simulate conditions of the prototype rockwad in the flume. Calibration and validation data obtained from the physical experiments. Anticipated cost share with S&T Program.
Labor	Hydraulic Engineer	$20,000	1	0	$20,000	BOR	S&T	
Research								
Labor	Hydraulic Engineer	$25,000	1	0	$25,000	BOR	CVPRF	Develop 2D hydrodynamic model (SRH-2D) to simulate conditions of the prototype rockwad in the flume. Calibration and validation data obtained from 3D results. Anticipated cost share with S&T Program.
Labor	Hydraulic Engineer	$37,500	1	0	$37,500	BOR	S&T	
Research								
Labor	Ecologist	$15,000	1	0	$15,000	BOR	CVPRF	

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
Labor	Ecologist	$15,000	1	0	$15,000	BOR	S&T	Use ELAM approach to simulate fish behavior around the rockwad for hydraulic conditions modeled in the physical experiments, SRH-2D model, and U2RANS model. Anticipated cost share with S&T Program.
Research								
Labor	Fisheries Scientist	$12,500	1	0	$12,500	BOR	S&T	Advise rockwad rendering, physical experiments, and modeling.
2021								
Design								
Labor	Drafting Technician	$10,000	1	0	$10,000	BOR	CVPRF	Produce bathymetric/topographical surface for hydraulic model and draft design drawing.
Design								
Labor	Ecologist	$35,000	1	0	$35,000	BOR	CVPRF	Use ELAM approach to simulate fish behavior in the study reach. ELAM simulations based on output from 2D hydrodynamic models of various rockwad habitat designs. Anticipated cost share with S&T Program.
Labor	Ecologist	$17,500	1	0	$17,500	BOR	S&T	
Design								
Labor	Hydraulic Engineer	$55,000	1	0	$55,000	BOR	CVPRF	Develop 2D hydrodynamic models (SRH-2D) to evaluate several rockwad habitat designs within a study reach. Determine optimum size, quantity, and placement pattern. Anticipated cost share with S&T Program.
Labor	Hydraulic Engineer	$37,500	1	0	$37,500	BOR	S&T	
Design								
Labor	Hydraulic Engineer	$5,000	1	0	$5,000	BOR	S&T	Review hydraulic models.
Design								
Labor	Fisheries Scientist	$10,000	1	0	$10,000	BOR	S&T	Advise development of rockwad design alternatives, hydraulic modeling, and fish behavior simulations.
Management								
Labor	Project Manager/ Engineer	$10,000	1	0	$10,000	BOR	CVPRF	Manage project through inter-office coordination, scheduling, reporting, budget monitoring, and other miscellaneous tasks.

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
2022								
Design								
Labor	Project Manager/ Engineer	$25,000	1	0	$25,000	BOR	S&T	Write final technical memorandum.

San Joaquin River: Sturgeon Bend White Sturgeon Spawning Habitat Enhancement Project

The project will enhance White Sturgeon spawning habitat near the confluence of the San Joaquin and Stanislaus rivers.

Classification:	Improvement, Habitat Restoration
Location:	Sturgeon Bend, San Joaquin Lower Mainstem
Funding Years:	2021 - 2026
Benefits Start Year:	2023
Priority:	- This project addresses the FY20 Priority for White Sturgeon of "High in-channel flows (spawning) and manipulate temperatures in spawning and rearing areas of San Joaquin River." This priority has been identified as data limited and this project would be the first sturgeon spawning restoration project in the Central Valley; results would improve DSM model predictions and address the FY20 Monitoring Priorities for sturgeon of "adult spawner abundance estimate" and "spawning habitat."
Partners:	Cramer Fish Sciences
Related Programs:	CALFED, AFRP, CVPIA b1, NMFS-RP

Authority

Provision	Percentage
(b)(1) AFRP	100.0%

Metrics

Name	Value	Units	Comment
Stream Channel restored (miles)	1	miles	Sturgeon spawning habitat.
Gravel augmentation (cubic yards)	15000	cubic yards	Placed in-channel to provide spawning gravel for spawning sturgeon.
Sturgeon spawning habitat area enhanced (acres)	4	acres	Adult sturgeon in-channel spawning habitat.
Fish Supported - Sturgeon	64	number of fish	Adult spawning sturgeon supported using a density of 16 fish/acre.

Deliverables

Date	Title
Dec. 2022	Report - Pre-Monitoring
Dec. 2025	Report - Construction Monitoring
Dec. 2022	Report - Conceptual Design(s)
Dec. 2024	Report - Basis of Design

Date	Title
Dec. 2022	Monitoring Plan
Dec. 2025	Final Report - ALL Project
Dec. 2025	Final Designs - 'As-Built'
Dec. 2023	Report - Permit Applications

Narrative

The Sturgeon Bend spawning habitat enhancement project will improve white sturgeon spawning habitat through in-channel improvements in the San Joaquin River near the confluence with the Stanislaus River. The project would benefit spawning White Sturgeon.

Project work consists of large substrate augmentation to support spawning of adult White sturgeon. This would be the FIRST sturgeon spawning restoration project in the Central Valley. The project is estimated to provide approximately 4 acres of Adult sturgeon in-channel spawning habitat, supporting roughly 64 adult sturgeon.

The project will increase opportunity for successful sturgeon spawning events through increased habitat and will coordinate pulse flows managed from the Stanislaus (SOG) and Tuolumne (TRTAC) to best utilize the improved habitat. We will develop a monitoring plan in collaboration with the SIT to ensure appropriate high quality (baseline and post-project) information is collected and analyzed to improve the DSM and foster adaptive management. This project will determine if changes in sturgeon spawning habitat in the San Joaquin River can provide population benefits. Results from this study will inform future modeling for habitat scenarios and fill data gaps regarding white sturgeon spawning habitat restoration. The project will specifically address the DSM parameters relating to white sturgeon spawning habit and help refine the white sturgeon DSM.

The project addresses abundance (FRP doubling goals for sturgeon), productivity, and life-history diversity metrics for the San Joaquin Basin tributaries and the Central Valley. The project addresses AFRP FRP actions (SJR E1, E3, E4), CVPIA FY20 Call for Proposals (Sturgeon: spawning habitat; Sturgeon Monitoring: adult spawner abundance estimate, spawning habitat).

This project is cost-effective since most funding is for project implementation.

By not implementing this project we miss an opportunity to improve the sturgeon DSM model, reducing the viability of using the DSM to manage of these species. Sturgeon spawning habitat in lower mainstem San Joaquin River will likely continue to be limiting.

There are no known stakeholder objections.

Data Management

Short term monitoring work will include pre-implementation data collection to establish a baseline, and post-implementation data collection to compare to the baseline for evaluation of the project's contribution to the doubling goal, including measures of available spawning habitat, and adult sturgeon utilization of the habitat. The project will also include as-built surveys to allow for assessment of habitat changes in the future. Data will be housed on the USFWS server and with public access upon request.

Data will be made available for submittal to the Center for Data Management.

There are no current plans to implement long-term monitoring. It will be useful to assess the effectiveness of the project over time and determine what level of maintenance is necessary to maintain sturgeon spawning habitat quality.

Project monitoring will utilize appropriate standardized protocols and where available, any CVPIA data management standards, including submittal to Center for Data Management when available. Post-project monitoring should offer an opportunity to better understand white sturgeon spawning habitat qualities and will be conducted in collaboration with SIT to ensure maximum usefulness to the DSM.

Contact J.D. Wikert - USFWS for data and reports

Risks

Risk	Likelihood	Impact
ESA and permitting delays	1	2
Unfavorable Hydrology Delays Construction	1	1

Cost Estimate

Year	Fund	Total	BOR	FWS
2020	CVPRF	$479,120	$0	$479,120
2022	CVPRF	$882,980	$0	$882,980

Total Cost: $1,362,100

Internal Agency Resources Table

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
2020								
Design								
Agreement	Agreement - Construction Design	$150,000	1.00	0.06	$159,000	FWS	CVPRF	
Environmental Compliance and Permitting								
Agreement	Agreement - Permitting	$155,000	1.00	0.06	$164,300	FWS	CVPRF	
Management								
Agreement	Agreement - Project Management	$20,000	1.00	0.06	$21,200	FWS	CVPRF	
Monitoring								
Agreement	Agreement - Monitoring	$50,000	1.00	0.06	$53,000	FWS	CVPRF	
Outreach								
Labor	Labor Expenditure	$17,000	1.00	0.06	$18,020	FWS	CVPRF	
Reporting								
Agreement	Reporting	$10,000	1.00	0.06	$10,600	FWS	CVPRF	
Research								
Agreement	Site Surveys	$50,000	1.00	0.06	$53,000	FWS	CVPRF	
2022								
Implementation								
Agreement	Project Implementation	$700,000	1.00	0.06	$742,000	FWS	CVPRF	
Management								
Agreement	Agreement - Project Management	$20,000	1.00	0.06	$21,200	FWS	CVPRF	
Monitoring								
Agreement	Agreement - Monitoring	$75,000	1.00	0.06	$79,500	FWS	CVPRF	
Outreach								
Labor	Labor Expenditure	$13,000	1.00	0.06	$13,780	FWS	CVPRF	
Reporting								
Agreement	Reporting	$25,000	1.00	0.06	$26,500	FWS	CVPRF	

Tuolumne and San Joaquin River Juvenile Habitat Assessment at Dos Rios Ranch

The Division of Planning wants to prepare an Environmental Assessment to evaluate suitable habitat for Fall-Run Chinook Salmon at various flow rates due to the proposed Dos Rios Ranch Preserve and utilize the SIT DSM to estimate change in survival rates.

Classification:	Improvement, FloodPlain
Location:	Dos Rios Ranch, Confluence of Tuolumne and San Joaquin River, San Joaquin Lower Mainstem
Funding Years:	2019 - 2020
Benefits Start Year:	2020
Priority:	1 - Address priority to increase perennially inundated juvenile habitat for Fall-Run Chinook Salmon on the Lower San Joaquin River upstream of Tuolumne River, benefiting all upstream production.
Partners:	FWS, River Partners
Related Programs:	AFRP

Authority

Provision	Percentage
(b)(1) AFRP	100.0%

Metrics

Name	Value	Units	Comment
Habitat Assessment	750	acres	The Dos Rios Ranch Preserve Project consists of actively restoring 745 acres of floodplain habitat, according to the "Dos Rios Ranch Floodplain Expansion and Ecosystem Restoration Project" by MBK Engineers in partnership with River Partners. The scope of this proposal is to evaluate how much of that habitat is suitable for Fall-Run Chinook Salmon at various flows to calculate change in survival rates in the SIT DSM.

Deliverables

Date	Title
Sep. 2020	Deliverable #5: Environmental Assessment Document
Apr. 2020	Deliverable #2: Technical Memorandum categorizing HEC-RAS results with DSM Watersheds.
Mar. 2020	Deliverable #1: Technical Memorandum of HEC-RAS model results
May. 2020	Deliverable #3: Technical Memorandum of evaluating suitable habitat at project location.

Date	Title
Jul. 2020	Deliverable #4: Final Report of Modeling with the DSM for Fall-Run Chinook Salmon.

Narrative

The 2,100-acre Dos Rios Ranch Preserve Project, located at the confluence of the Tuolumne and San Joaquin rivers, is situated in an ecologically critically area designated by federal and state agencies, has the potential to restore 745-acres of floodplain habitat for Fall-Run Chinook Salmon in the Lower San Joaquin River, a priority of the Science Integration Team (SIT), along with additional habitat for Central Valley Steelhead and other riparian species. Reclamation wants to assess the amount of suitable habitat for Fall-Run Chinook Salmon at various flows along the Tuolumne and Stanislaus Rivers to establish a flow-habitat relationship that would improve the survival rate calculations in the DSM, which will inform decision-makers of a quantified benefit in constructing the Dos Rios Ranch Preserve. The Project Management Team will accomplish this goal by completing a series of technical memoranda, which will result in a final report of model updates to the DSM for Fall-Run Chinook Salmon and an Environmental Assessment document. The benefit of this work will produce a need for an implementation charter in Fiscal Year 2021 and beyond.

Data Management

Data generated from model development will be hosted on the Reclamation Division of Planning servers and will be shared with Project Management Team Members and FlowWest, as part of the data management strategy for the Science Integration Team. Distribution of data will be available upon request; contact Jim Shannon at (916) 978-5060 or jshannon@usbr.gov.

HEC-RAS model will be added to the Science Integration Team stable of modeling tools (managed by FlowWest).

Risks

Risk	Likelihood	Impact
Scheduling operation negotiations with San Joaquin River National Wildlife Refuge Operators.	1	2

Cost Estimate

Year	Fund	Total	BOR	FWS
2020	CVPRF	$150,000	$150,000	$0

Total Cost: $150,000

Internal Agency Resources Table

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
2020								
Planning and Analysis								
Labor	Contractor	$40,000	1.00	0.00	$40,000	BOR	CVPRF	
Labor	USBR Staff	$110,000	1.00	0.00	$110,000	BOR	CVPRF	

Lower Mokelumne: River Salmonid Spawning and Rearing Habitat Improvement Project

The placement, sorting, and harvesting of gravel and cobble (1/4"-5") to maintain restored spawning habitat in the lower Mokelumne River.

