

**FISHERIES
CHARTERS APPENDIX B**

**2019 ANNUAL WORK PLAN
PUBLIC DRAFT**

**CENTRAL VALLEY PROJECT IMPROVEMENT ACT
TITLE XXXIV OF PUBLIC LAW 102-575**

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

Determine what a predator contact point is and if predator contact points exist, can actions be taken to restore the contact point that will increase juvenile salmonid survival?

DCN: AFRP2110

Classification: Research, Fish Passage

Location: Sacramento-San Joaquin Delta

Funding Years: 2018 - 2023

Benefits Start Year: 2023

Priority: SIT Priority: Fall Chinook – 4 Adaptively manage reduction/imp. predator contact points

Partners: FWS, MWD, Natural Resource Scientists, NMFS, DAF Consultants, EBMUD

Related Programs: CAMP, Interagency Ecological Program, NMFS, WIIN Act, AFRP, AFSP b21

Authority

Provision	Percentage	Comment
(b)(1) AFRP	100.0%	NA

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

Name	Value	Units	Comment
			survival will update the DSM parameter estimate.

Deliverables

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
Sep. 2023	Final Report

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 6 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 Is and the lowermost Mokelumne River RST. Natural Productivity: number of natural-origin juveniles per natural-origin adults passing Chipps Is 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.

Project Management Team: Dave Forkel-DAF Consultants; Michelle Workman-EBMUD; J.D. Wikert, Mark Gard-FWS; Corey Phillis, Alison Collins, Russell Ryan-MWD; Steve Lindley, Cyril Michel, Andrew Hein-NMFS; Dave Vogel-Resource Scientists; River Lighting PMT

Data Management

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.

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.

2. Data will be provided to CVPIA as GIS and/or Excel data and maintained in relational databases.
3. 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.
4. J.D. Wikert (FWS) can be contacted to provide data which will be stored on the Lodi FWO server, and/or forwarded to the Center for Data Management when that program becomes operational.

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		\$800,694	\$0	\$0	\$800,694
2019	CVPRF	\$703,801	\$703,801	\$0	\$0
2019		\$28,579	\$0	\$0	\$28,579
2020	CVPRF	\$1,342,162	\$1,342,162	\$0	\$0
2020		\$55,579	\$0	\$0	\$55,579
2021	CVPRF	\$543,979	\$543,979	\$0	\$0
2022	CVPRF	\$405,656	\$405,656	\$0	\$0

Total Cost: \$4,523,183

Internal Agency Resources Table

Fiscal Year 2018

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
Management								
Agreement	Management	\$10,600	1.00	0.00	\$10,600	BOR	CVPRF	NA
Planning and Analysis								
Agreement	financial assistance agreement, if funded	\$183,229	1.00	0.00	\$183,229	BOR	CVPRF	NA
In-Kind Labor	In-kind planning and analysis	\$9,194	1.00	0.00	\$9,194	Local		Anticipated cost share from NMFS, EBMUD, and MWD.
Reporting								
Agreement	Reporting	\$21,370	1.00	0.00	\$21,370	BOR	CVPRF	NA
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		Anticipated cost share from NMFS, EBMUD, and MWD.

Fiscal Year 2019

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
Design								
Agreement	Design	\$106,000	1.00	0.00	\$106,000	BOR	CVPRF	NA
Environmental Compliance and Permitting								
Agreement	Environmental compliance	\$84,800	1.00	0.00	\$84,800	BOR	CVPRF	NA
Management								
Agreement	Management	\$10,600	1.00	0.00	\$10,600	BOR	CVPRF	NA
Planning and Analysis								

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
Agreement	Planning and analysis	\$480,390	1.00	0.00	\$480,390	BOR	CVPRF	NA
In-Kind Labor	In-kind planning and analysis	\$28,579	1.00	0.00	\$28,579	Local		Anticipated cost share from NMFS, EBMUD, and MWD.
Reporting								
Agreement	Reporting	\$22,011	1.00	0.00	\$22,011	BOR	CVPRF	NA

Fiscal Year 2020

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
Construction								
Agreement	Construction	\$636,000	1.00	0.00	\$636,000	BOR	CVPRF	NA
Management								
Agreement	Management	\$10,600	1.00	0.00	\$10,600	BOR	CVPRF	NA
Planning and Analysis								
In-Kind Labor	In-kind planning and analysis	\$28,579	1.00	0.00	\$28,579	Local		Anticipated cost share from NMFS, EBMUD, and MWD.
Agreement	Planning and analysis	\$205,268	1.00	0.00	\$205,268	BOR	CVPRF	NA
Reporting								
Agreement	Reporting	\$11,336	1.00	0.00	\$11,336	BOR	CVPRF	NA
Research								
In-Kind Labor	In-kind research	\$27,000	1.00	0.00	\$27,000	Local		Anticipated cost share from NMFS, EBMUD, and MWD.
Agreement	Research	\$478,958	1.00	0.00	\$478,958	BOR	CVPRF	NA

Fiscal Year 2021

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
<i>Management</i>								
Agreement	Management	\$10,600	1.00	0.00	\$10,600	BOR	CVPRF	NA
<i>Planning and Analysis</i>								
Agreement	Planning and analysis	\$510,028	1.00	0.00	\$510,028	BOR	CVPRF	NA
<i>Reporting</i>								
Agreement	Reporting	\$23,351	1.00	0.00	\$23,351	BOR	CVPRF	NA

Fiscal Year 2022

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
<i>Management</i>								
Agreement	Management	\$10,600	1.00	0.00	\$10,600	BOR	CVPRF	NA
<i>Planning and Analysis</i>								
Agreement	Planning and analysis	\$371,005	1.00	0.00	\$371,005	BOR	CVPRF	NA
<i>Reporting</i>								
Agreement	Reporting	\$24,051	1.00	0.00	\$24,051	BOR	CVPRF	NA

Delta Tidal Habitat Restoration and Monitoring (Parr Study)

The 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:	Improvement, Habitat Restoration
Location:	Delta, exact locations TBD, Sacramento-San Joaquin Delta
Funding Years:	2017 - 2021
Benefits Start Year:	2017
Priority:	SIT Priority: Fall Chinook – 1 Sacramento Mainstem below Bend Bridge, Improve/increase juvenile Chinook rearing habitat
Partners:	DWR, USBR
Related Programs:	CDWR, CSAMP, CVPIA b16, Interagency Ecological Program, NMFS-RPAs, AFRP, CDFW

Authority

Provision	Percentage	Comment
(b)(1) AFRP	100.0%	NA

Metrics

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

Deliverables

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

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.

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. PMT- Ian Smith of USBR; Brett Harvey and James Newcomb of DWR; Jason Hassrick and Lenny Grimaldo of ICF; Anna Sturrock of UC Davis; and Rachel Johnson of NMFS.

Data Management

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 previous 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.

Deliverables

1. Monthly meetings with Reclamation’s point of contact during the planning and implementation phases. This component of Objective 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.
3. 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.
4. Semi-annual progress updates.
5. 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.
6. 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 is not able to purchase Bradmoor 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

Fiscal Year 2018

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
<i>Construction</i>								
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.

Fiscal Year 2019

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
<i>Construction</i>								
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.

Fiscal Year 2020

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
<i>Construction</i>								
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.

American River Salmonid Habitat Restoration

Restore juvenile Chinook salmon and steelhead rearing habitat and enhance natural channel processes on the lower American River. Annual habitat improvement projects are planned for the next five years.

DCN: AFRP2112

Classification: Improvement, Habitat Restoration

Location: Paradise Beach, American River

Funding Years: 2017 - 2022

Benefits Start Year: 2018

Priority: SIT Priority: Fall Chinook – 5 American River, Improve/increase juvenile rearing habitat (floodplain); Winter Chinook – 3 Create/Improve juvenile rearing habitat in non-natal tributaries

Partners: NMFS, Sacramento County, Sacramento Water Forum, SAFCA, USBR, CDFW, FWS

Related Programs: NMFS, AFRP, CDFW

Authority

Provision	Percentage	Comment
(b)(13) Gravel	100.0%	Provides authority for spawning gravel and rearing habitat in the American River.

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

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

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 2018 project location will be Paradise Beach, Upper River Bend, or Sailor Bar area. The project management team will determine the ultimate location each year following completion of the prior year (2017) project and synthesis of past monitoring results.
2. The project focus is on increasing juvenile rearing habitat on the floodplain of the American River, a SIT priority.
3. 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.
4. 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.
5. The 2018 project will be designed to produce approximately 24,000 large Chinook emigrants, based on the SIT value of 2 large Chinook/m², and also benefit juvenile steelhead habitat productivity.
6. Permits, within the complex permitting environment, have already been largely obtained through programmatic permits, so most of the funding supports on the ground restoration work.
7. 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.
8. Focus is habitat improvement.
9. If not implemented the successful collaboration with the diverse American River stakeholders would be jeopardized. Collaboration has been occurring through the Water Forum stakeholder meetings, Northern California Water Agency salmon plan meetings, 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 all of the time and resources their staff spends on the project.
10. 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.

The project management team consists of John Hannon (USBR), Paul Cadrett (USFWS), Lilly Allen (Water Forum), Mike Healey (CDFW), and Ruth Goodfield (NMFS).

Data Management

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

Fiscal Year 2018

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
<i>Construction</i>								
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.
<i>Monitoring</i>								
Agreement	Contract	\$15,000	1.00	0.00	\$15,000	BOR	CVPRF	Aerial photography FAR contract solicited through competitive bid.

Fiscal Year 2019

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
<i>Construction</i>								
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.
<i>Monitoring</i>								
Agreement	Contract	\$15,000	1.00	0.00	\$15,000	BOR	CVPRF	Aerial photography FAR contract solicited through competitive bid.

Fiscal Year 2020

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
<i>Construction</i>								
Labor	Sacramento Water Forum	\$985,000	1.00	0.00	\$985,000	BOR	CVPRF	Financial Assistance Agreement for project management and implementation. The Water

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
								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

Fiscal Year 2021

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
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								
Labor	Contract	\$15,000	1.00	0.00	\$15,000	BOR	CVPRF	Aerial photography FAR contract solicited through competitive bid

Fiscal Year 2022

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
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

East Sand Slough Restoration - Sacramento River

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

DCN: AFRP2113

Classification: Improvement, Habitat Restoration

Location: Sacramento River at Red Bluff, Sacramento Upper Mainstem

Funding Years: 2017 - 2021

Benefits Start Year: 2019

Priority: SIT Priority: Fall Chinook – 1 Sacramento Mainstem below Bend Bridge, Improve/increase juvenile Chinook rearing habitat

Partners: Sacramento River Forum, Tehama County RCD, USFS, City of Red Bluff, Glenn Colusa Irrigation District

Authority

Provision	Percentage	Comment
(b)(13) Gravel	100.0%	NA

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 out migrants at two fish per square meter of rearing habitat (SIT value).

Deliverables

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

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 inundate vegetated habitat over the range of flows incrementally. 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 outmigrating 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.

Project management team: John Hannon, Jim Earley, Mike Berry, Ruth Goodfield.

Data Management

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

Fiscal Year 2018

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
<i>Implementation</i>								
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.

Fiscal Year 2019

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
<i>Implementation</i>								
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.

Fiscal Year 2020

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
<i>Implementation</i>								
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.

Fiscal Year 2021

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
<i>Implementation</i>								
Agreement	FA agreement with Sacramento River Forum	\$800,000	1.00	0.00	\$800,000	BOR	CVPRF	Finish revegetation and continue monitoring.

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:	Improvement, Spawning Gravel
Location:	Sacramento River Keswick to Clear Creek, Sacramento Upper Mainstem
Funding Years:	2017 - 2022
Benefits Start Year:	2018
Priority:	SIT Priority: Winter Chinook – 1 Upper Sacramento River above temperature control points, increase spawning habitat
Partners:	Western Shasta Resource Conservation District, ACID, Glenn Colusa Irrigation District

Authority

Provision	Percentage	Comment
(b)(13) Gravel	100.0%	Authorizes spawning gravel replacement in the Sacramento River

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

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

Date	Title
Sep. 2021	Injected and placed gravel

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 Reinitiation of Consultation on Long-Term Water Operations.