Classification:	Improvement, Spawning Gravel
Location:	38.22596, -121.02368, Mokelumne River
Funding Years:	2016 - 2021
Benefits Start Year:	2017
Priority:	4 - Next portion of ONGOING and highly successful spawning/rearing habitat restoration between AFRP and EBMUD on the Mokelumne River. This is in line with the following CVPIA SIT / Core Teams recommendations: maintain spawning habitat in the CVP streams and other CV streams where prior CVPIA investments in gravel restoration were made.
Partners:	EBMUD
Related Programs:	NMFS-RP

Authority

Provision	Percentage
(b)(1) AFRP	100.0%

Metrics

Name	Value	Units	Comment
Restored Floodplain Habitat	10	acres	Depending on final site designs and constraints, 3-10 acres of floodplain habitat will be restored
Spawning habitat	3	acres	Depending on final site designs and constraints, up to 3 acres of additional in-river spawning habitat will be created
Spawning Gravel	5000	cubic yards	Depending on final site designs and constraints, 1,000-5,000 cubic yards of gravel will be harvested from restored floodplain habitats and placed in-river.

Deliverables

Date	Title
Dec. 2015	FY15 Mokelumne Spawning Gravel Project Annual Report
Dec. 2016	FY16 Mokelumne Spawning Gravel Project Annual Report
Dec. 2017	FY17 Mokelumne Spawning and Rearing Habitat Project Annual Report
Dec. 2018	FY18 Mokelumne Spawning and Rearing Habitat Project Annual Report
Dec. 2019	FY19 Mokelumne Spawning and Rearing Habitat Project Annual Report

Date	Title
Dec. 2020	FY20 Mokelumne Spawning and Rearing Habitat Project Annual Report
Dec. 2021	5-year Technical Report - Mokelumne Spawning and Rearing Habitat Project
Dec. 2021	FY21 Mokelumne Spawning and Rearing Habitat Project Annual Report

Narrative

This ongoing project addresses the 2020 SIT priority maintain spawning habitat in the CVP streams and other CV streams where prior CVPIA investments in gravel restoration were made.

Quantitative prediction of expected outcome: For purposes of testing the CVPIA DSMs, completion of this charter is expected to increase available juvenile rearing habitat by 3-10 acres during crucial spring rearing periods and provide an additional 11,500 square meters of spawning habitat.

Spawning gravel will be primarily obtained through the excavation and recontouring of the lower Mokelumne River stream bank and provide the added benefit of creating seasonal floodplain habitats for juvenile salmonid rearing. The objectives of the proposed rearing habitat portion of the project are to incorporate juvenile salmonid rearing habitat with the long-term spawning habitat rehabilitation that has occurred on the Mokelumne River since 1990. The specific objectives include; improve juvenile survival by providing habitat that promotes primary production and macroinvertebrate production for food, provide shallow water habitat for protection from predation, and encourage freshwater rearing to a larger size, ultimately, increasing the survival of juvenile fall-run Chinook Salmon and steelhead trout in the Mokelumne River. Floodplain habitat will be designed to seasonally inundate under current flow regimes on the lower Mokelumne River to maximize effectiveness. Additionally, creating floodplain rearing habitat will produce materials for continued spawning habitat improvement and maintenance of the long-term progress made via the CVPIA & EBMUD-funded projects that have occurred to date (as other local commercial spawning gravel sources are no longer generally available).

The objectives of the proposed spawning habitat rehabilitation activities are to increase available and usable spawning areas by providing spawning gravels within the appropriate size range; increase use of spawning habitat; improve gravel permeability and intergravel water quality; decrease redd superimposition (Merz 1998); and, ultimately, increase the natural production of fall-run Chinook Salmon and steelhead trout in the Mokelumne River. Increased gravel substrate will also increase production of aquatic invertebrates (Ochikubo Chan 2003), the food base for juvenile salmonids.

Data Management

Objective specific monitoring will access the function and biological use of restored floodplain habitats. Topography surveys, 2D hydrodynamic modeling, and juvenile fish monitoring will be performed before and after restoration takes place. To assess differences in primary production, benthic macroinvertebrate and fish diet samples will be taken and compared between in-channel and newly created floodplain habitats.

Long-Term Trend monitoring (LTT) will continue on the lower Mokelumne River. Salmonid redd surveys are conducted on a weekly basis throughout each spawning season (October through March). Chinook salmon and *O. mykiss* redds are enumerated and each spawning location is marked using a high resolution GNSS unit. Rotary Screw traps are monitored from December through June to assess number, timing and size of rearing and outmigrating juvenile salmonids.

EBMUD collects and manages all data related to this project and provides electronic copies to AFRP staff. Secure electronic data backups will be retained by EBMUD and USFWS. Additionally, data and analyses will be provided to CVPIA Fisheries.

Risks

Risk	Likelihood	Impact
Gravel availability. There is a potential that some of the floodplain areas will contain less appropriately sized gravel than modeling indicates. However, EBMUD has identified several other potential gravel sources on their property within the Mokelumne Watershed.	2	1
Obtaining permits. EBMUD and USFWS have recently completed permits associated with this work that remain valid through FY19. Renewing permits for work past FY19 will require some effort, but is not expected to slow any progress on this charter	1	1

Cost Estimate

Year	Fund	Total	BOR	FWS	Local
2017		$62,500	$0	$0	$62,500
2017	CVPRF	$53,000	$0	$53,000	$0
2018		$62,500	$0	$0	$62,500
2018	CVPRF	$121,900	$0	$121,900	$0
2019		$62,500	$0	$0	$62,500
2019	CVPRF	$121,900	$0	$121,900	$0
2020	SIK	$72,500	$0	$0	$72,500
2020	CVPRF	$121,900	$0	$121,900	$0
2021	SIK	$72,500	$0	$0	$72,500
2021	CVPRF	$121,900	$0	$121,900	$0
2017	SIK	$30,000	$0	$0	$30,000

Total Cost: $903,100

Internal Agency Resources Table

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
2017								
Implementation								
In-Kind Labor	EBMUD project implementation, oversight, modeling and monitoring	$62,500	1.00	0.00	$62,500	Local		
Agreement	AFRP Mokelumne River Spawning Gravel Improvement Grant	$50,000	1.00	0.06	$53,000	FWS	CVPRF	Financial Assistance Agreement that will fund floodplain excavation, material sorting, contouring of restored floodplain habitat and in-channel placement of spawning gravel.
Monitoring								
In-Kind Labor	EBMUD	$30,000	1.00	0.00	$30,000	Local	SIK	$10,000/project for pre-project and post-project fisheries monitoring. Funding will include labor, fish tags, fish traps, cameras, other monitoring equipment.
2018								
Implementation								
In-Kind Labor	EBMUD project implementation, oversight, modeling and monitoring	$62,500	1.00	0.00	$62,500	Local		
Agreement	AFRP Mokelumne River Spawning Gravel Improvement Grant	$115,000	1.00	0.06	$121,900	FWS	CVPRF	Financial Assistance Agreement that will fund floodplain excavation, material sorting, contouring of restored floodplain habitat and in-channel placement of spawning gravel.

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
2019								
Implementation								
In-Kind Labor	EBMUD project implementation, oversight, modeling and monitoring	$62,500	1.00	0.00	$62,500	Local		
Agreement	AFRP Mokelumne River Spawning Gravel Improvement Grant	$115,000	1.00	0.06	$121,900	FWS	CVPRF	Financial Assistance Agreement that will fund floodplain excavation, material sorting, contouring of restored floodplain habitat and in-channel placement of spawning gravel.
2020								
Implementation								
In-Kind Labor	EBMUD project implementation, oversight, modeling and monitoring	$62,500	1.00	0.00	$62,500	Local	SIK	
Agreement	AFRP Mokelumne River Spawning Gravel Improvement Grant	$115,000	1.00	0.06	$121,900	FWS	CVPRF	Financial Assistance Agreement that will fund floodplain excavation, material sorting, contouring of restored floodplain habitat and in-channel placement of spawning gravel.
Monitoring								
In-Kind Labor	EBMUD	$10,000	1.00	0.00	$10,000	Local	SIK	$10,000 for pre-project and post-project fisheries monitoring. Funding will include labor, fish tags, fish traps, cameras, other monitoring equipment.
2021								
Implementation								
In-Kind Labor	EBMUD project implementation, oversight, modeling and monitoring	$62,500	1.00	0.00	$62,500	Local	SIK	

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
Agreement	AFRP Mokelumne River Spawning Gravel Improvement Grant	$115,000	1.00	0.06	$121,900	FWS	CVPRF	Financial Assistance Agreement that will fund floodplain excavation, material sorting, contouring of restored floodplain habitat and in-channel placement of spawning gravel.
Monitoring								
In-Kind Labor	EBMUD	$10,000	1.00	0.00	$10,000	Local	SIK	$10,000 for pre-project and post-project fisheries monitoring. Funding will include labor, fish tags, fish traps, cameras, other monitoring equipment.

2020 Annual Work Plan Public Draft

Refuge Water Supply Program Charters

Central Valley Project Improvement Act
Title XXXIV of Public Law 102-575

Incremental Level 4 Refuge Water Conveyance

Conveyance of surface water and groundwater pumping for refuges

DCN: 20RWSP001
Classification: Improvement, Administration
Location: Central Valley wide
Funding Years: 2019 - 2022
Benefits Start Year: 2020
Priority: 3 - Refuge Water Supply Program - Priority Ranking Numbers & Definitions:
1) Administration (RWSP staff and technical support);
2) Level 2 conveyance (L2) water conveyance and facilities construction;
3) Incremental Level 4 (IL4) acquisitions and conveyance; and
4) Unfunded needs.
Partners: CDFW, FWS, GWD
Related Programs: No Data.

Authority

Provision	Percentage
(d)(2) Refuge Acquisition IL4	100.0%

Metrics

Name	Value	Units	Comment
Conveyance: Inc L4 Refuge Water Conveyance (annual)	0	acre-feet	Inc L4 Water with no Conveyance Cost to RWSP for WY2019
Conveyance: Inc L4 Refuge Water Conveyance (annual)	0	acre-feet	Inc L4 Surface Water Conveyance for WY2019
Conveyance: Inc L4 Refuge Water Conveyance (annual)	0	acre-feet	Inc L4 Groundwater Pumping for WY2019

Deliverables

Date	Title
Mar. 2020	Conveyance of Incremental Level 4 Water Supplies

Narrative

Conveyance of Incremental (Inc.) Level 4 refuge water supplies to CVPIA refuges. This includes annually acquired surface water, purchased permanent surface water, and pumped groundwater.

The conveyance of Incremental Level 4 (IL4) surface water supplies requires conveyance contracts with a number of conveying entities. Due to the geographical location of the refuges, direct delivery of water to a refuge boundary from Reclamation conveyance facilities can only be achieved for two

of the 19 refuges. The remaining refuges receiving surface water deliveries require up to 3 conveying entities (including Reclamation facilities) for water to reach their boundaries. For the purpose of this charter, the primary conveyor represents the contracted conveyor conveying the initial diversion of refuge water supplies. In most cases, this water is then delivered to another conveying entity (secondary conveyor) with facilities in closer proximity to specific refuges. In some instances, the secondary conveyor completes the conveyance, delivering water to the refuge boundary. In other instances, a third conveying entity (tertiary conveyor) is necessary to complete refuge water conveyance due to the distances between certain refuges and available conveyance facilities. The secondary conveyor moves refuge water into the tertiary conveyor's system for final delivery to refuge boundaries.

-- FY20 represents projected costs to convey Incremental Level 4 water supplies to those CVPIA refuges with sufficient external conveyance capacity in Contract Water Year 2020 (March 1, 2020, thru February 28, 2021).
-- FY21 represents projected costs to convey Incremental Level 4 water supplies to those CVPIA refuges with sufficient external conveyance capacity in Contract Water Year 2021 (March 1, 2020, thru February 28, 2022).
--FY22 represents projected costs to convey Incremental Level 4 water supplies to those CVPIA refuges with sufficient external conveyance capacity in Contract Water Year 2022 (March 1, 2021, thru February 28, 2023)

Incremental Level 4 metrics (acre-feet estimates), both surface and ground water, for FY2020-2022 were developed with data available as of 5/2019.

Data Management

Contract and agreement records are maintained in the Bureau of Reclamation's Acquisitions Division and Resources Division. Delivery data is maintained on the Bureau of Reclamation's computer network server. Flow data for Gray Lodge Wildlife Area surface water is available on the internet at https://www.usbr.gov/mp/glwa/index.php.