14. No known stakeholder objections. Site-specific issues are addressed in the collaboration that goes into implementation.
15. Project management team is John Hannon, Jim Early, Mike Berry, Paul Zedonis, Ruth Goodfield.

Data Management

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 deepwater 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.

Contacts: John Hannon at the Reclamation Bay Delta Office, and Jim Early at the USFWS Red Bluff Office. Paul Zedonis at the Northern California Area Office.

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	\$800,000	\$800,000	\$0
2020	CVPRF	\$800,000	\$800,000	\$0
2021	CVPRF	\$800,000	\$800,000	\$0

Total Cost: \$3,200,000

Internal Agency Resources Table

Fiscal Year 2018

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
<i>Implementation</i>								
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.

Fiscal Year 2019

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
<i>Implementation</i>								
Agreement	Financial Assistance Agreement with WSRCD or similar entity	\$800,000	1.00	0.00	\$800,000	BOR	CVPRF	Gravel purchase, delivery, placement, and oversight. Completed project.

Fiscal Year 2020

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
<i>Implementation</i>								
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.

Fiscal Year 2021

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
<i>Implementation</i>								

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
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: Improvement, Habitat Restoration

Location: Sac River Redding to Red Bluff, Sacramento Upper Mainstem

Funding Years: 2014 - 2022

Benefits Start Year: 2015

Priority: SIT Priority: Fall Chinook – 1 Sacramento Mainstem below Bend Bridge, Improve/increase juvenile chinook rearing habitat; Winter Chinook – 1 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, AFRP, CDFW

Authority

Provision	Percentage	Comment
(b)(13) Gravel	100.0%	Authorizes spawning and rearing habitat projects in the Sacramento River

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)
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)
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.

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

Deliverables

<u>Date</u>	<u>Title</u>
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
Dec. 2018	Anderson River Park channels completed
Dec. 2018	South Cypress Side Channels completed
Dec. 2019	Shea Island Side Channel work completed
Mar. 2020	Rio Vista side channel completed
Dec. 2020	Reading Island Side Channel phase II completed
Dec. 2020	Rancho Breisgau side channel completed

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) 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.

Project management team: John Hannon, Jim Earley, Mike Berry, Ruth Goodfield

Data Management

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 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.
2. 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.
3. Center for data management yet to come.
4. 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).
5. 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. Paul Zedonis at the Northern California Area Office.

Risks

Risk	Likelihood	Impact
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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	\$2,000,000	\$2,000,000	\$0
2020	CVPRF	\$2,000,000	\$2,000,000	\$0

Total Cost: \$8,956,000

Internal Agency Resources Table

Fiscal Year 2015

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
<i>Implementation</i>								
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.

Fiscal Year 2016

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
<i>Implementation</i>								
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.

Fiscal Year 2017

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
<i>Implementation</i>								
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.

Fiscal Year 2018

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
<i>Implementation</i>								

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
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.
Agreement	Sacramento River Forum	\$650,000	1.00	0.00	\$650,000	BOR	CVPRF	Implements high priority side channel restoration project at Rancho Breisgau.

Fiscal Year 2019

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
<i>Implementation</i>								
Agreement	Western Shasta Resource Conservation District and/or Sac River Forum	\$2,000,000	1.00	0.00	\$2,000,000	BOR	CVPRF	Financial Assistance Agreements for continuation of the projects.

Fiscal Year 2020

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
<i>Implementation</i>								
Agreement	FA with WSRCD and/or Sac River Forum	\$2,000,000	1.00	0.00	\$2,000,000	BOR	CVPRF	Financial Assistance Agreements for project implementation. Includes permitting, survey, design, construction, and monitoring.

Data and Analytic Support

Science Integration Team support (data visualization & stewardship, and peer review management)

DCN: AFRP2116
 Classification: Performance Monitoring, Administration
 Location: Central Valley Project Improvement Act
 Funding Years: 2017 - 2021
 Benefits Start Year: 2017
 Priority: SIT Support
 Partners: FWS, USBR
 Related Programs: AFRP, CAMP

Authority

Provision	Percentage	Comment
(b)(15) CAMP	100.0%	

Metrics

Name	Value	Units	Comment
Peer Reviews	1	completion	Desire in first year is to compile list of peer reviewers and to complete peer review of 2017 Fall Run DSM and 2017 Technical Memorandum. Are DSM's and Tech Memorandum receiving annual peer review?
Data Visualization	1	metadata	Is visualization meeting SIT needs?

Deliverables

Date	Title
Dec. 2017	Tech Memo Support description
Mar. 2018	Contract Closeout Summary
Mar. 2018	Peer Review of 2017 Technical Memorandum
Mar. 2018	Peer Review of 2017 Fall Run DSM

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.
5. Peer Review management - procures and manages peer reviewers for CVPIA.
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

Contractor visualizes, coordinates, and stewards data generated by the Science Mentor via the DSM's. Contractor may store all pertinent data on their own system but will mirror all data/metadata on DOI system twice per year during the course of this Charter. 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
2018	CVPRF	\$135,000	\$135,000	\$0
2019	CVPRF	\$260,000	\$260,000	\$0
2020	CVPRF	\$260,000	\$260,000	\$0
2021	CVPRF	\$260,000	\$260,000	\$0

Total Cost: \$915,000

Internal Agency Resources Table

Fiscal Year 2018

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
<i>Planning and Analysis</i>								
Agreement	Contract # to follow	\$135,000	1.00	0.00	\$135,000	BOR	CVPRF	Current contract funded through March, 2018. This amount is for 2nd half of FY18 via a new contract. \$125k contract; \$10k contract management

Fiscal Year 2019

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
<i>Planning and Analysis</i>								
Agreement	Contract # to follow	\$260,000	1.00	0.00	\$260,000	BOR	CVPRF	\$250k contract; \$10k contract management

Fiscal Year 2020

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
<i>Planning and Analysis</i>								
Agreement	Contract # to follow	\$260,000	1.00	0.00	\$260,000	BOR	CVPRF	\$250k contract; \$10k contract management

Fiscal Year 2021

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
<i>Planning and Analysis</i>								
Agreement	Contract # to follow	\$260,000	1.00	0.00	\$260,000	BOR	CVPRF	\$250k contract; \$10k contract management

Tracy Fish Facility Improvement Program (TFFIP)

Tracy Fish Facility Improvement Program (TFFIP) Administration and Program Management

DCN: AFRP2117
 Classification: Administration, Reconnaissance
 Location: Sacramento-San Joaquin Delta
 Funding Years: 2018 - 2019
 Benefits Start Year: 2018
 Priority: CVPIA authorized high priority project

Authority

Provision	Percentage	Comment
(b)(4) Tracy	100.0%	

Metrics

No Data.

Deliverables

Date	Title
Dec. 2018	Accomplishments Report
Jan. 2019	Annual Report

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 website 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 2019 includes 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>

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 BOR MP Regional Office

Risks

No Data.

Cost Estimate

Year	Fund	Total	BOR	FWS
2019	WRR	\$710,000	\$710,000	\$0
2019	CVPRF	\$426,000	\$426,000	\$0
2020	WRR	\$772,500	\$772,500	\$0
2020	CVPRF	\$463,500	\$463,500	\$0
2021	WRR	\$772,500	\$772,500	\$0
2021	CVPRF	\$463,500	\$463,500	\$0

Total Cost: \$3,608,000

Internal Agency Resources Table

Fiscal Year 2019

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
<i>Administration</i>								
Agreement	TFFIP	\$710,000	1.00	0.00	\$710,000	BOR	WRR	Administration and Implementation of Program Priorities
Agreement	TFFIP	\$426,000	1.00	0.00	\$426,000	BOR	CVPRF	Administration and Implementation of Program Priorities

Fiscal Year 2020

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
<i>Administration</i>								
Agreement	TFFIP	\$772,500	1.00	0.00	\$772,500	BOR	WRR	Administration and Implementation of Program Priorities
Agreement	TFFIP	\$463,500	1.00	0.00	\$463,500	BOR	CVPRF	Administration and Implementation of Program Priorities

Fiscal Year 2021

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
<i>Administration</i>								
Agreement	TFFIP	\$772,500	1.00	0.00	\$772,500	BOR	WRR	Administration and Implementation of Program Priorities
Agreement	TFFIP	\$463,500	1.00	0.00	\$463,500	BOR	CVPRF	Administration and Implementation of Program Priorities

Green Sturgeon Juvenile Investigation

Upper Sacramento River Juvenile Green Sturgeon in-river habitat use/rearing habitat investigation and outmigration to overwintering area (Delta Migration) Study

DCN: AFRP2118

Classification: Reconnaissance, Performance Monitoring

Location: Sacramento River: Redding to Colusa, Sacramento Upper Mainstem

Funding Years: 2017 - 2023

Benefits Start Year: 2017

Priority: SIT Priority: Green Sturgeon - 1 Adaptively manage flows, habitats, and/or temperature to increase juvenile recruitment

Partners: NMFS, USACE

Related Programs: NMFS, NMFS-RP, AFRP, CVPIA b1

Authority

Provision	Percentage	Comment
(b)(1) AFRP	100.0%	This phased study is meant to identify and characterize habitats used by juvenile Green Sturgeon in the Sacramento River so that habitat restoration actions can be developed to benefit the species and management of vital Sacramento River water resources. The data is directly applicable to meeting the needs of DSM model development with respect to quantity of juvenile rearing habitat available for Green Sturgeon. This multi-year effort has succeeded in the prior 3 years to provide critical information on the life-history characteristics of this species and will result in the evaluation of temperature and flow management operations on the Sacramento River considering the needs of winter-run Chinook salmon and Green Sturgeon.

Metrics

Name	Value	Units	Comment
Habitat Assessment	160	miles	Determine, in given water year type(s), 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

Date	Title
Sep. 2020	Annual Report

Date	Title
Sep. 2022	Annual Report
Dec. 2023	Final Report

Narrative

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. 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 FY19 and beyond would continue to expand upon work 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 DSM that is currently being developed for Green Sturgeon. This project fits within the CVPIA SIT team priority of evaluating habitat use 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 understood phases of this species. Efforts to learn 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 AFRP 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.

Two years of study suggests that juvenile green sturgeon downstream migration cues are primarily flow dependent with annual variation in timing affected by natural weather variability. Location and size of juveniles varies each fall with water temperature appearing to be an important variable which has ramifications on potential Sacramento River water flow and temperature management efforts.

The project management team consists of Bill Poytress (USFWS-Program Manager), Josh Gruber (USFWS-Technical Lead), Arnold Amman (NMFS-Acoustics Technical Lead), Brian Mulvey (ACOE-Program Manager), David Smith (ACOE-Modeling Technical Lead), and Josh Israel (USBR).

Data Management

Telemetry and physical habitat data (temp. flow, velocity, depth, and substrate composition) generated by this project will be coordinated with USACOE 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	\$173,822	\$0	\$173,822
2020	CVPRF	\$174,823	\$0	\$174,823
2021	CVPRF	\$177,033	\$0	\$177,033

Total Cost: \$673,510

Internal Agency Resources Table

Fiscal Year 2018

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
<i>Research</i>								
Labor	RBFWO biologists or technicians	\$241,542	0.41	0.00	\$99,032	FWS	CVPRF	Based on USFWS RO estimated FY18 FTE rate. Will consist of small portions of time from multiple RBFWO staff.
Equipment or Materials	Equipment and Materials to support data gathering and analysis	\$48,800	1.00	0.00	\$48,800	FWS	CVPRF	Field equipment and additional support materials

Fiscal Year 2019

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
<i>Research</i>								
Labor	RBFWO Biologist or Technicians	\$243,957	0.41	0.00	\$100,022	FWS	CVPRF	Will consist of small portions of time from multiple RBFWO staff
Equipment or Materials	Equipment and Materials to support data gathering and analysis	\$73,800	1.00	0.00	\$73,800	FWS	CVPRF	Field equipment and additional support materials

Fiscal Year 2020

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
<i>Research</i>								
Labor	Fish Biologist and Technician Financial Support	\$246,397	0.41	0.00	\$101,023	FWS	CVPRF	Funds to support field work based on FY 19 rate + 1.0%, as recommended by USFWS RO.
Equipment or Materials	Financial Support for Field Equipment	\$73,800	1.00	0.00	\$73,800	FWS	CVPRF	Equipment to support field activities, primarily telemetry tags and receivers.