Risks

Risk	Likelihood	Impact
Conveyance contractor default	1	3
Unfavorable hydrology	1	3

Cost Estimate

Year	Fund	Total	BOR	FWS
2020	CVPRF	$1,177,880	$1,177,880	$0
2021	CVPRF	$2,393,806	$2,393,806	$0
2022	CVPRF	$2,661,748	$2,661,748	$0

Total Cost: $6,233,434

Internal Agency Resources Table

Type	Name	Rate	Frac	MU	Total	Agency	Fund	Description
2020								
Implementation								
Agreement	Glenn-Colusa Irrigation District Agreement #R13AC20502 - IL4 Surface Water Conveyance	$400,000	1.00	0.00	$400,000	BOR	CVPRF	Convey surface water to Delevan NWR (10,455 AF of permanently acquired NOD Incremental Level 4 water. (Included in Inc. L4 Surface Water Conveyance in 50,650 AF in Benefit section).
Agreement	PG&E Contract #R15PD00454 - IL4 Groundwater Pumping (Power Costs)	$135,020	1.00	0.00	$135,020	BOR	CVPRF	Electrical power costs for pumping IL4 groundwater from wells on Pixley NWR. (1000 AF included in Inc. L-4 Groundwater Pumped Benefit of 2,000).
Agreement	Grassland Water District Agreement #17WC205027 - IL4 Surface Water Conveyance	$80,000	1.00	0.00	$80,000	BOR	CVPRF	Convey surface water to Los Banos WA and Salt Slough Unit of N. Grasslands WA. (AF included in 50,650 of Inc. L4 Surface Water Conveyance in Benefit section).
Agreement	Henry Miller Reclamation District Contract #17WC205028 - IL4 Surface Water Conveyance	$44,000	1.00	0.00	$44,000	BOR	CVPRF	Convey surface water to Los Banos WA and Grassland Resource Conservation District. (AF included in 50,650 of Inc. L4 Surface Water Conveyance in Benefit section).
Agreement	Buena Vista Water Storage District Agreement #R10AC20683 - IL4 Surface Water Conveyance	$180,000	1.00	0.00	$180,000	BOR	CVPRF	Convey surface water to Kern. (Included in Inc. L4 Surface Water Conveyance in Benefit 50,650).
Agreement	CA Dept. of Water Resources Agreement #12WC204346 - IL4 Surface Water Conveyance	$48,000	1.00	0.00	$48,000	BOR	CVPRF	Convey surface water to tertiary conveyor for Kern NWR (Included in Inc. L4 Surface Water Conveyance in Benefit 50,650).

Type	Name	Rate	Frac	MU	Total	Agency	Fund	Description
Agreement	CA Dept. of Fish & Wildlife Reimbursement Agreement #15WC204671 - IL4 Groundwater Pumping SOD	$0	1.00	0.00	$0	BOR	CVPRF	Actual NEED is $50,000 – will use existing funds on Agreement. Costs for pumping IL4 groundwater developed on SOD Wildlife Areas & lift pumping IL4 surface water onto SOD WAs-1,000 AF developed groundwater (AF included in Inc Level 4 Groundwater Pumped Benefit of 2,000)
Agreement	San Luis Delta- Mendota Water Authority Agreement #80720X0 354 - IL4 Surface Water Conveyance	$0	1.00	0.00	$0	BOR	CVPRF	Actual NEED is $1,600,000 will use existing IL4 funds on Agreement for FY2020. Convey surface water to secondary & tertiary conveyors for Kern NW; Los Banos & Mendota WAs; China Island & Salt Slough Units of N. Grasslands WA; and Grassland Resource Conservation District. (AF included in 50,650 of Inc
Agreement	Incremental Level 4 Conveyance at NO Cost to RWSP	$0	1.00	0.00	$0	BOR	CVPRF	IL4 water delivered with no conveyance costs to RWSP. (2,500 AF surface water via Merced ID FERC license mitigation requirement; & 20,000 AF groundwater on GRCD.) (AF included in "Inc L4 Water with No Conveyance Cost to RWSP' Benefit section)
Agreement	Central California Irrigation District Contract #17WC205023 - IL4 Surface Water Conveyance	$200,000	1.00	0.00	$200,000	BOR	CVPRF	Convey surface water to China Island Unit of N. Grasslands WA and to tertiary conveyor for Los Banos WA; Salt Slough Unit of N. Grasslands WA; and Grassland Resource Conservation District. (AF included in 50,650 of Inc. L4 Surface Water Conveyance in Benefit section).

Type	Name	Rate	Frac	MU	Total	Agency	Fund	Description
Monitoring								
Equipment or Materials	IL4 Water Quality Monitoring SOD WAs - 2 LABS: SD Ag - BPA #R13PA20140; and WET - BPA #R11PA20028	$37,240	1.00	0.00	$37,240	BOR	CVPRF	Costs for laboratory analysis of water samples and supplies for IL4 groundwater quality monitoring program related to CDFW SOD WAs Reimbursement Agreement.
Technical Support								
Labor	CDFW R-4 Was water quality monitoring	$275,225	.18	0.00	$49,540	BOR	CVPRF	Technical support labor involved for MP156/157 staff to provide water quality monitoring
Labor	Agreement and contract modifications	$102,003	.04	0.00	$4,080	BOR	CVPRF	MP3800 Contracts Division technical support to process agreement and contract modifications
2021								
Implementation								
Agreement	Glenn-Colusa Irrigation District Agreement #R13AC20502 - IL4 Surface Water Conveyance	$272,000	1.00	0.03	$280,160	BOR	CVPRF	Convey surface water to Kern NWR (1,706 AF of permanent purchased NOD Inc. Level 4 water via reallocation/transfer from NOD to SOD; and 5,600 AF via E. Bear Creek Unit groundwater/CVP exchange projects). (Included in Inc. L4 Surface Water Conveyance in Benefit 39,757).
Agreement	Henry Miller Reclamation District Contract #17WC205028 - IL4 Surface Water Conveyance	$18,000	1.00	0.03	$18,540	BOR	CVPRF	Convey surface water to Los Banos WA and Grassland Resource Conservation District. (AF included in 39,757 of Inc. L4 Surface Water Conveyance in Benefit section).
Agreement	PG&E Contract #R15PD00454 - IL4 Groundwater Pumping (Power Costs)	$75,519	1.00	0.03	$77,785	BOR	CVPRF	Electrical power costs for pumping IL4 groundwater from wells on Pixley NWR. (1000 AF included in Inc. L-4 Ground-water Pumped Benefit of 2,500).

Type	Name	Rate	Frac	MU	Total	Agency	Fund	Description
Agreement	CA Dept. of Water Resources Agreement #12WC204346 - IL4 Surface Water Conveyance	$46,000	1.00	0.03	$47,380	BOR	CVPRF	Convey surface water to tertiary conveyor for Kern NWR (1,706 AF of permanent purchased NOD Inc. Level 4 water via reallocation/transfer from NOD to SOD; and 5,600 AF via E. Bear Creek Unit groundwater/ CVP exchange projects). (Included in Inc. L4 Surface Water Conveyance in Benefit 39,757).
Agreement	Central California Irrigation District Contract #17WC205023 - IL4 Surface Water Conveyance	$310,000	1.00	0.03	$319,300	BOR	CVPRF	Convey surface water to China Island Unit of N. Grasslands WA and to tertiary conveyor for Los Banos WA; Salt Slough Unit of N. Grasslands WA; and Grassland Resource Conservation District. (AF included in 39,575 of Inc. L4 Surface Water Conveyance in Benefit section).
Agreement	San Luis Delta- Mendota Water Authority Agreement #80720X0 354 - IL4 Surface Water Conveyance	$1,326,000	1.00	0.03	$1,365,780	BOR	CVPRF	Convey surface water to secondary & tertiary conveyors for Kern NW; Los Banos & Mendota WAs; China Island & Salt Slough Units of N. Grasslands WA; and Grassland Resource Conservation District. (AF included in 39,757 of Inc. L4 Surface Water Conveyance in Benefit section).
Agreement	CA Dept. of Fish & Wildlife Reimb Agreement #15WC204671 - IL4 Groundwater Pumping SOD	$57,750	1.00	0.03	$59,483	BOR	CVPRF	Costs for pumping Inc. L4 groundwater water developed on SOD Wildlife Areas (WA) and lift pumping of Inc. L4 surface water onto SOD WAs – 1,500 AF developed groundwater. (Acre-feet included in Incremental Level 4 Groundwater Pumped Benefit of 2,500)

Type	Name	Rate	Frac	MU	Total	Agency	Fund	Description
Agreement	Grassland Water District Contract #17WC205027 - IL4 Surface Water Conveyance	$144,000	1.00	0.03	$148,320	BOR	CVPRF	Convey surface water to Los Banos WA and Salt Slough Unit of N. Grasslands WA. (AF included in 39,757 of Inc. L4 Surface Water Conveyance in Benefit section).
Agreement	Incremental Level 4 Conveyance at NO Cost to RWSP	$0	1.00	0.00	$0	BOR	CVPRF	Inc L4 water delivered with no conveyance costs to RWSP. (2,500 AF surface water via Merced ID FERC license mitigation requirement.) (AF included in 'Inc L4 Water with No Conveyance Cost to RWSP' Benefit section)
Monitoring								
Equipment or Materials	IL4 Water Quality Monitoring SOD WAs - 2 LABS: SD Ag - BPA #R13PA20140; and WE	$21,194	1.00	0.03	$21,830	BOR	CVPRF	Costs for laboratory analysis of water samples and supplies for Inc. L4 groundwater quality monitoring program related to CDFW SOD WAs Reimbursement Agreement.
Technical Support								
Labor	CDFW R-4 Was water quality monitoring	$283,481	.18	0.03	$51,026	BOR	CVPRF	Technical support labor involved for MP156/157 staff to provide water quality monitoring
Labor	Agreement and contract modifications	$105,063	.04	0.03	$4,202	BOR	CVPRF	MP3800 Contracts Division technical support to process agreement and contract modifications
2022								
Implementation								
Agreement	CA Dept. of Fish & Wildlife Reimbursement Agreement #15WC204671 - IL4 Groundwater Pumping SOD	$57,750	1.00	0.06	$61,215	BOR	CVPRF	Costs for pumping Inc. L4 groundwater water developed on SOD Wildlife Areas (WA) and lift pumping of Inc. L4 surface water onto SOD WAs – 1,500 AF developed groundwater. (Acre-feet included in Incremental Level 4 Groundwater Pumped Benefit of 2,500)

Type	Name	Rate	Frac	MU	Total	Agency	Fund	Description
Agreement	San Luis Delta- Mendota Water Authority Agreement #80720X0 354 - IL4 Surface Water Conveyance	$1,326,000	1.00	0.06	$1,405,560	BOR	CVPRF	Convey surface water to secondary & tertiary conveyors for Kern NW; Los Banos & Mendota WAs; China Island & Salt Slough Units of N. Grasslands WA; and Grassland Resource Conservation District. (AF included in 39,757 of Inc. L4 Surface Water Conveyance in Benefit section).
Agreement	CA Dept. of Water Resources Agreement #12WC204346 - IL4 Surface Water Conveyance	$46,000	1.00	0.06	$48,760	BOR	CVPRF	Convey surface water to tertiary conveyor for Kern NWR (1,706 AF of permanent purchased NOD Inc. Level 4 water via reallocation/transfer from NOD to SOD; and 5,600 AF via E. Bear Creek Unit groundwater/ CVP exchange projects). (Included in Inc. L4 Surface Water Conveyance in Benefit 39,757).
Agreement	Grassland Water District Contract #17WC205027 - IL4 Surface Water Conveyance	$144,000	1.00	0.06	$152,640	BOR	CVPRF	Convey surface water to Los Banos WA and Salt Slough Unit of N. Grasslands WA. (AF included in 39,757 of Inc. L4 Surface Water Conveyance in Benefit section).
Agreement	Central California Irrigation District Contract #17WC205023 - IL4 Surface Water Conveyance	$310,000	1.00	0.06	$328,600	BOR	CVPRF	Convey surface water to China Island Unit of N. Grasslands WA and to tertiary conveyor for Los Banos WA; Salt Slough Unit of N. Grasslands WA; and Grassland Resource Conservation District. (AF included in 39,575 of Inc. L4 Surface Water Conveyance in Benefit section).
Agreement	Glenn-Colusa Irrigation District Agreement #R13AC20502 - IL4 Surface Water Conveyance	$285,000	1.00	0.06	$302,100	BOR	CVPRF	Convey surface water to Delevan NWR (10,455 AF of permanent purchased NOD Incremental Level 4 water (Corning-Thomes-Proberta WDs). (Included in Inc.

Type	Name	Rate	Frac	MU	Total	Agency	Fund	Description
								L4 Surface Water Conveyance in Benefit 39,575).
Agreement	Incremental Level 4 Conveyance at NO Cost to RWSP	$0	1.00	0.00	$0	BOR	CVPRF	Inc L4 water delivered with no conveyance costs to RWSP. (2,500 AF surface water via Merced ID FERC license mitigation requirement.) (AF included in 'Inc L4 Water with No Conveyance Cost to RWSP' Benefit section)
Agreement	Henry Miller Reclamation District Contract #17WC205028 - IL4 Surface Water Conveyance	$18,000	1.00	0.06	$19,080	BOR	CVPRF	Convey surface water to Los Banos WA and Grassland Resource Conservation District. (AF included in 39,757 of Inc. L4 Surface Water Conveyance in Benefit section).
Agreement	PG&E Contract #R15PD00454 - IL4 Groundwater Pumping (Power Costs)	$75,519	1.00	0.06	$80,050	BOR	CVPRF	Electrical power costs for pumping IL4 groundwater from wells on Pixley NWR. (1000 AF included in Inc. L-4 Ground-water Pumped Benefit of 2,500).
Agreement	Buena Vista Water Storage District Agreement #R10AC20683 - IL4 Surface Water Conveyance	$174,000	1.00	0.06	$184,440	BOR	CVPRF	Convey surface water to Kern NWR (1,706 AF of permanent purchased NOD Inc. Level 4 water via reallocation/transfer from NOD to SOD; and 5,600 AF via E. Bear Creek Unit groundwater/CVP exchange projects). (Included in Inc. L4 Surface Water Conveyance in Benefit 39,757).
Technical Support								
Labor	CDFW R-4 Was water quality monitoring	$291,738	.18	0.06	$52,512	BOR	CVPRF	Technical support labor involved for MP156/157 staff to provide water quality monitoring
Labor	Agreement and contract modifications	$108,123	.04	0.06	$4,325	BOR	CVPRF	MP3800 Contracts Division technical support to process agreement and contract modifications

Type	Name	Rate	Frac	MU	Total	Agency	Fund	Description
Monitoring								
Equipment or Materials	IL4 Water Quality Monitoring SOD WAs - 2 LABS: SD Ag - BPA #R13PA20140; and WET - BPA #R11PA20028	$21,194	1.00	0.06	$22,466	BOR	CVPRF	Costs for laboratory analysis of water samples and supplies for Inc. L4 groundwater quality monitoring program related to CDFW SOD WAs Reimbursement Agreement.

Incremental Level 4 Water Purchases and L2 Exchanges

Purchase of Incremental Level 4 and Exchange of L2 Refuge Water

DCN:	20RWSP002
Classification:	Improvement, Water Acquisition
Location:	Refuges and Wildlife Areas
Funding Years:	2020 - 2022
Benefits Start Year:	2020
Priority:	5 - 'The RWSP's funding priorities are: 1) Labor & overhead (Administrative and Technical); 2) Conveyance of 100% Level 2 water; 3) Acquisition and conveyance of IL4; 4) Facilities construction – ongoing needs
Partners:	GWD, CDFW, FWS
Related Programs:	No Data.

Authority

Provision	Percentage
(d)(2) Refuge Acquisition IL4	100.0%

Metrics

Name	Value	Units	Comment
d2 Refuge: Inc L4 Water Acquisition, including Replacement Water	0	acre-feet	

Deliverables

Date	Title
Oct. 2020	Incremental Level 4 Water

Narrative

Purchase surface and ground water from various sources and enter into uneven exchange agreements for refuge Level 2 to increase IL4 supplies.

Data Management

Water contract records are maintained in the Bureau of Reclamation's Resources Management Division. Incremental Level 4 delivery and losses data is maintained in the Bureau of Reclamation's Resources Management Division.

Risks

Risk	Likelihood	Impact
Water Not Available for Purchase	1	1

Cost Estimate

Year	Fund	Total	BOR	FWS
2020	CVPRF	$8,572,000	$8,572,000	$0
2021	CVPRF	$8,200,000	$8,200,000	$0
2022	CVPRF	$8,200,000	$8,200,000	$0

Total Cost: $24,972,000

Internal Agency Resources Table

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
2020								
Acquisition								
Labor	Water Quality Monitoring	$40,000	1.00	0.00	$40,000	BOR	CVPRF	Technical services provided by the Environmental Affairs Division to monitor the water quality of various sources of water acquired for refuges.
Labor	Refuge L2 Exchanges to Acquire IL4	$0	1.00	0.00	$0	BOR	CVPRF	Various L2 exchanges are anticipated that would result in additional IL4 water being made available. Costs to negotiate and administer agreements would be covered under admin costs - no additional costs are anticipated
Agreement	Acquire IL4 Water	$8,532,000	1.00	0.00	$8,532,000	BOR	CVPRF	Acquire surface and groundwater from various sources to meet IL4 supplies.
2021								
Acquisition								
Labor	Water Quality Monitoring	$40,000	1.00	0.00	$40,000	BOR	CVPRF	Technical services provided by the Environmental Affairs Division to monitor the water quality of various sources of water acquired for refuges.
Agreement	Acquire IL4 Water	$8,160,000	1.00	0.00	$8,160,000	BOR	CVPRF	Acquire water from various sources to be used to meet Inc. L4 supplies
Labor	Refuge L2 Exchanges to Acquire IL4	$0	1.00	0.00	$0	BOR		Various L2 exchanges are anticipated that would result in additional IL4 water being made available. Costs to negotiate and administer agreements would be covered under admin costs - no additional costs are anticipated.

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
2022								
Acquisition								
Labor	Refuge L2 Exchanges to Acquire IL4	$0	1.00	0.00	$0	BOR	CVPRF	Various L2 exchanges are anticipated that would result in additional IL4 water being made available. Costs to negotiate and administer agreements would be covered under admin costs - no additional costs are anticipated.
Labor	Water Quality Monitoring	$40,000	1.00	0.00	$40,000	BOR	CVPRF	Technical services provided by the Environmental Affairs Division to monitor the water quality of various sources of water acquired for refuges.
Agreement	Inc. Level 4 Water Purchases and L2 Exchanges	$8,160,000	1.00	0.00	$8,160,000	BOR	CVPRF	Acquire surface and groundwater from various sources to be used to meet Inc. L4 supplies

Level 2 Refuge Water Conveyance (FY2020)

Conveyance of surface water and groundwater pumping for refuges

DCN: 20RWSP003
Classification: Improvement, Refuge Surface
Location: Central Valley wide,
Funding Years: 2019 - 2022
Benefits Start Year: 2020
Priority: 2 - Refuge Water Supply Program - Priority Ranking Numbers & Definitions:
1) Administration (RWSP staff and technical support);
2) Level 2 (L2) water conveyance and facilities construction;
3) Incremental Level 4 (IL4) Acquisitions and conveyance; and
4) Unfunded needs.
Partners: CDFW, FWS, GWD
Related Programs: No Data.

Authority

Provision	Percentage
(d)(1) Refuge Conveyance L2	100.0%

Metrics

Name	Value	Units	Comment
Conveyance: L2 Refuge Water Convey (annual)	330884	acre-feet	L2 Surface Water Conveyance for WY2020
Conveyance: L2 Refuge Water Convey (annual)	49506	acre-feet	L2 Water from Diverse Sources at no Cost to RWSP for WY2020
Conveyance: L2 Refuge Water Convey (annual)	16232	acre-feet	L2 Groundwater Pumping for WY2020

Deliverables

Date	Title
Mar. 2020	Level 2 Water Conveyance to CVPIA Refuges

Narrative

Conveyance of Level 2 (L2) refuge water supplies to CVPIA refuges. This includes CVP surface water and water from diverse sources such as groundwater, mitigation water, water rights water, riparian rights water, and accretion water. The conveyance budget for FY2020 includes some assumptions to reduce the potential for over-estimations. For example, instead of using full L2 quantities for NOD conveyance cost estimates, an average of L2 deliveries for 2-3 recent years (excluding critically dry years) is used. Early in FY2020, the conveyance budget will be refined and

recalculated. If the revised budget need is less than the allocated budget amount, the CVPIA Program Administrator and Refuge Water Supply Program (RWSP) team will be informed to allow for a determination where the unneeded funds can be used to benefit other RWSP activities or CVPIA Program needs.

The conveyance of surface water supplies requires conveyance contracts with a number of conveying entities. Due to the geographical location of the refuges, direct delivery of water to a refuge boundary from Reclamation conveyance facilities can only be achieved for two of the 19 refuges. The remaining refuges receiving surface water deliveries require up to 3 conveying entities (including Reclamation facilities) for water to reach their boundaries. For the purpose of this charter, the primary conveyor represents the contracted conveyor conveying the initial diversion of refuge water supplies. In most cases, this water is then delivered to another conveying entity (secondary conveyor) with facilities in closer proximity to specific refuges. In some instances, the secondary conveyor completes the conveyance, delivering water to the refuge boundary. In other instances, a third conveying entity (tertiary conveyor) is necessary to complete refuge water conveyance due to the distances between certain refuges and available conveyance facilities. When a tertiary conveyor is utilized, the secondary conveyor moves refuge water into the tertiary conveyor's system for final delivery to refuge boundaries.

-- FY20 represents projected costs to convey full L2 water supplies to those CVPIA refuges with sufficient external conveyance capacity in Contract Water Year 2020 (March 1, 2020, thru February 28, 2021).
-- FY21 represents projected costs to convey full L2 water supplies to those CVPIA refuges with sufficient external conveyance capacity in Contract Water Year 2021 (March 1, 2021, thru February 28, 2022).
- FY22 represents projected costs to convey full L2 water supplies to those CVPIA refuges with sufficient external conveyance capacity in Contract Water Year 2022 (March 1, 2022, thru February 28, 2023).

A factor of 3% increase was applied to all FY2020 conveyance estimates to arrive at an estimate for FY2021, repeating the process for FY2022 estimates, to meet the out-year planning estimates for the work plans, providing an adjustment to account for future rate increases. However, once each of those years moves up into the position of being the "next fiscal year" with an assigned Proposed President's Budget, the Refuge Water Conveyance budget is reanalyzed, refined, and recalculated, incorporating upcoming-year rate estimates based on the then-prevailing rates for all conveyance contracts, applying the same process as described earlier above, again narrowing the budget closer to expected conditions.

There are no "fixed" conveyance costs for any of the 19 CVPIA refuges. Overall conveyance costs may vary according to hydrology; for example, in a critically dry year where refuges full L2 allocations are reduced by 25%, there may be a reduction in L2 conveyance costs as a result of delivering fewer L2 supplies. All current conveyance agreements contain provisions allowing for rate increases or include a rate escalator.

Data Management

Contract and agreement records are maintained in the Bureau of Reclamation's Acquisitions Division and Resources Division. Delivery data is maintained on the Bureau of Reclamation's compute network server. Flow data for Gray Lodge Wildlife Area surface water is available on the internet at: http://www.usbr.gov/mp/glwa/index.php

Risks

Risk	Likelihood	Impact
Unfavorable hydrology	1	2
Conveyance contractor default	1	3

Cost Estimate

Year	Fund	Total	BOR	FWS	DFW
2020	CVPRF	$14,757,159	$13,825,414	$931,745	$0
2020	SIK	$170,000	$0	$0	$170,000
2021	CVPRF	$14,429,772	$13,443,784	$985,988	$0
2021	SIK	$145,000	$0	$0	$145,000
2022	CVPRF	$14,717,853	$13,718,347	$999,506	$0
2022	SIK	$145,000	$0	$0	$145,000

Total Cost: $44,364,784

Internal Agency Resources Table

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
2020								
Implementation								
Agreement	Henry Miller Reclamation District Contract #17WC205028 - L2 Surface Water Conveyance	$165,000	1.00	0.00	$165,000	BOR	CVPRF	Convey surface water to Los Banos WA and Grassland Resource Conservation District (AF included in (AF included in 330,384 under Benefit section)
Agreement	Henry Miller Reclamation District Agreement #11650-2-0013 (with FWS) - L2 Surface Water Conveyance	$742,822	1.00	0.00	$742,822	FWS	CVPRF	Convey surface water to San Luis and West Bear Creek Units of the San Luis NWR (AF included in 330,884 under Benefit section)
Agreement	Biggs-West Gridley Water District Agreement #R10AC20559 - L2 Surface Water Conveyance	$0	1.00	0.00	$0	BOR	CVPRF	Actual funding need is $110,000 – will use existing funds on Agreement. Convey surface water to Gray Lodge WA (AF included in 330,884 under Benefit section)
In-Kind Equipment or Materials	Water District Conveyance Fees	$170,000	1.00	0.00	$170,000	DFW	SIK	District fees to convey water to primary and secondary lands within the Gray Lodge Wildlife Area.
Agreement	Grassland Water District Contract #17WC205027 - L2 Surface Water Conveyance	$450,000	1.00	0.00	$450,000	BOR	CVPRF	Convey surface water supplies to Los Banos WA; Salt Slough Unit of N. Grasslands WA; and Freitas and Kesterson Units of San Luis NWR (AF included in 330,884 under Benefit section)
Agreement	Glenn-Colusa Irrigation District Agreement #R13AC20502 - L2 Surface Water Conveyance	$2,200,000	1.00	0.00	$2,200,000	BOR	CVPRF	Convey surface water to Sacramento, Colusa and Delevan NWRs (AF included in 330,884 under Benefit section)

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
Agreement	Central California Irrigation District Contract #17WC205023 - L2 Surface Water Conveyance	$1,125,000	1.00	0.00	$1,125,000	BOR	CVPRF	Convey surface water to China Island Unit of N. Grasslands WA; and to tertiary conveyor for Los Banos WA; Salt Slough Unit of N. Grasslands WA; Freitas & Kesterson Units of San Luis NWR; Grassland Resource Conservation District (AF included in 330,884 under Benefit section)
Agreement	CA Dept. of Water Resources Agreement #12WC204346 - L2 Surface Water Conveyance	$48,000	1.00	0.00	$48,000	BOR	CVPRF	Convey surface water to tertiary conveyor for Kern NWR (AF included in 330,884 under Benefit section)
Agreement	FWS Costs for Groundwater Pumping and Lift Pumping L2 Water (BOR-FWS Interagency 'Split' Agreement)	$253,339	1.00	0.00	$188,923	FWS	CVPRF	1) Groundwater pumping at Merced (4,952 AF--part of 16,232 in Benefit section); 2) temp lift pumps rental for fall @Sutter (AF included in 330,884 in Benefit); 3) lift pumping to elevate surface water at Colusa & Sutter (Triangle) reference boundaries (AF included in 330,884 under Benefit)
Agreement	San Luis & Delta-Mendota Water Authority Agreement #80720X0354 - L2 Surface Water Conveyance	$8,200,000	1.00	0.00	$8,200,000	BOR	CVPRF	Convey surface water to Volta & Mendota WAs; & to secondary & tertiary conveyors for Los Banos WA; China Is & Salt Sl Units of N. Grasslands WA; Freitas, Kesterson & E. Bear San Luis NWR; Kern NWR; & GRCD (AF included in 330,884 under Benefit section)
Agreement	Buena Vista Water Storage District Agreement #R10AC20683 - L2 Surface Water Conveyance	$180,000	1.00	0.00	$180,000	BOR	CVPRF	Convey surface water directly to Kern NWR (AF included in 330,884 under Benefit section)