Fiscal Year 2021

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
<i>Research</i>								
Equipment or Materials	Equipment and Materials to support data gathering and analysis	\$75,000	1.00	0.00	\$75,000	FWS	CVPRF	Equipment to support field activities, primarily telemetry tags and receivers.
Labor	Fish Biologist and Technician Financial Support	\$248,861	0.41	0.00	\$102,033	FWS	CVPRF	Funds to support field work based on FY20 rate + 1.0%

Lower Mokelumne River Salmonid Spawning and Rearing Habitat Improvement Project

The excavation and recontouring of the lower Mokelumne River stream bank to provide seasonal floodplain habitats for juvenile salmonid rearing and to sort and harvest gravel and cobble (1/4"-5") from the excavated materials, which will be used to improve or expand nearby spawning habitats.

DCN: AFRP2119
 Classification: Improvement, Flood Plain
 Location: Mokelumne River
 Funding Years: 2016 - 2021
 Benefits Start Year: 2018
 Priority: SIT Support
 Partners: EBMUD
 Related Programs: NMFS-RP

Authority

Provision	Percentage	Comment
(b)(1) AFRP	100.0%	N/A

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. 2018	FY18 Mokelumne Spawning and Rearing Habitat Project Annual Report
Dec. 2019	FY19 Mokelumne Spawning and Rearing Habitat Project Annual Report
Dec. 2020	FY20 Mokelumne Spawning and Rearing Habitat Project Annual Report
Dec. 2021	FY21 Mokelumne Spawning and Rearing Habitat Project Annual Report
Dec. 2021	5-year Technical Report - Mokelumne Spawning and Rearing Habitat Project

Narrative

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 inter-gravel 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.

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. PMT: Mark Gard - UFWS, Tanya Shea - CDFW, and Michelle Workman - EBMUD

Links to CVPIA Core Team FY17 priorities: Fall-run Chinook - Improve Juvenile Rearing Habitat - Sacramento, Yuba, Feather, American, Calaveras, Mokelumne, Merced, Tuolumne, Stanislaus and San Joaquin Rivers and the Delta;

Data Management

Objective specific monitoring will assess 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
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
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

Cost Estimate

Year	Fund	Total	BOR	FWS	Local
2018	Other	\$92,500	\$0	\$0	\$92,500
2018	CVPRF	\$121,900	\$0	\$121,900	\$0
2019	Other	\$62,500	\$0	\$0	\$62,500
2019	CVPRF	\$121,900	\$0	\$121,900	\$0

Total Cost: \$398,800

Internal Agency Resources Table

Fiscal Year 2018

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
Implementation								
In-Kind Labor	EBMUD	\$62,500	1.00	0.00	\$62,500	Local	Other	EBMUD anticipated funding/in-kind. project implementation, oversight, modeling and monitoring
Agreement	AFRP Mokelumne River Spawning Gravel	\$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	\$30,000	1.00	0.00	\$30,000	Local	Other	\$10,000/project for pre-project and post-project fisheries monitoring. EBMUD Funding will include labor, fish tags, fish traps, cameras, and other monitoring equipment.

Fiscal Year 2019

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
Implementation								
In-Kind Labor	EBMUD	\$62,500	1.00	0.00	\$62,500	Local	Other	EBMUD anticipated funding in-kind. project implementation, oversight, modeling and monitoring
Agreement	AFRP Mokelumne River Spawning Gravel	\$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.

Stanislaus River Migratory Corridor Rehabilitation

Restore shallow water rearing and migratory habitat for juvenile salmonids in the Stanislaus River downstream of Riverbank through collaboration with willing landowners.

DCN: AFRP2120

Classification: Improvement, Habitat Restoration

Location: Lower Stanislaus River, Stanislaus River

Funding Years: 2018 - 2024

Benefits Start Year: 2020

Priority: SIT Priority: Fall Chinook – 3 Stanislaus River, Improve/increase juvenile rearing habitat (floodplain)

Partners: Cramer Fish Sciences

Related Programs: NMFS-RP, NMFS-RPAs, AFRP, CVPIA b13

Authority

Provision	Percentage	Comment
(b)(1) AFRP	100.0%	Project 2017 funding will be allocated shortly. Successful grantee will contact landowners of suitable sites (already identified by FWS) to develop conceptual designs.

Metrics

Name	Value	Units	Comment
b1(other): Area of habitat, protection, and restoration (acres)	0	miles	placeholder until designs are complete
b1(other): Area of habitat, protection, and restoration (acres)	0	acres	placeholder until designs are complete
conceptual design	1	number of actions	One or more conceptual designs will be developed with willing landowners.

Deliverables

Date	Title
Sep. 2018	Preliminary conceptual designs
Jun. 2020	Final Design
Jun. 2020	Permits
Dec. 2023	Final Report

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 outmigrating 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 address 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). 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.

Project Management Team: FWS - J.D. Wikert; USBR - John Hannon

Data Management

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.

Risks

Risk	Likelihood	Impact
Landowner support/access. Given the 28 potential sites identified, it is unlikely that we will not find one willing partner for the project.	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

Total Cost: \$1,696,000

Internal Agency Resources Table

Fiscal Year 2017

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
<i>Design</i>								
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).
<i>Environmental Compliance and Permitting</i>								
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).
<i>Inventory/Reconnaissance</i>								
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).
<i>Management</i>								

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
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).
<i>Outreach</i>								
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).

Fiscal Year 2018

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
<i>Construction</i>								
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).
<i>Design</i>								
Agreement	new FWS financial assistance agreement	\$150,000	1.00	0.06	\$159,000	FWS	CVPRF	NA
<i>Environmental Compliance and Permitting</i>								
Agreement	new FWS financial assistance agreement	\$150,000	1.00	0.06	\$159,000	FWS	CVPRF	NA

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
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).

Fiscal Year 2019

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
Construction								
Agreement	new FWS financial assistance agreement	\$275,000	1.00	0.06	\$291,500	FWS	CVPRF	NA
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).

Stanislaus River Juvenile Rearing - Rodden Road

Ongoing project to implement both in- and off-channel restoration designed to provide additional rearing habitat for juvenile salmon and steelhead in the Stanislaus River in collaboration with private landowners across the river from the City of Oakdale.

DCN:	AFRP2121
Classification:	Improvement, Habitat Restoration
Location:	Lower Stanislaus River, Stanislaus River
Funding Years:	2017 - 2023
Benefits Start Year:	2019
Priority:	SIT Priority: Fall Chinook – 3 Stanislaus River, Improve/increase juvenile rearing habitat (floodplain)
Partners:	Cramer Fish Sciences
Related Programs:	CVPIA b13, NMFS-RPAs, AFRP, CALFED

Authority

Provision	Percentage	Comment
(b)(1) AFRP	100.0%	NA

Metrics

Name	Value	Units	Comment
off-channel rearing	0	acres	3.8
in-channel gravel	1300	cubic yards	NA
riparian habitat restored	0	miles	.44
Spawning habitat	1	acres	NA

Deliverables

Date	Title
Jun. 2019	Conceptual Project designs
Jun. 2020	Environmental Compliance permits
Jun. 2020	Final Project Designs
Sep. 2023	Project Completion Report

Narrative

1. The project will provide 3.8 acres of off-channel seasonally inundated rearing habitat and 1,300 cubic yards of in-channel spawning and rearing habitat. Designs are currently at the 65% level.

This project builds on existing CVPIA restoration projects upstream (Lover’s Leap, Honolulu Bar, and Lancaster Road).

2. This charter supports the fall-run "Stanislaus River, Improve/increase juvenile rearing habitat (floodplain)" Core Team priority.
3. The project design includes re-grading perched floodplain habitat to reconnect juvenile rearing habitat with the river on a 1-2 year interval. The project will also provide additional spawning gravel in the main channel adjacent to the property.
4. The project addresses the doubling goal for Stanislaus River Chinook Salmon as well as the CV wide doubling goal and should also benefit out-migrating steelhead. The charter focuses on the doubling goal for fall-run Chinook salmon for the Stanislaus River and the Central Valley. The project implements Stanislaus River Action 2 [Improve watershed management to restore and protect instream and riparian habitat, including consideration of restoring and replenishing spawning gravel.] of the Final Restoration Plan. It also implements OCAP RPAs II.2.1 and III.2.2.
5. 3.8 acres of floodplain provides habitat for nearly 285,000 juvenile fall-run Chinook salmon (0.054 square meters per fish - DSM).
6. The project is more cost effective since planning and permitting has been informed by previous projects in the vicinity. The bulk of funding is slated for project construction.
7. Post-project monitoring will inform the DSM in regards to properly parameterizing juvenile growth and survival in higher gradient off-channel habitats relative to valley floor floodplains (Cosumnes).
8. The project is primarily focused on implementing restoration. See above (7) for DSM benefits.
9. Impacts from not doing the charter are continued decline of anadromous fish populations.
10. There are no known stakeholder objections to the project. Project is proceeding with willing landowners that sought us out.

Data Management

1. Short- and long-term data will be managed by the grantee with copies available to CVPIA at any time. Long-term data will reside with CVPIA staff.
2. Data will be collected using CVPIA (CAMP) protocols where appropriate and will be provided to the Center for Data management when appropriate.
3. Performance metrics are derived using DSM parameters (e.g., 0.054 square meters per fry).

Project Management Team: FWS - J.D. Wikert; CFS - Joe Merz, Rocko Brown, Jesse Anderson

Risks

Risk	Likelihood	Impact
Landowner backs out	1	1
Project does not occur and population continues to decline	1	1

Cost Estimate

Year	Fund	Total	BOR	FWS
2018	CVPRF	\$649,780	\$0	\$649,780
2019	CVPRF	\$169,600	\$0	\$169,600
2020	CVPRF	\$201,400	\$0	\$201,400

Total Cost: \$1,020,780

Internal Agency Resources Table

Fiscal Year 2018

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
Implementation								
Agreement	new grant	\$505,000	1.00	0.06	\$535,300	FWS	CVPRF	Implement project. Final funding for implementing designs.
Management								
Agreement	new grant	\$8,000	1.00	0.06	\$8,480	FWS	CVPRF	Management of grant
Reporting								
Agreement	new grant	\$36,000	1.00	0.06	\$38,160	FWS	CVPRF	Reporting on research
Research								
Agreement	new grant	\$64,000	1.00	0.06	\$67,840	FWS	CVPRF	First year of post-project research.

Fiscal Year 2019

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
Management								
Agreement	new grant	\$10,000	1.00	0.06	\$10,600	FWS	CVPRF	Management of grant
Reporting								
Agreement	new grant	\$40,000	1.00	0.06	\$42,400	FWS	CVPRF	Reporting on research
Research								
Agreement	new grant	\$110,000	1.00	0.06	\$116,600	FWS	CVPRF	Second year of post-project research.

Fiscal Year 2020

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
Management								

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
Agreement	new grant	\$10,000	1.00	0.06	\$10,600	FWS	CVPRF	Management of grant
<i>Outreach</i>								
Agreement	new grant	\$10,000	1.00	0.06	\$10,600	FWS	CVPRF	NA
<i>Reporting</i>								
Agreement	new grant	\$50,000	1.00	0.06	\$53,000	FWS	CVPRF	Reporting on research plus possible peer reviewed publication
<i>Research</i>								
Agreement	new grant	\$120,000	1.00	0.06	\$127,200	FWS	CVPRF	Final year of post-project research.