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
Agreement	Water from Diverse Sources at No Cost to RWSP	$0	1.00	0.00	$0	BOR	CVPRF	L2 surface water from diverse sources with NO conveyance/power cost to Refuge Program. Sutter 4,649 AF riparian rights; Gray Lodge 20,000 AF water rights; Los Banos 3,995 AF mitigation; Merced 8,548 AF mitigation via Merced ID (FERC license); GRCD 10,000 groundwater; Volta 2314 AF accretion flows.
Agreement	BOR Costs Groundwater/Lift Pumping L2 Water (CDFW Reimb #s15WC204671 & 16WC204795?; PG&E #R15PD00454	$1,157,861	1.00	0.00	$1,157,861	BOR	CVPRF	Total need=$1,457,861; $300,000 covered with existing funds on Agreement. For L2 groundwater & lift pumping, including Project Use Energy. (Groundwater AF included in L2 Groundwater Pumped Benefit 16,232) Refuges: Pixley NWR; Gray Lodge, Volta, Los Banos, & Mendota WAs; China Island, Salt Slough & E. Bear Cr. Unit
Technical Support								
Labor	Gray Lodge Wildlife Area water quality monitoring	$278,720	.25	0.00	$69,703	BOR	CVPRF	Labor involved for MP156/157 staff to provide water quality monitoring
Labor	Sutter NWR Pilot Project water quality monitoring	$270,982	.37	0.00	$100,187	BOR	CVPRF	Labor involved for MP156/157 staff to provide water quality monitoring
Labor	MP3800 Agreement and contract modifications	$76,003	.13	0.00	$12,920	BOR	CVPRF	Labor involved for staff to process agreement and contract modifications
Labor	NCAO conveyance agreement administration	$294,320	.06	0.00	$17,659	BOR	CVPRF	Administration of North-of-Delta refuge water conveyance agreements
Labor	NCAO hydrologic technician Flow/ Pump meter management	$166,462	.11	0.00	$18,311	BOR	CVPRF	Collect delivery data from Gray Lodge meters; perform maintenance on flow meters and groundwater pump meters

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
Monitoring								
Agreement	Sutter NWR/RD-1004 Pilot Project Water Quality Monitoring	$75,301	1.00	0.00	$75,301	BOR	CVPRF	Contract laboratory water sampling analysis costs and supply costs for Sutter/RD1004 L2 Conveyance Pilot Project: Convey CVP water to Sutter NWR via Sacramento River thru RD-1004, then down Butte Creek to E. Borrow Ditch to Sutter NWR. Monitor water quality at point of acceptance, and points of delivery.
Agreement	Water Quality Monitoring - Gray Lodge WA - 2 LABS: APPL - BPA #R11PA20027; Basic - BPA #R11PA20029	$5,472	1.00	0.00	$5,472	BOR	CVPRF	Contract laboratory water sampling analysis costs and supply costs for Gray Lodge Wildlife Area water quality monitoring program for both groundwater and surface water supplies.
2021								
Implementation								
Agreement	Grassland Water District Contract #17WC205027 - L2 Surface Water Conveyance	$421,000	1.00	0.03	$433,630	BOR	CVPRF	Convey surface water supplies to Los Banos WA; Salt Slough Unit of N. Grasslands WA; and Freitas and Kesterson Units of San Luis NWR (AF included in 337,222 under Benefit section)
Agreement	Buena Vista Water Storage District Agreement #R10AC20683 - L2 Surface Water Conveyance	$273,000	1.00	0.03	$281,190	BOR	CVPRF	Convey surface water directly to Kern NWR (AF included in 337,222 under Benefit section)
Agreement	BOR Costs Groundwater/Lift Pumping L2 Water (CDFW Reimb #s15WC204671 &	$1,028,496	1.00	0.03	$1,059,351	BOR	CVPRF	Costs for pumping L2 groundwater & lift pumping required to elevate surface water supplies @ refuge boundaries including Project Use Energy (Groundwater AF included in L2

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
	16WC204795; PG&E #R15PD00454							Groundwater Pumped Benefit 13,686) Refuges: Pixley NWR; Gray Lodge, Volta, Los Banos, & Mendota; China Is & Salt Slough Units; E. Bear Cr. Unit
Agreement	FWS Costs for Groundwater Pumping and Lift Pumping L2 Water (BOR-FWS Interagency 'Split' Agreement)	$253,339	1.00	0.03	$260,939	FWS	CVPRF	1) Groundwater pumping at Merced (4,952 AF--part of 13,686 in Benefit section); 2) temp lift pumps rental for fall @ Sutter (AF included in 337,222 in Benefit);3) lift pumping to elevate surface water at Colusa & Sutter (Triangle) reference boundaries (AF included in 335,222 under Benefit)
Agreement	Biggs-West Gridley Water District Agreement #R10AC20559 - L2 Surface Water Conveyance	$110,000	1.00	0.03	$113,300	BOR	CVPRF	Convey surface water to Gray Lodge WA (AF included in 337,222 under Benefit section)
Agreement	Central California Irrigation District Contract #17WC205023 - L2 Surface Water Conveyance	$1,267,000	1.00	0.03	$1,305,010	BOR	CVPRF	Convey surface water to China Island Unit of N. Grasslands WA; and to tertiary conveyor for Los Banos WA; Salt Slough Unit of N. Grasslands WA; Freitas & Kesterson Units of San Luis NWR; Grassland Resource Conservation District (AF included in 337,222 under Benefit section)
Agreement	Henry Miller Reclamation District Agreement #11650-2-0013 (with FWS) - L2 Surface Water Conveyance	$703,931	1.00	0.03	$725,049	FWS	CVPRF	Convey surface water to San Luis and West Bear Creek Units of the San Luis NWR (AF included in 337,222 under Benefit section)
Agreement	CA Dept. of Water Resources Agreement #12WC204346 - L2 Surface Water Conveyance	$46,000	1.00	0.03	$47,380	BOR	CVPRF	Convey surface water to tertiary conveyor for Kern NWR (AF included in 337,222 under Benefit section)

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
In-Kind Equipment or Materials	Water District Conveyance Fees	$145,000	1.00	0.00	$145,000	DFW	SIK	District fees to convey water to primary and secondary lands within the Gray Lodge Wildlife Area.
Agreement	San Luis Delta-Mendota Water Authority Agreement #80720X0354 - L2 Surface Water Conveyance	$7,320,000	1.00	0.03	$7,539,600	BOR	CVPRF	Convey surface water to Volta & Mendota WAs; and to secondary & tertiary conveyors for Los Banos WA; China Island and Salt Slough Units of N. Grasslands WA; Freitas & Kesterson Units of San Luis NWR; Kern NWR; & Grassland Resource Conservation District (AF included in 337,222 under Benefit section)
Agreement	Water from Diverse Sources at No Cost to RWSP	$0	1.00	0.00	$0	BOR	CVPRF	L-2 surface water from diverse sources with NO conveyance/ power cost to Refuge Program. Sutter 12,423 AF riparian rights; Gray Lodge 18,800 AF water rights; Los Banos 3,995 AF mitigation; Merced 8,548 AF mitigation via Merced ID (FERC license); GRCD 4,407 groundwater; Volta 2314 AF accretion flows.
Agreement	Glenn-Colusa Irrigation District Agreement #R13AC20502 - L2 Surface Water Conveyance	$2,125,000	1.00	0.03	$2,188,750	BOR	CVPRF	Convey surface water to Sacramento, Colusa and Delevan NWRs (AF included in 337,222 under Benefit section)
Agreement	Henry Miller Reclamation District Contract #17WC205028 - L2 Surface Water Conveyance	$236,000	1.00	0.03	$243,080	BOR	CVPRF	Convey surface water to Los Banos WA and Grassland Resource Conservation District (AF included in 337,222 under Benefit section)
Technical Support								
Labor	Gray Lodge Wildlife Area water quality monitoring	$287,082	.25	0.03	$71,794	BOR	CVPRF	Labor involved for MP156/157 staff to provide water quality monitoring

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
Labor	Sutter NWR Pilot Project water quality monitoring	$279,111	.37	0.03	$103,192	BOR	CVPRF	Labor involved for MP156/157 staff to provide water quality monitoring
Labor	MP3800 Agreement and contract modifications	$78,283	.13	0.03	$13,307	BOR	CVPRF	Labor involved for staff to process agreement and contract modifications
Labor	NCAO conveyance agreement administration	$303,150	.06	0.03	$18,188	BOR	CVPRF	Administration of North-of-Delta refuge water conveyance agreements
Labor	NCAO hydrologic technician Flow/ Pump meter management	$171,456	.11	0.03	$18,860	BOR	CVPRF	Collect delivery data from Gray Lodge meters; perform maintenance on flow meters and groundwater pump meters
Monitoring								
Labor	Bear Creek Water Loss Study	$0	1.00	0.00	$0	BOR	CVPRF	Collect and evaluate flow data to determine conveyance water losses to the East Bear Creek Unit of the San Luis NWR Complex. Costs included in 'RWSP Technical Support' charter for labor.
Agreement	Water Quality Monitoring - Gray Lodge WA - 2 LABS: APPL - BPA #R11PA20027; Basic - BPA #R11PA20029	$6,944	1.00	0.03	$7,152	BOR	CVPRF	Contract laboratory water sampling analysis costs and supply costs for Gray Lodge Wildlife Area water quality monitoring program for both groundwater and surface water supplies.
2022								
Implementation								
Agreement	Grassland Water District Contract #17WC205027 - L2 Surface Water Conveyance	$421,000	1.00	0.06	$446,260	BOR	CVPRF	Convey surface water supplies to Los Banos WA; Salt Slough Unit of N. Grasslands WA; and Freitas and Kesterson Units of San Luis NWR (AF included in 337,222 under Benefit section)
Agreement	Water from Diverse Sources at No Cost to RWSP	$0	1.00	0.00	$0	BOR	CVPRF	L-2 surface water from diverse sources with NO conveyance/ power cost to Refuge Program. Sutter 12,423 AF

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
								riparian rights; Gray Lodge 18,800 AF water rights; Los Banos 3,995 AF mitigation; Merced 8,548 AF mitigation via Merced ID (FERC license); GRCD 4,407 groundwater; Volta 2314 AF accretion flows.
Agreement	Henry Miller Reclamation District Contract #17WC205023 - L2 Surface Water Conveyance	$236,000	1.00	0.06	$250,160	BOR	CVPRF	Convey surface water to Los Banos WA and Grassland Resource Conservation District (AF included in 337,222 under Benefit section)
Agreement	Central California Irrigation District Contract #17WC205023 - L2 Surface Water Conveyance	$1,267,000	1.00	0.06	$1,343,020	BOR	CVPRF	Convey surface water to China Island Unit of N. Grasslands WA; and to tertiary conveyor for Los Banos WA; Salt Slough Unit of N. Grasslands WA; Freitas & Kesterson Units of San Luis NWR; Grassland Resource Conservation District (AF included in 337,222 under Benefit section)
Agreement	Biggs-West Gridley Water District Agreement #R10AC20559 - L2 Surface Water Conveyance	$110,000	1.00	0.06	$116,600	BOR	CVPRF	Convey surface water to Gray Lodge WA (AF included in 337,222 under Benefit section)
Agreement	Glenn-Colusa Irrigation District Agreement #R13AC20502 - L2 Surface Water Conveyance	$2,125,000	1.00	0.06	$2,252,500	BOR	CVPRF	Convey surface water to Sacramento, Colusa and Delevan NWRs (AF included in 337,222 under Benefit section)
Agreement	FWS Costs for Groundwater Pumping and Lift Pumping L2 Water (BOR-FWS Interagency 'Split' Agreement)	$253,339	1.00	0.00	$253,339	FWS	CVPRF	1) Groundwater pumping at Merced (4,952 AF- part of 13,686 in Benefit section); 2) temp lift pumps rental for fall @ Sutter (AF included in 337,222 in Benefit); 3) lift pumping to elevate surface water at Colusa & Sutter

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
								(Triangle) reference boundaries (AF included in 337,222 under Benefit)
Agreement	San Luis Delta-Mendota Water Authority Agreement #80720X0354 - L2 Surface Water Conveyance	$7,320,000	1.00	0.06	$7,759,200	BOR	CVPRF	Convey surface water to Volta & Mendota WAs; and to secondary & tertiary conveyors for Los Banos WA; China Island and Salt Slough Units of N. Grasslands WA; Freitas & Kesterson Units of San Luis NWR; Kern NWR; & Grassland Resource Conservation District (AF included in 337,222 under Benefit section)
Agreement	CA Dept. of Water Resources Agreement #12WC204346 - L2 Surface Water Conveyance	$46,000	1.00	0.06	$48,760	BOR	CVPRF	Convey surface water to tertiary conveyor for Kern NWR (AF included in 337,222 under Benefit section)
Agreement	Buena Vista Water Storage District Agreement #R10AC20683 - L2 Surface Water Conveyance	$175,000	1.00	0.06	$185,500	BOR	CVPRF	Convey surface water directly to Kern NWR (AF included in 357,366 under Benefit section)
Agreement	Henry Miller Reclamation District Agreement #11650-2-0013 (with FWS) - L2 Surface Water Conveyance	$703,931	1.00	0.06	$746,167	FWS	CVPRF	Convey surface water to San Luis and West Bear Creek Units of the San Luis NWR (AF included in 337,222 under Benefit section)
In-Kind Equipment or Materials	Water District Conveyance Fees	$145,000	1.00	0.00	$145,000	DFW	SIK	District fees to convey water to primary and secondary lands within the Gray Lodge Wildlife Area.
Agreement	BOR Costs Groundwater/Lift Pumping L2 Water (CDFW Reimb #s15WC204671 & 16WC204795?; PG&E #R15PD00454	$1,028,496	1.00	0.06	$1,090,206	BOR	CVPRF	Costs for pumping L2 groundwater & lift pumping required to elevate surface water supplies @ refuge boundaries incl Project Use energy. (Groundwater AF incl in L2 Groundwater Pumped Benefit 13,686) Refuges: Pixley NWR;

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
								Gray Lodge, Volta, Los Banos, & Mendota; China Island & Salt Slough Units; E. Bear Creek
Technical Support								
Labor	Gray Lodge Wildlife Area water quality monitoring	$295,443	.25	0.06	$69,703	BOR	CVPRF	Labor involved for MP156/157 staff to provide water quality monitoring
Labor	Sutter NWR Pilot Project water quality monitoring	$287,240	.37	0.06	$100,187	BOR	CVPRF	Labor involved for MP156/157 staff to provide water quality monitoring
Labor	MP3800 Agreement and contract modifications	$80,563	.13	0.06	$12,920	BOR	CVPRF	Labor involved for staff to process agreement and contract modifications
Labor	NCAO conveyance agreement administration	$311,979	.063	0.06	$17,659	BOR	CVPRF	Administration of North-of-Delta refuge water conveyance agreements
Labor	NCAO hydrologic technician Flow/ Pump meter management	$176,447	.11	0.06	$18,311	BOR	CVPRF	Collect delivery data from Gray Lodge meters; perform maintenance on flow meters and groundwater pump meters
Monitoring								
Agreement	Water Quality Monitoring - Gray Lodge WA - 2 LABS: APPL - BPA #R11PA20027; Basic - BPA #R11PA20029	$6,944	1.00	0.06	$7,361	BOR	CVPRF	Contract laboratory water sampling analysis costs and supply costs for Gray Lodge Wildlife Area water quality monitoring program for both groundwater and surface water supplies.
Labor	Bear Creek Water Loss Study	$0	1.00	0.00	$0	BOR	CVPRF	Collect and evaluate flow data to determine conveyance water losses to the East Bear Creek Unit of the San Luis NWR Complex. Costs included in 'RWSP Technical Support' charter for labor.

Refuge Construction - Biggs-West Gridley/Gray Lodge WA Project

Project implementation or contract and construction management service

DCN: 20RWSP004
Classification: Improvement, Refuge Facility
Location: Sutter Buttes Region, North of Delta Refuges and Wildlife Areas
Funding Years: 2017 - 2021
Benefits Start Year: 2021
Priority: High
Partners: Ducks Unlimited, FWS, Gray Lodge, BWDWD, CDFW
Related Programs: CVPIA b2

Authority

Provision	Percentage
(d)(5)-(1) Refuge Facility L2	80.0%
(d)(5)-(2) Refuge Facility IL4	20.0%

Metrics

Name	Value	Units	Comment
Full Level 4 Delivery Capacity	44000	acre-feet	Amount of water required for optimum management of wetlands, subject to water supply availability.

Deliverables

Date	Title
Oct. 2018	FY19 Service Agreement (MP-410 and MPCO)
Oct. 2019	FY20 Service Agreement (MP-410 and MPCO)
Oct. 2020	FY21 Service Agreement (MP-410 and MPCO)
May. 2021	Construction Completion

Narrative

This charter is for Reclamation's Mid-Pacific Construction Office (MPCO) construction contract and management support services to be provided to Ducks Unlimited for the implementation of the Gray Lodge Wildlife Area Water Supply Project (formally known as the Biggs-West Gridley Water District (BWGWD) Conveyance Improvement Project). The project includes improvements to the BWGWD water conveyance system to increase system capacity and accommodate deliveries of full Level 4 water supplies to the Gray Lodge WA, a CVPIA refuge. This Project builds upon previous phases of BWGWD conveyance improvements completed between 2013-15 and funded by Reclamation.

The resulting MPCO Service Agreement will be for contract management and construction management services to monitor the project construction activities. MPCO personnel will be on site to help coordinate construction work, verify that work is constructed per the design and specifications, monitor schedules and budgets, attend weekly project management meetings, provide construction/engineering support as needed, and prepare written daily and weekly construction update reports. BWGWD was awarded a grant from the California Natural Resources Agency (CNRA) to implement the construction Project. BWGWD is working with Ducks Unlimited, a RWSP NGO partner, to perform the construction work. MPCO will be supporting Ducks Unlimited who is the construction contract administrator for this project. The total CNRA (state) contribution to this project is $52,458,449.

Data Management

Project notes, data (daily updates and weekly reports) and reports will be maintained by Reclamation's Construction Office (MPCO) and Reclamation's Resources Management Division, Program Management Branch (MP-410).

Risks

Risk	Likelihood	Impact
Cost estimates and budget	1	2
Lack of Construction Office resources/expertise	1	2

Cost Estimate

Year	Fund	Total	BOR	SIK
2013	CVPRF	$29,438,990	29,438,990	$0
2017	State Prop 1	$52,458,449	$0	$52,458,449
2018	CVPRF	$29,420	$29,420	$0
2019	CVPRF	$135,785	$135,785	$0
2020	CVPRF	$945,490	$945,490	$0

Total Cost: $83,008,134

Internal Agency Resources Table

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
2018								
Construction								
Agreement	Service Agreement	$29,420	0.00	0.00	$29,420	BOR	CVPRF	Service agreement with MPCO to provide technical support MP-410 and DU for Gray Lodge Wildlife Water Supply Prjec.
2019								
Construction								
Agreement	Service Agreement	$400,000	1.00	0.00	$135,785	BOR	CVPRF	Contract management and on-site construction management services in FY19. State cost share for construction under CNRA grant is $52,458,449.
2020								
Construction								
Agreement	Service Agreement	$400,000	1.00	0.00	$945,490	BOR	CVPRF	Contract management and on-site construction management services in FY20.

Refuge Construction - East Bear Creek Pump Station Modifications Project

Service agreement for O&M support services

DCN: 20RWSP005
Classification: Improvement, Refuge Facility
Location: San Luis NWR Complex, South of Delta Refuges and Wildlife Areas
Funding Years: 2019 - 2021
Benefits Start Year: 2020
Priority: High
Partners: FWS

Authority

Provision	Percentage
(d)(5)-(1) Refuge Facility L2	67.0%
(d)(5)-(2) Refuge Facility IL4	33.0%

Metrics

Name	Value	Units	Comment
Full Level 4 water delivery capacity.	13290	acre-feet	Amount of water required for optimum wetland management, subject to water supply availability.

Deliverables

Date	Title
Oct. 2018	Service Agreement - FY19 (MP-410 and Tracey Office)
Feb. 2019	A/E design contract executed
Sep. 2019	A/E design contract deliverables completed/ being modifications
Oct. 2019	Service Agreement - FY20 (MP-410 and Tracey Office)

Narrative

The East Bear Creek Pump Station is the only facility available to divert water from Bear Creek for this San Luis Wildlife Refuge East Bear Creek Unit's wetlands. Therefore, it is critical to keep the facility fully operational throughout the year, addressing any electrical and mechanical issues quickly. Since the completion of the pump station in 2009, it has been plagued by mechanical and electrical issues. Funding is needed to:

1. Enter into a service agreement with Reclamation's Tracey Office to provide O&M (electrical and mechanical) services for the East Bear Creek pump station.
2. Enter into an A/E contract with a design firm to help assess and prioritize needed design and operational changes to the pump station to minimize unscheduled pump shutdowns.
3. Purchase materials for implementation of identified design and operational modifications to improve pump station performance (e.g., new valves, controls, electronics, etc.).
4. Enter into a service agreement with Reclamation's Engineering and Design Division (MP-200) to provide QA/QC technical review support of design and operational modifications.

Data Management

Data and reports will be maintained within Reclamation's Resources Management Division, Program Management Branch (MP-410).

Risks

Risk	Likelihood	Impact
Pump Plant failure - inability to pump water	2	2

Cost Estimate

Year	Fund	Total	BOR	FWS
2019	CVPRF	$0[24]	$0	$0
2020	CVPRF	$1,200,000	$1,200,000	$0
2021	CVPRF	$250,000	$250,000	$0
2022	CVPRF	$100,000	$100,000	$0

Total Cost: $1,550,000

[24] Contract was not executed in 2019, scheduled to be executed in 2020.

Internal Agency Resources Table

Type	Name	Rate	Frack.	MU	Total	Agency	Fund	Description
2020								
Construction								
Agreement	Contract for Services	$450,000	1.00	0.00	$450,000	BOR	CVPRF	A/E contract with an engineering design firm to: (1) assess, identify and prioritize EBC pump plan operational and design issues and (2) modify designs/operations to address identified issues.
Agreement	Service Agreement	$150,000	1.00	0.00	$150,000	BOR	CVPRF	FY20 Service Agreement with Tracey Office to provide emergency call out repairs and O&M support to the refuge managers.
Agreement	Service Agreement	$500,000	1.00	0.00	$500,000	BOR	CVPRF	FY20 Service Agreement with MP-200 for QA/QC technical review support of design and operational modifications.
Agreement	Supplies and Materials	$100,000	1.00	0.00	$100,000	BOR	CVPRF	For supplies/materials needed to implement designs and operations modifications
2021								
Construction								
Agreement	Service Agreements	$150,000	1.00	0.00	$150,000	BOR	CVPRF	FY21 Service Agreement with Tracey Office to provide emergency call out repairs and O&M support to the refuge managers.
Agreement	Supplies and Materials	$100,000	1.00	0.00	$100,000	BOR	CVPRF	For supplies/materials needed to implement designs/operations modifications.
2022								
Construction								
Agreement	Service Agreement	$100,000	1.00	0.00	$100,000	BOR	CVPRF	FY22 Service Agreement with Tracey Office to provide emergency call out repairs and O&M support to the refuge managers.

Refuge Construction - Sutter NWR Lift Station Project

Sutter NWR Lift Station Construction Support Services

DCN: 20RWSP006
Classification: Improvement, Refuge Facility
Location: Sutter Flood Control Bypass, North of Delta Refuges and Wildlife Areas
Funding Years: 2017 - 2020
Benefits Start Year: 2020
Priority: High
Partners: Ducks Unlimited, FWS, CDFW, CDWR
Related Programs: CVPIA b2

Authority

Provision	Percentage
(d)(5)-(1) Refuge Facility L2	78.0%
(d)(5)-(2) Refuge Facility IL4	22.0%

Metrics

Name	Value	Units	Comment
Full Level 4 water delivery capacity.	30000	acre-feet	Amount of water required for optimum management of wetlands, subject to water supply availability.

Deliverables

Date	Title
Oct. 2018	FY19 Service Agreement (MP410 and MPCO)
Oct. 2019	FY20 Service Agreement (MP410 and MPCO)
May. 2020	Construction Completion

Narrative

The Sutter NWR Lift Station Project is identified as part of the preferred alternative in the Sutter NWR Conveyance Study (Study), which was completed January 2015. The Lift Station is being designed with the capacity to provide the Refuge's full Level 4 water supply (30,000 AF) and will be a key component for long-term conveyance solutions identified in the Study. Project design, environmental compliance, and permitting are expected to be completed in late fall 2018. The Lift Station will be equipped with state-of-the-art cylindrical fish screens. Project construction is expected to start in summer 2019, however, actual start date is subject to environmental compliance and permitting activities being complete. Ducks Unlimited, a RWSP NGO partner, was awarded a grant from the California Natural Resources Agency (CNRA) to implement the construction Project. The total CNRA (state) contribution to this project is $5,927,167.

Reclamation has committed to providing construction contract and management services to Ducks Unlimited for project implementation. These services will be provided by Reclamation's Mid-Pacific Construction Office (MPCO) in Willows, CA. MP-410 will enter into annual service agreements with MPCO for these support services.

Reclamation has also committed to providing continued engineering design support during bidding and construction of the project. These services will be provided by Reclamation's Mid-Pacific design division (MP-200) as Engineer of Record. MP-410 will enter into annual service agreements with MP-200 for these support services.

Finally, Reclamation has committed to reimbursing Ducks Unlimited for Project implementation expenses not reimbursable under the CNRA grant. This will be reimbursed under a Federal Financial Assistance agreement between Reclamation and Ducks Unlimited (funds for this agreement are expected to be obligated in FY18).

Data Management

Project information will be maintained within Reclamation's Resources Management Division, Program Management Branch (MP-410).