Yuba Hallwood Side Channel and Floodplain Restoration Project

Side Channel and Floodplain Restoration

DCN: AFRP2122

Classification: Performance Monitoring, Performance Monitoring

Location: Yuba River

Funding Years: 2018 - 2022

Benefits Start Year: 2019

Priority: SIT Priority: Fall Chinook – 2 Yuba River, Improve/increase spawning and juvenile rearing habitat

Partners: Cramer Fish Sciences, ESA, South Yuba River Citizens League

Related Programs: NMFS-RP

Authority

Provision	Percentage	Comment
(b)(1) AFRP	100.0%	

Metrics

Name	Value	Units	Comment
Riparian Habitat	10	Acres	NA
Floodplain Restoration	70	Acres	NA
Juvenile Rearing Habitat	4	Miles	NA
Juvenile salmonids	18780	number of fish	This number based on the Yuba ESHE model approximation of each juvenile using 0.018636 acres. Approximately 5 outmigrants can use each habitat area per year.

Deliverables

Date	Title
Mar. 2018	Designs and permits
Oct. 2019	Phase 1 as-built plans
Dec. 2019	Pre-restoration monitoring report
Dec. 2020	Phase 1 post-restoration monitoring report
Oct. 2021	Phase 2 as-built plans
Dec. 2022	Phase 2 post-restoration monitoring report

Narrative

AFRP has funded a large (2.5-mile long x 0.1 mile wide) floodplain and side-channel restoration project located in a remnant Yuba River channel downstream of Daguerre Point Dam. Design plans, permits, and landowner agreements are completed, Last minute delays caused the project to be delayed until April 2019 and may be completed that year or continue into 2020. Some re-design has been required to accommodate changes from the high flows of 2016-17. The purpose of the project is to create juvenile salmonid rearing habitat on lands which are part of the Teichert Hallwood Facility gravel operation. Fish habitat enhancement will be achieved through increased frequency of surface water connectivity between the main Yuba River channel and the existing small, intermittent channel and extensive floodplain of the site. Also, improved habitat features will be constructed and floodplain revegetation will be implemented to provide high quality, off-channel rearing habitat for juvenile Chinook salmon and steelhead which currently is very limited in the lower Yuba River. Phase 1 implementation has been funded, but the design plans include Phase 2 and Phase 3 implementation that could increase the amount of restored floodplain from 70 acres to 170 acres.

The project supports CVPIA Core Team 2018 priorities for spring-run Chinook salmon (SRCS) and fall-run Chinook salmon (FRCS) of improving rearing habitat on the Yuba River. The project would benefit multiple species (SRCS, FRCS, and steelhead) and two ESA-listed threatened species (SRCS and steelhead). Increased natural production would contribute for the doubling goal of 66,000 FRCS in the lower Yuba River and the Central Valley doubling goals for SRCS and steelhead. The project addresses AFRP Final Restoration Plan/CPAR non-structural action E4, Evaluate the benefits of restoring stream channel and riparian habitats of the Yuba River, including the creation of side channels for spawning and rearing habitats for salmonids. Juvenile rearing in the Yuba River was not identified as a primary or secondary limiting factor in the Final Restoration Plan but was identified as the primary limiting factor in the USFWS Fish Focus Group (FFG) process circa 2008. The project is supported by NMFS's 2014 recovery plan for Central Valley salmonids, specifically Yuba River Recovery Actions YUR-2.2 (Increase floodplain habitat availability in the lower Yuba River), and YUR-2.4 (Create and restore side channel habitats to increase the quantity and quality of off-channel rearing and spawning areas in the Yuba River).

This project is very cost effective. The projected overall cost per acre is \$26,572 (including permitting, design, outreach, implementation, monitoring, and project management) calculated from a total project cost of \$4.5 million for 170 acres. By leveraging a relationship with a nearby aggregate producer and landowner performing the role of restoration contractor, the Project cost is considerably lower than could otherwise be realized. For example, the earthwork costs are much lower than the range of restoration costs developed by others for side channel reconnection of \$40,000 to \$70,000 in 2003 dollars; and \$52,957 to \$92,675 adjusted to 2017 (Thomson and Pinkerton, 2008). Additionally, in order to perform fine grading of floodplain features and side channels, the extensive Middle Training Wall needs to be removed (~2,900,000 cubic yards). The contractor is not charging the Project for this material removal, valued at a cost of \$15,109,000 (\$5.21 per cubic yard) if this material was simply removed from the river corridor and placed nearby.

Cost estimate for FY2019 is \$650,000 for Phase 2 implementation to restore approximately 50 additional acres (similar for Phase 3 in FY2020) plus \$200,000 in FY2019 and FY2020 for post-project monitoring. This is about half of the already low cost per acre identified above because permitting, and landowner agreements will already be in place.

Paul Cadrett(USFWS) and Rachel Hutchinson (South Yuba River Citizen's League) are the project managers, and Chris Hammersmark (cbec, inc.) and Joe Merz (Cramer Fish Sciences) are the technical experts. Variations of the project team have successfully planned, permitted, monitored, and implemented

salmonid habitat other restoration projects in the Yuba River and elsewhere. The entire team is comprised of geomorphologists, engineers, fish biologists, and riparian ecologists with expertise in riparian and floodplain restoration. In addition, SYRCL and cbec have been working to develop strong partnerships with the landowners (i.e., Western Aggregates, Teichert, BLM, Long Bar Mine Company) and county officials in Yuba County to encourage restoration opportunities. Congressman John Garamendi has met several times with all of the above as well as the California Department of Fish and Wildlife, National Marine Fisheries Service, U.S. Army Corps of Engineers, Three Rivers Levee Improvement Authority, and Yuba County Water Agency, and has explicitly expressed support for these partnerships.

Data Management

Short-term benefits would be incurred because rearing juvenile salmonids could use newly-restored habitat following each construction season. Habitat functionality may change over time due to degradation by high flow events, but we hope to provide high-quality habitat for 5-10 years. High flow events and a changing river are to be expected and provide other benefits, such as deposition of fine sediment and organic material that promotes invertebrate and riparian seedling production. Long-term benefits may be extended with project maintenance. The monitoring from this project will compare juvenile salmonid growth and survival rates with those of other sites and restoration projects. Hence, it will address habitat quality-related data gaps in the Central Valley DSM model for these parameters. This project would increase the availability of floodplain and off-channel rearing habitat which would have greater food production, shallower depths, slower water velocities, and greater cover conducive to increased growth and survival of juvenile salmonids. Consequently, not doing the project would cause more juveniles to rear in the main river channel which largely lacks these conditions.

The project partners, led by Cramer Fish Sciences and SYRCL, have developed a monitoring plan for the Hallwood project site. The plan includes specific hypotheses and studies that are designed to measure project effectiveness as related to specific restoration goals (4 mile of off-channel habitat created, 70 acres of floodplain area restored). In addition the plan sets out hypotheses that will improve our understanding of the effects of restoration on salmonid abundance and health (baseline and post-restoration population estimates, predation risk), habitat quality (stream temperature and BMI populations), and riparian ecosystem function (juvenile instream and floodplain habitat), in the short and long term. All monitoring data will be made available to the CVPIA and can be standardized for input into state or federal databases. Project assessment will focus on the rearing stages of Chinook salmon and will incorporate standardized monitoring associated with the other ongoing projects to elucidate the effects of species ontogeny and shifting environmental conditions along the river continuum on rearing salmonid (and associated food web and habitat) response to restoration actions. The performance of the design features will also be assessed, to ensure that as-built designs are creating expected acres and miles of habitat. In addition, the monitoring plan will include specific hypotheses that will test how well riparian recruitment and succession is occurring where restoration projects have been or will be implemented. The research goals of this monitoring plan will be based on input and feedback from AFRP and the team. Additionally, the team will request feedback from CDFW, NMFS, and the Yuba River Management Team.

Risks

Risk	Likelihood	Impact
Permits fall through	1	3
Collaboration issues	1	2
Gravel market collapse	1	3
High flows prohibit work in river	2	2

Cost Estimate

Year	Fund	Total	BOR	FWS
2018	CVPRF	\$901,000	\$0	\$901,000
2019	CVPRF	\$901,000	\$0	\$901,000
2020	CVPRF	\$212,000	\$0	\$212,000

Total Cost: \$2,014,000

Internal Agency Resources Table

Fiscal Year 2018

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
<i>Implementation</i>								
Agreement	Yuba Hallwood Side channel and Floodplain Restoration	\$650,000	1.00	0.06	\$689,000	FWS	CVPRF	50 additional acres restoration.
<i>Monitoring</i>								
Agreement	Yuba Hallwood Side Channel and Floodplain Restoration	\$200,000	1.00	0.06	\$212,000	FWS	CVPRF	Phase 1 post-project monitoring.

Fiscal Year 2019

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
<i>Implementation</i>								
Agreement	Yuba Hallwood Side channel and Floodplain Restoration	\$650,000	1.00	0.06	\$689,000	FWS	CVPRF	50 additional acres of restoration.
<i>Monitoring</i>								
Agreement	Yuba Hallwood Side Channel and Floodplain Restoration	\$200,000	1.00	0.06	\$212,000	FWS	CVPRF	Phase 2 post-project monitoring.

Fiscal Year 2020

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
<i>Monitoring</i>								
Agreement	Yuba Hallwood Side Channel and Floodplain Restoration	\$200,000	1.00	0.06	\$212,000	FWS	CVPRF	Phase 3 post-project monitoring.

Yuba Long Bar Floodplain Restoration

Juvenile Salmonid Rearing Habitat Restoration. Floodplain Habitat Restoration.

DCN: AFRP2123

Classification: Improvement, Flood Plain

Location: Yuba River

Funding Years: 2018 - 2022

Benefits Start Year: 2019

Priority: SIT Priority: Fall Chinook – 2 Yuba River, Improve/increase spawning and juvenile rearing habitat

Partners: Long Bar Mining Company, South Yuba River Citizens League, Yuba County Water Agency, cbec, inc., Cramer Fish Sciences

Related Programs: NMFS-RP

Authority

Provision	Percentage	Comment
(b)(1) AFRP	100.0%	

Metrics

Name	Value	Units	Comment
Riparian Habitat Restored	10	acres	NA
Juvenile salmonids	13414	number of fish	This number based on the Yuba ESHE model approximation of each juvenile using 0.018636 acres. Approximately 5 outmigrants can use each habitat area per year.
Floodplain Restored	50	acres	NA
Side Channel Restored	1	miles	NA

Deliverables

Date	Title
Oct. 2018	Monitoring plan
Mar. 2019	65% design plans
Sep. 2019	90% design plans
Dec. 2019	Pre-project monitoring report
Mar. 2020	All permits, CEQA/NEPA
Oct. 2020	As-built plans
Dec. 2021	Post-project monitoring report

Date	Title
Jun. 2022	Final report

Narrative

This project would create or improve rearing habitat primarily through floodplain, side channel, or riparian restoration, or the installation of instream woody material at Long Bar on the lower Yuba River (LYR). Project objectives are (1) to restore up to 50 acres of rearing habitat and (2) monitor restoration actions and answer specific hypotheses about how the LYR fish populations and riparian habitat are responding to restoration treatments in the LYR between Parks Bar and Marysville. The project supports CVPIA Core Team 2018 priorities for spring-run Chinook salmon (SRCS) and fall-run Chinook salmon (FRCS) of improving rearing habitat on the Yuba River. The project would benefit multiple species (SRCS, FRCS, and steelhead) and two ESA-listed threatened species (SRCS and steelhead). The project addresses AFRP Final Restoration Plan/CPAR non-structural action E4, Evaluate the benefits of restoring stream channel and riparian habitats of the Yuba River, including the creation of side channels for spawning and rearing habitats for salmonids. Juvenile rearing in the Yuba River was not identified as a primary or secondary limiting factor in the Final Restoration Plan but was identified as the primary limiting factor in the USFWS Fish Focus Group (FFG) process circa 2008. The project is supported by NMFS’s 2014 recovery plan for Central Valley salmonids, specifically Yuba River Recovery Actions YUR-2.2 (Increase floodplain habitat availability in the lower Yuba River), and YUR-2.4 (Create and restore side channel habitats to increase the quantity and quality of off-channel rearing and spawning areas in the Yuba River).

Paul Cadrett(USFWS) and Rachel Hutchinson (South Yuba River Citizen’s League) are the project managers, and Chris Hammersmark (cbec, inc.) and Joe Merz (Cramer Fish Sciences) are the technical experts. Variations of the project team have successfully planned, permitted, monitored, and implemented salmonid habitat other restoration projects in the Yuba River and elsewhere. The entire team is comprised of geomorphologists, engineers, fish biologists, and riparian ecologists with expertise in riparian and floodplain restoration. Currently, the team is working in the LYR on a CVPIA-funded project at Hallwood, which will result in up to 150 or more acres of habitat restoration and 4+ miles of new off-channel habitat. In addition, SYRCL and cbec have been working to develop strong partnerships with the landowners (i.e., Western Aggregates, Teichert, BLM, Long Bar Mine Company) and county officials in Yuba County to encourage restoration opportunities. Congressman John Garamendi has met several times with all of the above as well as the California Department of Fish and Wildlife, National Marine Fisheries Service, U.S. Army Corps of Engineers, Three Rivers Levee Improvement Authority, and Yuba County Water Agency, and has explicitly expressed support for these partnerships.

Cost estimate for FY2018 is \$125,000 to supplement the initial \$150,000 award for FY2017. A project has been selected (at Long Bar), and SYRCL, cbec, Cramer Fish Sciences, and USFWS staff have been working with the landowners (i.e., Long Bar Mining Company and BLM) on the project design and an agreement that is satisfactory to all parties. This additional money is needed to obtain and assess new topographic and bathymetric data due to the recent high flows that have substantially changed the proposed restoration site, to expand the design to include a second, nearby location to create a larger project and to conduct pre-project monitoring. Additionally, project design plans and permits will be completed, as well as initial outreach to stakeholders.

Implementation funding could be phased in FY19 and out years and range from \$1.0 to \$ 2.8M, depending on the size of the project (up to 50 acres). The projected overall cost per acre could be approximately \$26,572 (including permitting, design, outreach, implementation, monitoring, and project management) calculated from a total project cost of \$4.5 million for 170 acres for our Hallwood

restoration project. Similar to the Hallwood project, by leveraging a relationship with a nearby aggregate producer and landowner performing the role of restoration contractor, the project cost is considerably lower than could otherwise be realized. For example, the earthwork costs are much lower than the range of restoration costs developed by others for side channel reconnection of \$40,000 to \$70,000 in 2003 dollars; and \$52,957 to \$92,675 adjusted to 2017 (Thomson and Pinkerton, 2008). Monitoring is expected to cost \$50,000 per year.

Data Management

Short-term benefits would be incurred because rearing juvenile salmonids could use newly-restored habitat following each construction season. Habitat functionality may change over time due to degradation by high flow events, but we hope to provide high-quality habitat for 5-10 years. High flow events and a changing river are to be expected and provide other benefits, such as deposition of fine sediment and organic material that promotes invertebrate and riparian seedling production. Long-term benefits may be extended with project maintenance. The monitoring from this project will compare juvenile salmonid growth and survival rates with those of other sites and restoration projects. Hence, it will address habitat quality-related data gaps in the Central Valley DSM model for these parameters. This project would increase the availability of floodplain and off-channel rearing habitat which would have greater food production, shallower depths, slower water velocities, and greater cover conducive to increased growth and survival of juvenile salmonids. Consequently, not doing the project would cause more juveniles to rear in the main river channel which largely lacks these conditions.

The project partners, led by Cramer Fish Sciences and SYRCL, will develop a monitoring plan for the Long Bar project site. The plan would include specific hypotheses and studies that are designed to measure project effectiveness as related to specific restoration goals (1 mile of off-channel habitat created, 50 acres of floodplain area restored). In addition the plan will set out hypotheses that will improve our understanding of the effects of restoration on salmonid abundance and health (baseline and post-restoration population estimates, predation risk), habitat quality (stream temperature and BMI populations), and riparian ecosystem function (juvenile instream and floodplain habitat), in the short and long term. All monitoring data will be made available to the CVPIA and can be standardized for input into state or federal databases. Project assessment will focus on the rearing stages of Chinook salmon and will incorporate standardized monitoring associated with the other ongoing projects to elucidate the effects of species ontogeny and shifting environmental conditions along the river continuum on rearing salmonid (and associated food web and habitat) response to restoration actions. The performance of the design features will also be assessed, to ensure that as-built designs are creating expected acres and miles of habitat. In addition, the monitoring plan will include specific hypotheses that will test how well riparian recruitment and succession is occurring where restoration projects have been or will be implemented. The research goals of this monitoring plan will be based on input and feedback from AFRP and the team. Additionally, the team will request feedback from CDFW, NMFS, and the Yuba River Management Team.

Risks

Risk	Likelihood	Impact
Gravel market collapse	1	3
Permits fall through	1	3
High flows prohibit work in river	2	2
Collaboration issues	1	2

Cost Estimate

Year	Fund	Total	BOR	FWS
2018	CVPRF	\$132,500	\$0	\$132,500
2019	CVPRF	\$2,173,000	\$0	\$2,173,000
2020	CVPRF	\$901,000	\$0	\$901,000

Total Cost: \$3,206,500

Internal Agency Resources Table

Fiscal Year 2018

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
<i>Design</i>								
Agreement	Yuba Long Bar Floodplain Restoration project	\$25,000	1.00	0.06	\$26,500	FWS	CVPRF	Additional design needed to enlarge the project at a second, nearby site on Long Bar.
<i>Design Data</i>								
Agreement	Yuba Long Bar Floodplain Restoration	\$50,000	1.00	0.06	\$53,000	FWS	CVPRF	Update topography/bathymetry data due to high flows of 2016-17 plus ground-truthing to support DEM model and project design.
<i>Monitoring</i>								
Agreement	Yuba Long Bar Floodplain Restoration Project	\$50,000	1.00	0.06	\$53,000	FWS	CVPRF	Pre-project monitoring.

Fiscal Year 2019

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
<i>Implementation</i>								
Agreement	Yuba Long Bar Floodplain Restoration Project	\$2,000,000	1.00	0.06	\$2,120,000	FWS	CVPRF	Implementation funding
<i>Monitoring</i>								
Agreement	Yuba Long Bar Floodplain Restoration Project	\$50,000	1.00	0.06	\$53,000	FWS	CVPRF	Pre-project monitoring.

Fiscal Year 2020

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
<i>Monitoring</i>								
Agreement	Yuba Long Bar Floodplain Restoration Project	\$50,000	1.00	0.06	\$53,000	FWS	CVPRF	Post-project monitoring.
Agreement	Yuba Long Bar Floodplain Restoration Project	\$800,000	1.00	0.06	\$848,000	FWS	CVPRF	Additional implementation money if not completed in 2019.

Yuba River Flow Effects Modeling

Scientific inquiry and modeling effort building upon existing information (e.g., LiDAR data, 2D hydraulic model, etc.) and will contribute to the most informed and efficient creation and or enhancement of rearing habitat for fall-run and spring-run Chinook salmon as well as *O. mykiss* in the Yuba River.

DCN: AFRP2124

Classification: Research, Performance Monitoring

Location: Lower Yuba River, Yuba River

Funding Years: 2018 - 2020

Benefits Start Year: 2018

Priority: SIT Priority: Fall Chinook – 2 Yuba River, Improve/increase spawning and juvenile rearing habitat

Partners: cbec, inc., Trout Unlimited

Authority

Provision	Percentage	Comment
(b)(1) AFRP	100.0%	NA

Metrics

Name	Value	Units	Comment
Existing suitable habitat	0	acre-feet	Deduced in Task 1
Habitat deficit	0	acre-feet	to reach doubling goal; deduced in Task 1
Prioritized restoration locations	0	N/A	Deduced in Task 1
Flow characteristics	0	cfs	that maximize cohort success; deduced in Task 2
Flow characteristics and variability	0	cfs	that stimulate anadromy; deduced in Task 3
Temperature characteristics and variability	0	degrees	that stimulate anadromy; deduced in Task 3

Deliverables

Date	Title
Sep. 2019	Rearing habitat availability and deficit report
Mar. 2020	Genetic analysis report
Mar. 2020	Presentation to Yuba River Management Team
Sep. 2020	Anadromy and flow/temperatures report
Sep. 2020	Peer-reviewed publication

Narrative

Task 1. The amount of rearing habitat available to fall- and spring-run Chinook salmon, as well as steelhead, in the Yuba in different water years and Accord flow schedules are currently unknown and highly disputed. This study will build on previous work to quantify seasonal juvenile rearing habitat for Chinook that meets depth, velocity, cover, and inundation duration criteria. Such a study would estimate juvenile habitat available with different flows and directly inform adaptive management to maximize salmonid production in the Yuba. Obtaining more reliable habitat estimates was considered a high priority for future improvements to the Central Valley wide DSM.

Task 2. Past studies on the Yuba have resulted in the collection of many otolith and tissue samples of fish from the Feather/Yuba system; however, not all of these samples have been analyzed. Genetic and otolith samples can be used to deduce where fish in the Yuba originate, and their relationships to flow in different years and different water year types. Genetic results from between 50-100 adults that returned in a range of hydrologic conditions will be compared to flow patterns to improve our understanding of the relationships between adult salmonids in the Yuba river and flow dynamics. This study will also inform how Yuba flow management, such as pulse flows aimed at attracting fish out of the Feather into the Yuba, can be optimized to promote desirable genetics/origin of returning adults. This study will also provide information on hatchery-origin spawning, a key DSM knowledge gap.

Task 3. Recent studies examining the relationship between flow and anadromy in *O. mykiss* have found that flow variability and temperature are two of the main parameters affecting anadromy. This study will compare managed (Yuba Accord) flows to modeled unimpaired flows in different water year types with attention to flow variability and temperature levels and variability. After creating a natural flow regime template and an analysis of its comparison to managed flows, this study will compare Yuba flows to the range of flow/temperature dynamics from the literature that has been linked to anadromy and will make recommendations for adaptive management.

Task 4. In order for this project to be successful, a considerable amount of coordination between project partners, assistance with the completion of deliverables, and communication of project results will be necessary. This task includes project management/administration as well as support of the creation of listed deliverables, including the reports “Rearing habitat availability and deficit on the lower Yuba River,” “Genetic analysis of Chinook salmon in the lower Yuba River,” and “Anadromy in *O. mykiss* and its relationship to flow and temperature in the Yuba River” and the peer-reviewed scientific journal article. In addition, this task includes dissemination of project findings, including a presentation to the Yuba River Management Team.

Data Management

Products of this effort would include: a) a summary of currently available suitable habitat area by space and time to compare to the existing Emigrating Salmonid Habitat Estimation (ESHE) model of habitat need for the Yuba, b) a habitat deficit calculation (i.e., determining the amount of habitat that is required to reach the doubling goal) c) prioritized restoration locations based upon cost/level of enhancement effort required (i.e., volume of material, approximate cost) d) flow characteristics (magnitude, ratio, etc.) that have lead to successful cohorts and e) flow magnitude and variability (cfs) and temperature magnitude and variability (deg C) required to stimulate anadromy.

ESHE model documentation (Task 1) will be submitted as supplemental material with the final report.

Genetic and otolith sample databases (Task 2) will be submitted to Center for Data Management upon project completion.