Risks

Risk	Likelihood	Impact
Lack of Construction Office resources/expertise	1	2
Cost estimate and budget	1	2

Cost Estimate

Year	Fund	Total	BOR	SIK
2017	State Prop 1	$5,927,167	$0	$5,927,167
2017	CVPRF	$396,456	$396,456	$0
2018	CVPRF	$341,850	$341,850	$0
2019	CVPRF	$599,875	$599,875	$0
2020	CVPRF	$519,565	$519,565	$0

Total Cost: $7,784,913

Internal Agency Resources Table

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
2017								
Construction								
Agreement	Service Agreement	$1,500	1.00	0.00	$1,500	BOR	CVPRF	Service agreement with Reclamation's Construction Office in Willows, CA for contract management and construction management services in FY17. State cost share for construction under CNRA grant is $5,927,167.
Agreement	Service Agreement	$394,956	1.00	0.00	$394,956	BOR	CVPRF	Service agreement with Reclamation's MP-200 for engineering and design support services in FY17.
2018								
Construction								
Agreement	Service Agreement	$29,420	1.00	0.00	$41,850	BOR	CVPRF	Service agreement with Reclamation's Construction Office in Willows, CA for contract management and construction management services in FY18. State cost share for construction under CNRA grant is $5,927,167.
Agreement	Service Agreement	$300,000	1.00	0.00	$300,000	BOR	CVPRF	Service agreement with Reclamation's MP-200 for engineering and design support services in FY18.
2019								
Construction								
Agreement	Service Agreement	$135,785	1.00	0.00	$16,875	BOR	CVPRF	Service agreement with Reclamation's Construction Office in Willows, CA for contract management and construction management services in FY19. State cost share for construction under CNRA grant is $5,927,167.

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
Agreement	Service Agreement	$418,000	1.00	0.00	$583,000	BOR	CVPRF	Service agreement with Reclamation's MP-200 for engineering and design support services in FY19.
2020								
Construction								
Agreement	Service Agreement	$945,490	1.00	0.00	$373,565	BOR	CVPRF	Service agreement with Reclamation's Construction Office in Willows, CA for contract management and construction management services in FY20.
Agreement	Service Agreement	$146,000	1.00	0.00	$146,000	BOR	CVPRF	Service agreement with Reclamation's MP-200 for engineering and design support services in FY20.

2020 Annual Work Plan Public Draft

Independent Programs Charters

Central Valley Project Improvement Act
Title XXXIV of Public Law 102-575

CVP Restoration Fund Trinity River Restoration Program (TRRP) Channel Restoration Projects FY20

Implementation of a river restoration project (Dutch Creek) using CVPIA funding.

DCN: 20INDP001
Classification: Improvement, Habitat Restoration
Location: Trinity River, Klamath Basin, Northern California
Funding Years: 2019 - 2020
Benefits Start Year: 2019
Priority: 1 - 2000 Record of Decision
Partners: BLM, CDFW, DWR, Hoopa Tribe, NMFS, USFS, Yurok Tribe
Related Programs: No Data.

Authority

Provision	Percentage
(b)(21) Trinity River Restoration Program	100.0%

Metrics

Name	Value	Units	Comment
Change in presmolt habitat area at winter flow (1,200 cfs)	37	N/A	Units = Weighted usable area. Underestimated due to omission of cover from habitat estimate.
Split flow side channel	2	miles	New channel edge length created
Functional Riparian Floodplain	0	acres	6.2 acres - Database glitch prevents entry. Lowering and planting of high mine sediment terrace
Large Wood Jam Habitat Structures	3	number of actions	Geomorphic wood jams. Dozens of habitat wood placements as well.
Change in presmolt habitat area at baseflow (@450cfs)	15	N/A	Units = Weighted usable area. Underestimated due to omission of cover from habitat estimate

Deliverables

See Trinity River Restoration Program Annual Progress Report.

Narrative

The Dutch Creek channel rehabilitation project is situated at the top end of the Junction City Valley reach of the Trinity River. This is the broadest valley in the restoration reach of the Trinity and is where it has the highest potential to display the attributes of an alluvial river. However, it also was the location of some of the most intense hydraulic mining (followed by dredge mining) in California. The combination of mine-derived sedimentation compounded by flow regulation due to the TRD have resulted in dramatic channel simplification. The Dutch Creek project area in particular consists

of a straight, nearly featureless channel with a wedge of sediment occupying the valley where a functional floodplain should sit. The project seeks to accomplish the goals of increasing the availability of anadromous fish habitat above winter base flow for all life stages, increase available floodplain and favorable conditions for riparian vegetation, increase wetland habitat off-channel salmonid rearing habitat, and increase the geomorphic complexity of the river in this reach. It should be noted that this project was included in our proposal for FY19, but due to permitting delays another project was selected for FY19 funding (Chapman Ranch Phase A); Dutch Creek Channel Rehabilitation has moved to FY20.

Data Management

Information will be retained in the TRRP Office.

Risks

No Data.

Cost Estimate

Year	Fund	Total	BOR	FWS
2020	CVPRF	$1,500,000	$1,500,000	$0
2021	CVPRF	$1,500,000	$1,500,000	$0
2022	CVPRF	$1,500,000	$1,500,000	$0
2023	CVPRF	$1,500,000	$1,500,000	$0
2024	CVPRF	$1,500,000	$1,500,000	$0
2025	CVPRF	$1,500,000	$1,500,000	$0

Total Cost: $9,000,000

Internal Agency Resources Table

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
2020								
Implementation								
Agreement	Channel Construction Funding	$1,500,000	1.00	0.00	$1,500,000	BOR	CVPRF	Environmental site study and construction.
2021								
Implementation								
Agreement	Channel Construction Funding	$1,500,000	1.00	0.00	$1,500,000	BOR	CVPRF	Environmental site study and construction.
2022								
Implementation								
Agreement	Channel Construction Funding	$1,500,000	1.00	0.00	$1,500,000	BOR	CVPRF	Environmental site study and construction.
2023								
Implementation								
Agreement	Channel Construction Funding	$1,500,000	1.00	0.00	$1,500,000	BOR	CVPRF	Environmental site study and construction.
2024								
Implementation								
Agreement	Channel Construction Funding	$1,500,000	1.00	0.00	$1,500,000	BOR	CVPRF	Environmental site study and construction.
2025								
Implementation								
Agreement	Channel Construction Funding	$1,500,000	1.00	0.00	$1,500,000	BOR	CVPRF	Environmental site study and construction.

WRR Funding of Trinity River Restoration Program (TRRP) Record Of Decision (ROD) Restoration Actions

Implementing the Record of Decision for the Trinity River Restoration Program including flows, gravel, monitoring, watershed restoration work, and related administration.

DCN:	20INDP002
Classification:	Improvement, Water Operations
Location:	Trinity River, Trinity County, northern California
Funding Years:	2020
Benefits Start Year:	2020
Priority:	1 - 2000 Record of Decision
Partners:	Yurok Tribe, Hoopa Valley Tribe, CDFW, DWR, USFWS, USFS, NMFS, Trinity County
Related Programs:	No Data.

Authority

Provision	Percentage
(b)(1)	100.0%

Metrics

No Data.

Deliverables

No Data.

Narrative

The Trinity River Restoration Program funds a comprehensive internal and external program of work. The following list encompasses the scope of the TRRP funded by WRR under CVPIA (b)(23) authority.

TRRP Office Operations and Support Tasks - Includes building lease, fleet vehicles, Annual Report editing (TSC), Meeting notetaker contract.

TRRP Admin Personnel - Secretary, Grants specialist, Indian Self Determination Specialist
TMC - This task funds Hoopa Valley Tribe and the Yurok Tribe participation in the Trinity Management Council (TMC), the decision-making body of the TRRP.

Technical Assistance - Technical work group participation, hydrograph development, policy review, TRRP Refinements participation

Implementation - On the ground activities such as habitat restoration, gravel augmentation, and watershed restoration. Charter using (b)(1) authority is strictly for on the ground activities. This Charter using (b)(23) authority includes administrative costs associated with implementation.
Implementation Personnel - Implementation Branch Chief, engineer, outreach coordinator, civil engineering technicians (2), natural resource specialist

Miscellaneous - Contract for improvement to property in floodway; Temporary access agreements for restoration projects

Planning - Three contracts: NEPA support, Biological Assessment Development, Geophysical support services

Design & Support Services - Development and review of restoration designs
Construction (Non (b)(1)) - This Charter using (b)(23) authority includes administrative costs associated with construction related to implementation.

Watershed Implementation Grants - Grant(s) for tributary restoration work to government and NGO applicants

Science - Science Branch Chief, data steward, physical scientists (2), natural resource specialist
Science Program Support - Salary for program Riparian Ecologist employed on behalf of the Hoopa Valley Tribe

Status & Trend Monitoring

1. Redd Distribution
2. Outmigrant monitoring
3. Gravel Implementation Monitoring
4. Stream Gaging
5. Chinook CWT
6. Chinook Run Size Estimation
7. Tribal Harvest Monitoring
8. Fall Run Scale Age
9. Sport Harvest/Trinity Creel Survey

Effectiveness Monitoring

1. Flow Management Science - Targeted science solicitation for proposals addressing questions related to restoration flow optimization
2. Channel Rehab Effectiveness Monitoring - Field surveys and re-modeling of restoration sites to assess performance over time

Hatchery

1. Coded Wire Tag Purchase - Purchase of tags for cohort reconstruction
2. Run size estimation - Operation of Junction City Weir, hatchery monitoring

Data Management

Information will be retained in the TRRP Office in addition in compliance with the CVPIA Data Guidance. Following peer review, publications, reports, and data packages will be published at www.trrp.net/dataport.

Risks

No Data.

Cost Estimate

Year	Fund	Total	BOR	FWS
2020	WRR	$9,991,221	$9,991,221	$0
2021	WRR	$9,991,221	$9,991,221	$0
2022	WRR	$9,991,221	$9,991,221	$0
2023	WRR	$9,991,221	$9,991,221	$0
2024	WRR	$9,991,221	$9,991,221	$0
2025	WRR	$9,991,221	$9,991,221	$0

Total Cost: $59,947,326

Internal Agency Resources Table

Type	Name	Rate	Frac	MU	Total	Agency	Fund	Description
2020								
Non-Labor	TRRP Office Operations and Support Tasks	$793,433	1.0	1.0	$768,433	Reclamation	WRR	Includes building lease, fleet vehicles, Annual Report editing (TSC), Meeting notetaker contract
Labor	TRRP Admin Personnel	$437,287	1.0	1.0	$437,287	Reclamation	WRR	Secretary, Grants specialist, Indian Self Determination Specialist
Labor	TMC	0	1.0	1.0	$0	Reclamation	WRR	TMC participation is by NCAO Area Manager and is not included in TMC budget
638 AFA	TMC	$157,131	1.0	1.0	$157,131	Hoopa Valley Tribe	WRR	Meeting attendance and program participation by Tribal administrators
638 AFA	TMC	$145,552	1.0	1.0	$145,552	Yurok Tribe	WRR	Meeting attendance and program participation by Tribal administrators
638 AFA	Technical Assistance	$444,083	1.0	1.0	$444,083	Hoopa Valley Tribe	WRR	Technical work group participation, hydrograph development, policy review, TRRP Refinements participation
638 AFA	Technical Assistance	$452,331	1.0	1.0	$452,331	Yurok Tribe	WRR	Technical work group participation, hydrograph development, policy review, TRRP Refinements participation
Implementation								
Labor	Implementation Personnel	$498,983	1.0	1.0	$498,983	Reclamation	WRR	Implementation Branch Chief, engineer, outreach coordinator, civil engineering technicians (2), natural resource specialist
Contract	Miscellaneous	$250,000	1.0	1.0	$250,000	Reclamation	WRR	Improvement to property in floodway, temporary access agreements for restoration projects

Type	Name	Rate	Frac	MU	Total	Agency	Fund	Description
Contract	Planning	$630,421	1.0	1.0	$630,421	Reclamation	WRR	Three contracts: NEPA support, Biological Assessment Development, geophysical support services
638 AFA	Design & Support Services	$183,742	1.0	1.0	$183,742	Hoopa Valley Tribe	WRR	Development and review of restoration designs
638 AFA	Design & Support Services	$282,247	1.0	1.0	$282,247	Yurok Tribe	WRR	Development and review of restoration designs
638 AFA	Construction (Non (b)(1) note $1.5M	$1,500,000	0.5	1.0	$750,000	Hoopa Valley Tribe	WRR	Construction of Dutch Creek Channel Rehab site. Other 50% under (b)(1) Charter
638 AFA	Construction (Non (b)(1) note $1.5M	$1,500,000	0.5	1.0	$750,000	Yurok Tribe	WRR	Construction of Dutch Creek Channel Rehab site. Other 50% under (b)(1) Charter
638 AFA	Construction (Non (b)(1) note $1.5M	$207,056	1.0	1.0	$207,056	Yurok Tribe	WRR	Large wood supply
Non-Labor	Construction (Non (b)(1) note $1.5M	$40,000	1.0	1.0	$40,000	Reclamation	WRR	Value engineering study for new designs
638 AFA	Construction (Non (b)(1) note $1.5M	$126,856	1.0	1.0	$126,856	Yurok Tribe	WRR	Gravel augmentation implementation
638 AFA	Construction (Non (b)(1) note $1.5M	$75,304	1.0	1.0	$75,304	Hoopa Valley Tribe	WRR	Irrigation and maintenance of restoration site revegetation
Non-Labor	Construction (Non (b)(1) note $1.5M	$50,000	1.0	1.0	$50,000	Reclamation	WRR	Test pitting and development of geologic report for new project sites
Agreements	Watershed Implementation Grants	$500,000	1.0	1.0	$500,000	Other	WRR	Grant(s) for tributary restoration work to government and NGO applicants
Science								
Labor	Science Program Support	$446,648	1.0	1.0	$446,648	Reclamation	WRR	Science Branch Chief, data steward, physical scientists (2), natural resource specialist
638 AFA	Science Program Support	$187,389				Hoopa Valley Tribe		Salary for program Riparian Ecologist