All data collected related to supporting anadromy in steelhead (Task 3) will be submitted annually to the Center for Data Management and will be presented to the Yuba RMT.

Modeling outputs from all tasks will leverage existing data from previous monitoring efforts to improve the efficiency and effectiveness of restoration and management actions.

CVPIA data reporting and sharing guidelines will be followed as applicable. Backup data will be stored with TU and USFWS. Reports will be made public.

Data contact: MaryKate Swenarton mary_swenarton@fws.gov

The project management team for this effort includes MaryKate Swenarton (USFWS; technical expert, project manager), Dr. Natalie Stauffer-Olson (Trout Unlimited; project manager, technical expert), Dr. Rene Henery (Trout Unlimited; technical expert), Dr. Chris Hammersmark (cbec; technical expert), Dr. Mariah Meek (Michigan State University; technical expert), Dr. Rachel Johnson (NOAA/ UC Davis; technical expert), Dr. Anna Sturrock (UC Davis, technical expert) and Paul Cadrett (USFWS; technical expert).

In order to make effective progress towards the CVPIA doubling goals, a clear understanding of the relationships between flow, habitat, and life-history expression of salmonids in the Yuba River is necessary. Extensive monitoring and mapping data has been collected on the Yuba and can be leveraged to answer critical questions that will help maximize management actions to increase juvenile rearing habitat, adult returns, and *O. mykiss* anadromy in the river. The proposed project represents a scientific inquiry and modeling effort building upon existing information (e.g., LiDAR data, 2D hydraulic model, etc.) and will contribute to the most informed and efficient creation and or enhancement of rearing habitat for Chinook salmon and *O. mykiss* in the Yuba River. The project will also increase our ability to adaptively manage flows, habitat, and/or temperatures to increase the return of Yuba fish to their natal river and the frequency of anadromy in steelhead.

Risks

Risk	Likelihood	Impact
Collaboration issues	1	2

Cost Estimate

Year	Fund	Total	BOR	FWS	Local
2018	CVPRF	\$179,788	\$0	\$179,788	\$0
2018	Other	\$5,000	\$0	\$0	\$5,000
2019	CVPRF	\$89,599	\$0	\$89,599	\$0

Total Cost: \$274,386

Internal Agency Resources Table

Fiscal Year 2018

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
Research								
Agreement	Genetic analyses	\$5,000	1.00	0.06	\$5,300	FWS	CVPRF	Sequencing of 100+ Chinook salmon and steelhead individuals.
Agreement	Modeling	\$11,833	1.00	0.06	\$12,543	FWS	CVPRF	Modeling the relationship between genetics and flow dynamics.
Research								
Agreement	Modeling	\$59,111	1.00	0.06	\$62,658	FWS	CVPRF	Modeling of the relationships between flow characteristics, flow variability, temperature variability and anadromy in steelhead.
Research								
Agreement	Modeling	\$93,667	1.00	0.06	\$99,287	FWS	CVPRF	Modeling juvenile habitat availability and habitat deficit.
In-Kind Labor	Modeling/ project support	\$5,000	1.00	0.00	\$5,000	Local	Other	In-kind labor provided by Trout Unlimited.

Fiscal Year 2019

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
Research								
Agreement	Modeling	\$29,556	1.00	0.06	\$31,329	FWS	CVPRF	Modeling of the relationships between flow characteristics, flow variability, temperature variability and anadromy in steelhead.
Agreement	Project Support	\$10,000	1.00	0.06	\$10,600	FWS	CVPRF	Project management and manuscript writing/preparation
Research								
Agreement	Genetic analyses	\$44,971	1.00	0.06	\$47,669	FWS	CVPRF	Sequencing of 100+ Chinook salmon and steelhead individuals.

Clear Creek Annual Flow Management

Develop and implement a comprehensive flow program for salmon and steelhead in Clear Creek

DCN: AFRP2125

Classification: Improvement, Water Operations

Location: Clear Creek, Clear Creek

Funding Years: 2019 - 2023

Benefits Start Year: 2020

Priority: CVPIA authorized high priority project

Partners: CDWR, ESA, NMFS, NRCS, Point Blue Conservation Science, BLM, CDFW

Related Programs: EWP, NMFS-RP, NMFS-RPAs, CVPIA b12, CVPIA b2

Authority

Provision	Percentage	Comment
(b)(12) Clear Creek Flows	100.0%	NA

Metrics

Name	Value	Units	Comment
b12: Variable flow target	0	acre-feet	B2 target
b12: Water Temperature Target	56	degrees	56 for spawning and 60 for holding SCS. Targets incorporates the number of days exceeding target.

Deliverables

Date	Title
Dec. 2018	Operational Flow Management Plan Required by NMFS RPA #1.I.6
Dec. 2018	Adaptive Plan to Encourage Steelhead Anadromy within the Central Valley
Mar. 2019	Comprehensive Flow Plan Required by CVPIA Section 3406(b)12
Apr. 2019	Spring Attraction Flow Annual Proposal

Narrative

This charter proposes to address three RPA flow-related actions and consider other beneficial flow related needs by considering annual flow management holistically. Such an approach would consider the mandate of the RPAs and the geomorphic and ecological benefits of inter and intra annual variability. The

suggested approach would be a workgroup process that considers modeling (a similar practice used by the Trinity River Restoration Program) in developing an annual flow release schedule.

In addition to Channel Maintenance flows addressed in another charter, NMFS identified three primary flow related RPA actions in Clear Creek in their Biological Opinion on Bureau of Reclamation's and the State's long-term operations of the CVP and SWP to avoid jeopardy of ESA listed Central Valley Spring-run Chinook Salmon and Central Valley steelhead. The three RPA actions are: "Action I.1.1. Spring Attraction Flows" to "Encourage spring-run movement to upstream Clear Creek habitat for spawning"; "Action I.1.5. Thermal Stress Reduction" to "Reduce thermal stress to over-summering steelhead and spring-run during holding, spawning, and embryo incubation"; and "Action I.1.6. Adaptively Manage to Habitat Suitability/IFIM Study Results" to "Decrease risk to Clear Creek spring-run and CV steelhead population through improved flow management designed to implement state-of-the-art scientific analysis on habitat suitability." These actions provide ancillary benefit to non-listed salmonid in Clear Creek as well.

The USFWS flow reports developed for Clear Creek utilized a two-dimensional modeled microhabitat approach and the recommendations contained within focus around flows that provide suitable weighted usable area for fish using the contemporary topography as represented in the models (USFWS 2010, 2011a, 2011b, 2013, 2015). We propose to balance meeting the microhabitat needs of fish in the here-and-now, along with incorporating variability and disturbance that feeds long-term river processes that create habitat and encourages favorable life history variability.

Flow requirements for fish habitat and food-web productivity go beyond merely wetting an existing topography and riparian condition that a fish in-the-present can occupy. Long-term fish habitat and fish production requires consideration of flow for physical and successional fluvial and riparian processes that continuously create habitat. Avoid long periods of low variability in flow – a condition that encourages static channel and riparian condition and reduces total habitat over the long term. Provide variable flow that contributes to channel dynamics, riparian recruitment on floodplains and increases total available habitat over the long term. Transport and distribute gravel from the injection program. Increase gravel transport and channel variability through flow related mechanisms (migration, avulsion, erosion, deposition).

We envision the process to incorporate at least these basic steps:

1. Annually develop holistic flow proposal for coming year with input/review of CCTT parties
 - a. Review monitoring results.
 - b. Adjust actions as necessary to improve effectiveness, supported in written report based on monitoring.
2. Submit to NMFS for approval.

Project Management Team: BOR NCAO Fish Biologist Derek Rupert – Lead; FWS RBFWO Fish Biologist Charles Chamberlain – Co-lead; DFW Environmental Scientist Tricia Bratcher; DWR Environmental Scientist Mike Berry; BLM Ecologist Laura Brodhead

Data Management

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.

Geomorphic, fish and temperature monitoring funded through other charters will inform physical and fishery response to this annual flow management effort.

Risks

Risk	Likelihood	Impact
Very short timeline	3	2

Cost Estimate

Year	Fund	Total	BOR	FWS
2018	WRR	\$19,323	\$19,323	\$0
2018	CVPRF	\$9,662	\$0	\$9,662
2019	WRR	\$19,517	\$19,517	\$0
2019	CVPRF	\$9,758	\$0	\$9,758
2020	CVPRF	\$9,856	\$0	\$9,856
2020	WRR	\$19,712	\$19,712	\$0
2021	WRR	\$19,907	\$19,907	\$0
2021	CVPRF	\$9,953	\$0	\$9,953

Total Cost: \$117,688

Internal Agency Resources Table

Fiscal Year 2018

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
<i>Planning and Analysis</i>								
Labor	Natural Resource Specialist or Fish Biologist	\$241,542	0.08	0.00	\$19,323	BOR	WRR	Coordinate work-group to develop annual flow recommendations
Labor	Fish Biologist	\$241,542	0.04	0.00	\$9,662	FWS	CVPRF	Technical assistance in writing and implementing annual flow plans

Fiscal Year 2019

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
<i>Planning and Analysis</i>								
Labor	Natural Resource Specialist or Fish Biologist	\$243,957	0.08	0.00	\$19,517	BOR	WRR	Coordinate work-group to develop annual flow recommendations
Labor	Fish Biologist	\$243,957	0.04	0.00	\$9,758	FWS	CVPRF	Technical assistance in writing and implementing annual flow plans

Fiscal Year 2020

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
<i>Planning and Analysis</i>								

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
Labor	Fish Biologist	\$243,957	0.04	0.01	\$9,856	FWS	CVPRF	Technical assistance in writing and implementing annual flow plans
Labor	Natural Resource Specialist or Fish Biologist	\$243,957	0.08	0.01	\$19,712	BOR	WRR	Coordinate work-group to develop annual flow recommendations

Fiscal Year 2021

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
<i>Planning and Analysis</i>								
Labor	Natural Resource Specialist or Fish Biologist	\$243,957	0.08	0.02	\$19,907	BOR	WRR	Coordinate work-group to develop annual flow recommendations
Labor	Fish Biologist	\$243,957	0.04	0.02	\$9,953	FWS	CVPRF	Technical assistance in writing and implementing annual flow plans

Clear Creek Gravel Injection

Inject 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: Improvement, Spawning Gravel

Location: Clear Creek, Clear Creek

Funding Years: 2019 - 2023

Benefits Start Year: 2020

Priority: CVPIA authorized high priority project

Partners: CDWR, NPS, BLM, CDFW

Related Programs: NMFS-RP, NMFS-RPAs, CVPIA b12, EWP

Authority

Provision	Percentage	Comment
(b)(12) Clear Creek Flows	50.0%	Flows are integral to the distribution of gravel for habitat-forming processes.
(b)(12) Clear Creek Restoration	50.0%	Gravel is a key component of fluvially influenced habitats (spawning, rearing, floodplain)

Metrics

Name	Value	Units	Comment
b12: Spawning gravel placed annually (tons)	25000	tons	Amount of gravel required per year to restore spawning gravel supply to amount pre-Whiskeytown Dam
b12: Area of spawning hab created annually	219490	square feet	Current value is 63% of target of 347,308 square feet of usable spawning habitat which is the amount available pre-Whiskeytown Dam construction

Deliverables

Date	Title
Dec. 2018	Project Completion Report
Dec. 2019	Annual Project Completion Report
Dec. 2020	Annual Project Completion Report
Dec. 2021	Annual Project Completion Report
Dec. 2022	Annual Project Completion Report
Dec. 2023	Annual Project Completion Report

Narrative

The CVPIA (b)(12) program has a long-standing effort to augment gravel in Clear Creek to replace desirable sediment fractions blocked by the presence and operation of Whiskeytown Reservoir. 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 the NMFS' Recovery Plan for these listed species (NMFS 2014). This program also benefits Fall and Late Fall-run Chinook salmon. From 1996 to 2017, approximately 168,000 tons of gravel have been placed into Clear Creek. Creation of spawning habitat for all Clear Creek runs of Chinook salmon and steelhead has been documented by FWS. The project also helps restore sediment transport processes, such as coarse bedload transport continuity and sediment deposition on floodplain surfaces. 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.

This long-term gravel program would benefit from RPA Action I.1.2. Channel Maintenance Flows which would contribute to routing gravels downstream to feed fluvial processes and create habitat. That Maintenance Flow action has long been identified in separate annual charters, but it has not been implemented

The Clear Creek Restoration Program evaluates the amount of spawning habitat using potential spawning habitat mapping (PSAM) and Spawning Habitat Use (SHU) data collected by FWS. 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.

There are few years of PSAM data to inform the relationship between gravel injection and available spawning area. Initial results suggest that large gains were made up to about 2010 and that some of that ground was subsequently lost when we entered a period of combined low gravel injection rates and drought. Monitoring results from the summer 2017 were informative as the winter flow experience of 2016-2017 was exceptional among post dam years (up to 11,700 cfs at Igo). Sediment routing downstream was believed to have been high in response to the wet year. Inspection of gravel injection sites after high flows revealed that nearly all were evacuated of injected gravel and was suitable now for reinjection, except for the Whiskeytown Dam site that only experienced a relatively small spill flow (~1,200 cfs). Injections in summer/fall 2017 addressed some of these gravel sites.

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. A subcommittee of the CCTT was formed in spring 2018 to develop a new conceptual model, goals, reach-specific objectives, SMART metrics, and an explicit adaptive management framework.

Project Management Team: BOR NCAO Fish Biologist Derek Rupert – Lead; FWS RBFOW Fish Biologist Charles Chamberlain; DFW Environmental Scientist Tricia Bratcher; DWR Environmental Scientist Mike Berry; BLM Ecologist Laura Brodhead

Data Management

Compliance and effectiveness monitoring for the project are conducted as part of the b12 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. This rough estimate is based on a short period of monitoring beginning in 2010. In recent years the rate of gravel supplementation has decreased, and we entered a period of drought. During this same time, estimated PSAM in the upper reaches has decreased by 29% suggesting that an annual program will be required to maintain spawning gravels. 2) Based on previous observation we expect an increase of 16% Spawning Habitat Use per year following gravel mobilization. 3) The percent of steelhead redds in injection gravel in the upper reaches of Clear Creek increased 50% from 2003 to 2014. Based on this rate of increase we expect near-term increases of roughly 5% per year, however, we expect this relationship to be asymptotic to some yet-to-be-determined maximum level. The program has averaged about a third of the target 25,000 tons annual gravel injection targeted early in the Clear Creek Restoration Program.

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) 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 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, macroinvertebrate abundance and species richness and Juvenile Habitat Use.

Risks

Risk	Likelihood	Impact
Funding Reductions	1	3
High fuel costs	2	1
No channel maintenance flows	3	2

Cost Estimate

Year	Fund	Total	BOR	FWS
2018	CVPRF	\$309,662	\$309,662	\$0
2019	CVPRF	\$315,758	\$315,758	\$0
2020	CVPRF	\$312,120	\$312,120	\$0
2021	CVPRF	\$318,240	\$318,240	\$0
2022	CVPRF	\$324,360	\$324,360	\$0
2023	CVPRF	\$330,480	\$330,480	\$0

Total Cost: \$1,910,620

Internal Agency Resources Table

Fiscal Year 2018

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
<i>Implementation</i>								
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

Fiscal Year 2019

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
<i>Implementation</i>								
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.

Fiscal Year 2020

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
<i>Implementation</i>								
Agreement	Inject up to 12,000 tons of gravel at various locations	\$306,000	1.00	0.02	\$312,120	BOR	CVPRF	Gravel projects towards CVPIA target of 25,000 tons per year

Fiscal Year 2021

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
<i>Implementation</i>								
Agreement	Inject up to 12,000 tons of gravel at various locations	\$306,000	1.00	0.04	\$318,240	BOR	CVPRF	NA

Fiscal Year 2022

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
<i>Implementation</i>								
Agreement	Inject up to 12,000 tons of gravel at various locations	\$306,000	1.00	0.06	\$324,360	BOR	CVPRF	Gravel projects towards CVPIA target of 25,000 tons per year

Fiscal Year 2023

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
<i>Implementation</i>								
Agreement	Inject up to 12,000 tons of gravel at various locations	\$306,000	1.00	0.08	\$330,480	BOR	CVPRF	Gravel projects towards CVPIA target of 25,000 tons per year

Clear Creek Phase 3B Completion

Complete Phase 3B floodplain restoration actions that were left undone at time of original construction due to state bond crisis. Current plans have planning and design scheduled for 2019 and construction implementation for 2020.

DCN: AFRP2127

Classification: Improvement, Habitat Restoration

Location: Clear Creek, Clear Creek

Funding Years: 2019 - 2020

Benefits Start Year: 2020

Priority: CVPIA authorized high priority project

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	Comment
(b)(12) Clear Creek Restoration	100.0%	Address riparian and wetland loss/creation mass balance for 20 year LCC Floodway Rehabilitation (see narrative). This project will complete an earlier project that was left unfunded.

Metrics

Name	Value	Units	Comment
Permit requirement	1	completion	Address 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.
b12: 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 and projects currently under consideration could exceed metric value

Deliverables

Date	Title
Jul. 2021	Phase 3B Completion designs and bid documents

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 those final actions were a casualty of the California Bond Crisis. The purpose of this charter is to fund design to finish restoration at the Phase 3B Restoration site and realize the complete benefits of a fully constructed site. Additionally, in discussions regarding other Clear Creek projects, the Army Corps of Engineers 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 Corps concerns regarding the balance for this 20 year period that is soon coming to a close. This project is critical for meeting the commitments CVPIA has made to permitting agencies and the landowner. These commitments will also improve floodplain habitats for salmon and terrestrial species.

Project Management Team: BOR NCAO Fish Biologist Derek Rupert – Lead; FWS RBFWO Fish Biologist Charles Chamberlain – Co-lead; DFW Environmental Scientist Tricia Bratcher; DWR Environmental Scientist Mike Berry; BLM Ecologist Laura Brodhead

Data Management

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.

Risks

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

Cost Estimate

Year	Fund	Total	BOR	FWS
2019	CVPRF	\$198,308	\$198,308	\$0
2020	CVPRF	\$75,000	\$75,000	\$0

Total Cost: \$273,308

Internal Agency Resources Table

Fiscal Year 2019

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
<i>Construction</i>								
Labor	Construction management	\$241,542	0.10	0.00	\$24,154	BOR	CVPRF	Construction management
Agreement	Construction contract	\$150,000	1.00	0.00	\$150,000	BOR	CVPRF	Initial estimate of design and construction costs for Phase 3B Completion
<i>Planning and Analysis</i>								
Labor	Natural Resource Specialist	\$241,542	0.10	0.00	\$24,154	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.

Fiscal Year 2020

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
<i>Construction</i>								
Placeholder	Contingency	\$75,000	1.00	0.00	\$75,000	BOR	CVPRF	50% of estimated construction cost.

Clear Creek Stream Channel Restoration Phase 3C

Improve stream channel, floodplain, and associated habitats to provide increased spawning and rearing habitat for salmonids

DCN: AFRP2128

Classification: Improvement, Habitat Restoration

Location: Clear Creek, Clear Creek

Funding Years: 2018 - 2020

Benefits Start Year: 2019

Priority: CVPIA authorized high priority project

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	Comment
(b)(12) Clear Creek Restoration	100.0%	One-time modification of the channel.

Metrics

Name	Value	Units	Comment
b12: Area of spawning hab created annually	10000	square feet	This metric was originally a target of 347,288 square feet, not an annual target. Need to update spawning area metric with new contemporary methodology.
b12: 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 and projects currently under consideration could exceed metric value

Deliverables

Date	Title
Dec. 2019	Quarterly updates to Phase 3C Project Management Team
Sep. 2021	Performance report - fish, riparian, geomorphic

Narrative

The Clear Creek Stream Channel Restoration project is a construction project designed to convert Clear Creek Floodway surfaces from an industrial gravel extraction landscape to a functional floodplain and increase salmonid spawning and juvenile rearing habitat in a two-mile section of creek significantly degraded by gold and aggregate mining. Four phases of the project have been implemented including Phase 1 in 1998, Phase 2A in 1999, Phase 2B in 2001, Phase 3A in 2002, Redding Bar in 2003 and Phase 3B (partial) in 2008. Phases 3A and 3B created new stream channels. The completed phases filled gravel extraction pits, created floodplains and riparian habitat, and reduced fish stranding potential in the project area. Phase 3C will create floodplain and stream channels in the lowest part of this 2-mile reach. Geomorphic function, fish and wildlife habitat, mercury contamination, land ownership, and cost-effectiveness have all been considered in development of a 30% design just recently completed. Estimated cost for Phase 3C is \$6.6M.

Phase 3C is the last phase of the Lower Clear Creek Floodplain and Stream Channel Restoration Project (SCRCP) described in the Clear Creek Conceptual Plan (McBain and Trush et al. 1999a) and Clear Creek Technical and Design Document (McBain and Trush et al. 1999b). The SCRCP primary goals were to improve salmonid spawning and rearing habitat, reduce fish stranding and improve fish passage. While other stream channel restoration projects have been proposed and undertaken in Clear Creek, the SCRCP focused on a two-mile reach heavily damaged by human impacts including gold and gravel mining and lack of sediment due to Whiskeytown Dam. From 1998 to 2008, actions within this two-mile reach include Phase 1, Phase 2A, Phase 2B North, Phase 2B South, Phase 3A and Phase 3B. In addition to those projects within the two-mile focus area, additional project areas outside the focus area were implemented to provide source material for projects within, and these include restoration sites known as Phase 3 Borrow Areas, Lower Redding Bar, and Upper Redding Bar. The original project was intended to be constructed in 3 phases which were broken into smaller units to allow improved adaptive management by evaluating each phase to inform design of subsequent phases. Implementation of Phase 3C was delayed to allow monitoring of early phases to evaluate costs and benefits of the project. There was uncertainty of the benefits of the project and environmental costs due to potential loss of spawning habitat, potential mercury contamination, loss of habitat for sensitive amphibian, reptile and bird species. Monitoring results of adult and juvenile salmonid response to prior phases and numerical modeling of fish ecology suggest that the project would have larger benefits for juvenile salmonids than originally anticipated and that potential losses of spawning habitat are minimal due to poor existing spawning habitat conditions.

Project Management Team: BOR MPCO Engineer Casey Arthur– Lead (transitioning to Sean Frische); BOR NCAO Fish Biologist Derek Rupert; BOR TSC Engineer Rob Hildale; FWS RBFWO Deputy PL Matt Brown – Co-lead; FWS RBFWO Fish Biologist Charles Chamberlain; DFW Environmental Scientist Tricia Bratcher; DWR Environmental Scientist Mike Berry; BLM Ecologist Laura Brodhead

Data Management

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 assess 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 anticipated	2	2

Cost Estimate

Year	Fund	Total	BOR	FWS
2017	CVPRF	\$0	\$0	\$0
2018	CVPRF	\$100,000	\$0	\$100,000
2019	CVPRF	\$406,316	\$406,316	\$0
2020	CVPRF	\$159,403	\$159,403	\$0
2021	CVPRF	\$312,619	\$188,200	\$124,419
2022	CVPRF	\$50,000	\$50,000	\$0
2023	CVPRF	\$25,000	\$25,000	\$0

Total Cost: \$1,053,338

Internal Agency Resources Table

Fiscal Year 2017

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
<i>Design Data</i>								
Agreement	Monitoring to be determined	\$100,000	0.00	0.00	\$0	FWS	CVPRF	Supplemental funding for monitoring described in project proposal potentially including fish, geomorphological, avian, riparian, herpetological and mercury evaluations. Information will be used to evaluate the impacts and effectiveness of the project. Carried over into FY2018.