Type	Name	Rate	Frac	MU	Total	Agency	Fund	Description
Status & Trend Monitoring								
638 AFA	Redd Distribution	$80,026	1.0	1.0	$80,026	Yurok Tribe	WRR	Redd and carcass surveys
638 AFA	Redd Distribution	$100,292	1.0	1.0	$100,292	Hoopa Valley Tribe	WRR	Redd and carcass surveys
Interagency Agreement	Redd Distribution	$7,485	1.0	1.0	$7,485	USFS	WRR	Redd and carcass surveys
638 AFA	Outmigrant monitoring	$545,788	1.0	1.0	$545,788	Yurok Tribe	WRR	Operation of screw traps and data analysis
638 AFA		$306,771	1.0	1.0	$306,771	Hoopa Valley Tribe	WRR	Operation of screw traps and data analysis
Contract	Gravel Implementation Monitoring	$110,658	1.0	1.0	$110,658	Reclamation	WRR	Mapping of gravel movement through time
Interagency Agreement	Stream Gaging	$238,400	1.0	1.0	$238,400	USGS	WRR	Monitoring of mainstem flow and temperature
638 AFA	Chinook CWT	$197,937	1.0	1.0	$197,937	Hoopa Valley Tribe	WRR	Purchase and application of coded wire tags to hatchery fish
638 AFA	Chinook Run Size Estimation	$71,055	1.0	1.0	$71,055	Hoopa Valley Tribe	WRR	Mark-recapture of hatchery fish to inform cohort reconstruction
638 AFA	Tribal Harvest Monitoring	$180,000	1.0	1.0	$180,000	Yurok Tribe	WRR	Quantification of on-reservation salmon harvest
638 AFA	Tribal Harvest Monitoring	$117,506	1.0	1.0	$117,506	Hoopa Valley Tribe	WRR	Quantification of on-reservation salmon harvest
638 AFA	Fall Run Scale Age	$93,174	1.0	1.0	$93,174	Hoopa Valley Tribe	WRR	Fish aging to inform cohort reconstruction
638 AFA	Fall Run Scale Age	$49,549	1.0	1.0	$49,549	Yurok Tribe	WRR	Fish aging to inform cohort reconstruction
638 AFA	Sport Harvest/Trinity Creel Survey	$100,216	1.0	1.0	$100,216	Hoopa Valley Tribe	WRR	Monitoring of sport harvest by non-tribal members on HVT reservation

Type	Name	Rate	Frac	MU	Total	Agency	Fund	Description
Effectiveness Monitoring								
Agreements	Flow Management Science	$496,230	1.0	1.0	$496,230	Other	WRR	Targeted science solicitation for proposals addressing questions related to restoration flow optimization
638 AFA	Channel Rehab Effectiveness Monitoring	$50,000	1.0	1.0	$50,000	Hoopa Valley Tribe	WRR	Field surveys and re-modeling of restoration sites to assess performance over time
638 AFA	Channel Rehab Effectiveness Monitoring	$50,000	1.0	1.0	$50,000	Yurok Tribe	WRR	Field surveys and re-modeling of restoration sites to assess performance over time

San Joaquin River Restoration Program - Mendota Pool Bypass and Reach 2B Project

Construction of Mendota Pool Bypass for flow routing and fish passage

DCN:	20INDP003
Classification:	Improvement, Administration
Location:	San Joaquin River, San Joaquin Upper Mainstem
Funding Years:	2020 - 2024
Benefits Start Year:	2020
Priority:	1 - All CVPIA Restoration Funds will be applied to this project. Additional funding will come from other sources.
Partners:	USFWS, CDFW, DWR
Related Programs:	San Joaquin River Restoration Program

Authority

Provision	Percentage
SJRRP (PL111-11)	100.0%

Project Management Team

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Metrics

Restore and maintain fish populations. Visit the San Joaquin River Restoration Program website www.restoresjr.net for project details.

Deliverables

9/30/2024 Report on acquisition of land and construction of Mendota Pool fish screen
Deliverables in all years of this project will be coordinated with the CVPIA Data Manager, CVPIA Science Coordinator, and CVPIA Fish Resource Area Coordinator.

Narrative

The San Joaquin River Restoration Program (Program) has identified entrainment as a limiting factor for accomplishing spring-run Chinook salmon population goals in the Program's Fisheries Framework: Spring-run and Fall-run Chinook Salmon (2018). Conditions necessary for reestablishment of spring-run and fall-run Chinook salmon in the San Joaquin River must include volitional fish passage, sufficient flows to manage temperatures in the river, and basic habitat needs. To accomplish this goal, the Funding Constrained Framework for Implementation (2018) specifies in Stage 1 of the restoration, which extends from federal fiscal year (FY) 2017 through 2024, that

construction of the Mendota Pool Bypass and fish screen are priorities. In order to protect emigrating juvenile Chinook salmon from water deliveries that would be diverted from the San Joaquin River to Mendota Pool (2.5 miles northeast of Mendota, California), a fish screen is being designed for installation adjacent to the head of the Compact Bypass at the Mendota Pool Control Structure (Record of Decision for San Joaquin River Restoration Program's Mendota Pool Bypass and Reach 2B Improvements Project 2016). The fish screen would keep emigrating juvenile salmon in the river and guide them to the Compact Bypass during water deliveries, where they can continue their downstream migration. The Compact Bypass is planned to be operated for Exchange Contractor diversions in summer months in highly infrequent dry years or during flood flow deliveries. The screen would be designed to pass flow up to 2,500 cfs. The type of fish screen has not yet been determined, however the fish screen facility would be designed to NMFS fish screen criteria for approach, sweeping, and bypass entrance velocities (NMFS 2008).

Fiscal year 2020 funds would be directed toward the acquisition of a realty holding by BB Limited Corporation. Parcels held by BB Limited Corporation are the footprint for the Mendota Pool Compact Bypass and Fish Screen and are a necessary to begin design and construction of water conveyance and fish protection structures. The overall cost of the complete Mendota Pool Bypass, Fish Screen, and Reach 2B Levees Project is estimated to cost $336 million under the 2018 Funding Constrained Framework for Implementation projection. This project is part of the San Joaquin River Restoration Program actions to implement the 2006 Stipulation of Settlement in Natural Resources Defense Council, et al. v. Kirk Rodgers, et al.

For more information, please visit the San Joaquin River Restoration Program website www.restoresjr.net.

Data Management

Data will be retained by the San Joaquin River Restoration Program office in Mid-Pacific Region.

The PMT Data Steward will coordinate with external partners and biannually with the CVPIA Data Manager on the transmission of long-term monitoring and other pertinent data defined by the SIT and the PMT per the 2020 Data Guidance.

Field data will be recorded on data sheets or directly into a recording device/computer and transferred into a computer spreadsheet or database. The PMT Data Steward will coordinate with the CVPIA Data Manager on the transmission of relevant and pertinent data defined by the SIT and the PMT per the 2020 Data Guidance. Field data, analyses, and reports will be stored and backed up on a PMT computer/server.

Pre-project and Post-Project Monitoring Plans

Monitoring plans will follow guidance established for the Program and described in the Fisheries Framework: Spring-run and Fall-run Chinook Salmon (2018) and will be coordinated with the CVPIA Data Manager, CVPIA Fish Resource Area Coordinator, and others as described in the Deliverables and Data Management sections.

Risks

Risk	Likelihood	Impact
Potential delays in construction contracts due to land acquisition negotiations	2	2

Cost Estimate

Year	Fund	Total	BOR	FWS
2009 – 2019	CVPRF	$20,000,000	$20,000,000	$0
2020	CVPRF	$2,000,000	$2,000,000	$0
2021	CVPRF	$2,000,000	$2,000,000	$0
2022	CVPRF	$2,000,000	$2,000,000	$0
2023	CVPRF	$2,000,000	$2,000,000	$0
2024	CVPRF	$2,000,000	$2,000,000	$0
2025	CVPRF	$2,000,000	$2,000,000	$0

Total Cost: $32,000,000

Internal Agency Resources Table

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
2020								
Acquisition								
Agreement	Land Acquisition	$2,000,000	0.00	0.00	$2,000,000	BOR	CVPRF	
2021								
Acquisition								
Agreement	Land Acquisition	$2,000,000	1.00	0.00	$2,000,000	BOR	CVPRF	
2022								
Acquisition								
Agreement	Land Acquisition	$2,000,000	1.00	0.00	$2,000,000	BOR	CVPRF	
2023								
Acquisition								
Agreement	Land Acquisition	$2,000,000	1.00	0.00	$2,000,000	BOR	CVPRF	
2024								
Acquisition								
Agreement	Land Acquisition	$2,000,000	1.00	0.00	$2,000,000	BOR	CVPRF	
2025								
Acquisition								
Agreement	Land Acquisition	$2,000,000	1.00	0.00	$2,000,000	BOR	CVPRF	

Habitat Restoration Program (HRP) Protection and Habitat Restoration Projects

Land Protection and Habitat Restoration Projects

DCN:	20INDP004
Classification:	Improvement, Habitat Acquisition
Location:	Central Valley Wide
Funding Years:	2020 - 2022
Benefits Start Year:	2020
Priority:	1 - Program Priority
Partners:	River Partners, Santa Clara Valley Open Space Authority, Sierra Foothill Conservancy, Center for Natural Lands Management, California Rangeland Trust, Bureau of Land Management, U.S. Fish and Wildlife Service National Wildlife Refuges
Related Programs:	Central Valley Project Conservation Program

Authority

Provision	Percentage
HRP (b)(1)	100.0%

Metrics

Name	Value	Units	Comment
Number of acres of habitat restored for SWRCB Decision 1641	67	acres	Acres restored through habitat restoration actions for D-1641
Number of acres of habitat protected	71	acres	Acres protected through fee title acquisition and/or conservation easement actions
Number of acres of habitat restored	~300	acres	Acres restored through habitat restoration actions
Number of acres of habitat protected for SWRCB Decision 1641	71	acres	Acres protected through fee title acquisition or conservation easement actions for D-1641
Increases in population numbers from restoration actions	2	number of improvements	These actions will contribute towards recovery criteria goals.
Increases in various habitat types per acre	1	acres	Improvements in quantity of habitat types per acre from habitat restoration activities.
Number of Recovery Actions	4	number of actions	These actions will contribute toward recovery criteria goals.

Deliverables

Date	Title
Sep. 2021	Protection actions completed
Sep. 2021	Restoration actions completed
Sep. 2021	Species surveys completed

Narrative

Improvement activities will include land acquisition and habitat restoration projects to conserve CVP-impacted listed species and habitats, and species surveys to facilitate habitat restoration. Land acquisition includes the purchase and permanent protection of lands in fee title or conservation easement that support populations of endangered, threatened, and other species of concern. Habitat restoration involves the re-establishment of native vegetation and other habitat components to degraded lands that historically supported CVP-impacted listed species whose populations are present nearby. Species surveys include threatened and endangered species surveys to be conducted for environmental compliance purposes to facilitate the restoration of CVP-impacted species habitats. All funded projects are designed to meet specific recovery criteria in U.S. Fish and Wildlife Service species recovery plans.

Data Management

Information for this Charter, including all project files, will be permanently housed at BOR's Mid-Pacific Regional Office in Sacramento, and FWS's Pacific Southwest Regional Office in Sacramento. Additional information may be found at the CVPCP/HRPs website at http://www.usbr.gov/mp/cvpcp/.

Risks

No Data.

Cost Estimate

Year	Fund	Total	BOR	FWS
2020	CVPRF	$1,146,474	$581,008	$565,466
2021	CVPRF	$1,135,009	$575,198	$559,811
2022	CVPRF	$1,123,659	$569,446	$554,213

Total Cost: $3,405,142

Internal Agency Resources Table

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
2020								
Acquisition – Land protection through fee title and conservation easement purchase								
Agreement	Land Protection Projects	NA	NA	0.00	$401,237	BOR	CVPRF	BOR-funded Land Protection Projects
Implementation – Habitat restoration projects								
Agreement	Habitat Restoration Projects	NA	NA	0.00	$565,466	FWS	CVPRF	FWS-funded Habitat Restoration Projects
Agreement	Habitat Restoration Projects	NA	NA	0.00	$100,771	BOR	CVPRF	BOR-funded Habitat Restoration Projects
Implementation – Species surveys								
Agreement	Species Surveys Projects	NA	NA	0.00	$79,000	BOR	CVPRF	BOR-funded Species Surveys Projects
2021								
Acquisition – Land protection through fee title and conservation easement purchase								
Agreement	Land Protection Projects	NA	NA	0.00	$425,198	BOR	CVPRF	BOR-funded Land Protection Projects.
Implementation – Habitat restoration projects								
Agreement	Habitat Restoration Projects	NA	NA	0.00	$559,811	FWS	CVPRF	FWS-funded Habitat Restoration Projects
Agreement	Habitat Restoration Projects	NA	NA	0.00	$150,000	BOR	CVPRF	BOR-funded Habitat Restoration Projects

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
2022								
Acquisition – Land protection through fee title and conservation easement purchase								
Agreement	Land Protection Projects	NA	NA	0.00	$419,446	BOR	CVPRF	BOR-funded Land Protection Projects
Implementation – Habitat restoration projects								
Agreement	Habitat Restoration Projects	NA	NA	0.00	$554,213	FWS	CVPRF	FWS-funded Habitat Restoration Projects
Agreement	Habitat Restoration Projects	NA	NA	0.00	$150,000	BOR	CVPRF	BOR-funded Habitat Restoration Projects