Fiscal Year 2018

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
<i>Design Data</i>								
Agreement	Monitoring to be determined	\$200,000	0.50	0.00	\$100,000	FWS	CVPRF	Supplemental funding for monitoring described in project proposal potentially including fish, geomorphological, avian, riparian, herpetological and mercury evaluations. Information will be used to evaluate the impacts and effectiveness of the project. Instead, fund 100k each from '17 carryover & FY19.

Fiscal Year 2019

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
<i>Design Data</i>								
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

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
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

Fiscal Year 2020

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
Construction								
Labor	MPCO	\$58,930	1.00	0.00	\$58,930	BOR	CVPRF	Construction management
Labor	TSC - Sediment/River group	\$50,473	1.00	0.00	\$50,473	BOR	CVPRF	Design support during construction
Management								
Labor	MPCO	\$200,000	0.25	0.00	\$50,000	BOR	CVPRF	Project management

Fiscal Year 2021

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
Construction								
Labor	MPCO	\$43,200	1.00	0.00	\$43,200	BOR	CVPRF	Construction management
Labor	MPCO	\$50,000	1.00	0.00	\$50,000	BOR	CVPRF	Closeout
Labor	MPCO 3800	\$8,000	1.00	0.00	\$8,000	BOR	CVPRF	Procurement admin
Labor	TSC - Sediment/River group	\$37,000	1.00	0.00	\$37,000	BOR	CVPRF	Design support during construction

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
<i>Management</i>								
Labor	MPCO	\$200,000	0.25	0.00	\$50,000	BOR	CVPRF	Project management
<i>Monitoring</i>								
Labor	Fish Biologist	\$243,958	0.50	0.02	\$124,419	FWS	CVPRF	Post project evaluation on juvenile salmonid habitat use

Fiscal Year 2022

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
<i>Management</i>								
Labor	MPCO	\$200,000	0.25	0.00	\$50,000	BOR	CVPRF	Project management

Fiscal Year 2023

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
<i>Management</i>								
Labor	MPCO	\$25,000	1.00	0.00	\$25,000	BOR	CVPRF	Project management

American River Rotary Screw Trap Project

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

DCN: AFRP2129
 Classification: Performance Monitoring, Performance Monitoring
 Location: Watershed, American River
 Funding Years: 2017 - 2019
 Benefits Start Year: 2017
 Priority: SIT Support
 Partners: CDFW, Pacific States Marine Fisheries Commission

Authority

Provision	Percentage	Comment
(b)(15) CAMP	100.0%	Comprehensive Assessment and Monitoring Program

Metrics

Name	Value	Units	Comment
SIT watershed attributes for the American River: number of juveniles produced per adult salmon spawner, and proportion of juvenile salmon in each size class leaving a watershed	2	number of fish	The rotary screw traps at Watt Avenue on the American River provide data reflecting the total number of juvenile salmon coming from the spawning grounds on the American River. As such, those traps provide data that can be used to quantify the number of juveniles produced per adult salmon spawner, and proportion of juvenile salmon in each size class emigrating past Watt Avenue.

Deliverables

Date	Title
Sep. 2018	annual American River rotary screw trap annual report and a database with data

Narrative

The rotary screw trap monitoring activities in the American River provide data that can be used to assess the biological response to habitat management activities in that 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. The CAMP and its partner entities (California Department of Fish and Wildlife and Pacific States Marine Fisheries Commission) have an excellent record collecting high-quality data and producing deliverables on a timely basis in 2013, 2014, 2015, and 2016. The 2013 and 2014 reports are currently available on the CAMP website at:

http://www.fws.gov/sacramento/Fisheries/CAMP-Program/Documents-Reports/fisheries_camp-program_documents-reports.htm

Funding (1) provides access to long-term trend monitoring data for multiple taxa in one of the four Central Valley project watersheds, i.e., one of the watersheds where the CVPIA's Science Integration Team (SIT) has identified priority actions, (2) ensures continuity in work that is feasible (and has been ongoing for four years), (3) will provide the data that are needed to accomplish the CAMP's performance metric of producing an annual report, (4) provides access to standardized data pertaining to three threatened or endangered fish taxa, (5) will lead to data that can be used to validate the accuracy of the SIT's decision support model, (6) generates data that will facilitate watershed-scale comparisons between the predicted and actual benefits of habitat restoration activities, and (7) addresses a 2009 NMFS OCAP biological opinion requirement that the Bureau of Reclamation conduct "...juvenile monitoring for spring-run, winter-run, and steelhead on the...American River...through...rotary screw trapping". Unlike other entities that wish to conduct rotary screw trap operations on the American River, the Pacific States Marine Fisheries Commission is able to conduct those operations at a markedly lower cost, and staff with that organization have required a much lower level of supervision from the CAMP Program Manager to ensure their data are properly recorded and entered into the CAMP rotary screw trap platform. PMT: Cesar Blanco (USFWS), Felipe Carrillo (USFWS), John Hannon (USBR)

Data Management

The American River rotary screw trap data will be stored in the CAMP's rotary screw trap Platform which provides standardized data analyses and summaries. Data summaries from that database can be provided to CVPIA managers, stakeholders, the public, and the CVPIA's Science Integration Team on an as needed basis.

Risks

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

Cost Estimate

Year	Fund	Total	BOR	FWS
2017	CVPRF	\$226,100	\$0	\$226,100
2018	CVPRF	\$222,583	\$0	\$222,583
2019	CVPRF	\$242,400	\$0	\$242,400

Total Cost: \$691,083

Internal Agency Resources Table

Fiscal Year 2017

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
<i>Monitoring</i>								
Agreement	F13AC00053	\$226,100	1.00	0.00	\$226,100	FWS	CVPRF	The 2017 project cost includes \$185,000 for PSMFC work, \$11,100 for the 6% USFWS overhead cost, and \$20,000 to cover work involving otolith and survival studies.

Fiscal Year 2018

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
<i>Monitoring</i>								
Agreement	F13AC00053	\$222,583	1.00	0.00	\$222,583	FWS	CVPRF	NA

Fiscal Year 2019

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
<i>Monitoring</i>								
Agreement	F13AC00053	\$242,400	1.00	0.00	\$242,400	FWS	CVPRF	2019 cost assumes the 2018 cost plus 1% annual inflation.

Estimating the Abundance of Juvenile Chinook Salmon Entering and Exiting the Delta

Estimates run-specific juvenile salmon abundance by using a new approach to estimating trawl efficiency at Sacramento and Chipps Island combined with genetic sampling.

DCN: AFRP2130
 Classification: Performance Monitoring, Performance Monitoring
 Location: Sacramento and San Joaquin Rivers, Sacramento-San Joaquin Delta
 Funding Years: 2017 - 2021
 Benefits Start Year: 2017
 Priority: SIT Support
 Partners: NMFS, USGS, Fish Metrics, FWS - DJFMP
 Related Programs: Interagency Ecological Program

Authority

Provision	Percentage	Comment
(b)(15) CAMP	100.0%	NA

Metrics

Name	Value	Units	Comment
Improvement in abundance estimates	0	number of fish	Will contribute to improved estimates of abundance at key locations for assessing cumulative effects of restoration actions on juvenile salmon.

Deliverables

Date	Title
Dec. 2017	Biannual progress report
Jun. 2018	Biannual progress report
Dec. 2018	Biannual progress report
Jun. 2019	Biannual progress report
Dec. 2019	Biannual progress report
Jun. 2020	Biannual progress report
Dec. 2020	Biannual progress report
Jun. 2021	Biannual progress report
Dec. 2021	Peer review journal article

Narrative

This proposal will help to fill important information gaps related to SIT's DSM model for identifying restoration priorities. Quantifying the abundance, timing, size, and development stage of naturally produced juvenile salmon at Chipps Island are key metrics for Valley-wide assessments of population status and CVPIA effectiveness monitoring (SIT Technical memo, Table 1). However, the current salmon monitoring at Chipps Island is limited by imprecise run identification and uncertain trawl efficiencies, which preclude robust estimation of abundances of winter, spring, and fall-run Chinook salmon necessary to support the DSM model and track status and trends in salmon populations (IEP Salmon SAIL, Johnson et al. in press). Uncertainties in juvenile salmon survival were identified as one of the most influential data gaps in the Fall Chinook Salmon DSM (SIT memo, Table 8, Figures 5 and 6). We propose to fill these gaps by estimating these survival parameters with acoustic-tagged fish and by providing run-specific abundance estimates at both Sacramento and Chipps Island.

This project was funded by Interagency Ecological Program (IEP) through California Department of Fish and Wildlife (CDFW) and CVPIA in 2017 as an outcome of the IEP SAIL effort and will estimate the abundance of winter-run salmon entering the Delta at Sacramento and exiting the Delta at Chipps Island in 2016 and 2017. Here we identify the funding needed for three of the remaining four years of the project (2018-2020), where we would continue work on winter run abundance estimates and expand the effort as feasible to estimate the abundance of spring and fall run. CVPIA funding is requested for 2018 for conducting the study early in 2019. For 2018 implementation, our PMT is working to advance this project through the FY18 IEP Workplan with Reclamation and DWR funding.

The Project Management Team is made up of a multi-agency, interdisciplinary group: Gonzalo Castillo, USFWS; Russell Perry, USGS; Brian Pyper, Fish Metrics (statistical consultant); Arnold Ammann and Rachel Johnson, NOAA Fisheries; and Josh Israel, USBR.

The first objective of this project is to estimate trawl efficiencies at Sacramento and Chipps Island using an innovative approach that pairs releases of acoustic-tagged fish for estimating survival with releases of CWT fish for trawl recovery. This approach has the potential to yield precise efficiency estimates at sufficiently short time scales to (1) rigorously expand trawl catches to estimate abundance, and (2) to model relationships between efficiency and environmental covariates. Our second objective is to use a well-established genetic stock identification method to estimate genetic winter run, spring run, and fall run in the trawl catch at both locations. Our final objective is to combine the efficiency and genetic data to estimate population abundances of each run type rigorously.

Data Management

Trawling information will be kept in an electronic database maintained by FWS office in Lodi, CA. The acoustic tag detections will be in an electronic database managed by NOAA Fisheries in Santa Cruz, CA. Analyses files will be maintained and kept by the analysts doing the analyses at USGS and Fish Metrics.

Risks

Risk	Likelihood	Impact
Curtailed trawling at Chipps Island due to delta smelt take	1	2

Cost Estimate

Year	Fund	Total	BOR	FWS	DWR
2018	BDF	\$692,489	\$692,489	\$0	\$0
2018	CVPRF	\$747,908	\$0	\$747,908	\$0
2018	SC	\$1,174,200	\$0	\$0	\$1,174,200
2019	CVPRF	\$757,221	\$0	\$757,221	\$0
2019	SC	\$604,713	\$0	\$0	\$604,713
2019	BDF	\$0	\$0	\$0	\$0
2020	CVPRF	\$766,796	\$0	\$766,796	\$0
2020	SC	\$622,854	\$0	\$0	\$622,854
2020	BDF	\$0	\$0	\$0	\$0

Total Cost: \$5,366,182

Internal Agency Resources Table

Fiscal Year 2018

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
<i>Research</i>								
In-Kind Agreement	Genetic processing of tissue samples from salmon caught in the trawl samples	\$0	0.00	0.00	\$0	BOR	BDF	Samples are identified genetically using an agreement USBR has with Cramer Fish Sciences to process samples from the Tracy Fish Facilities.
Agreement	USGS Agreement for data analyses for 2019 data	\$53,045	1.00	0.06	\$56,228	FWS	CVPRF	To complete the analyses of annual data collected in 2019. The analyses will be a shared partnership between USGS and Fish Metrics
Agreement	Data Analyses agreement with Fish Metrics	\$53,045	1.00	0.06	\$56,228	FWS	CVPRF	To complete the data analyses component of the project for 2019. The data analyses will be a partnership between USGS and Fish Metrics.
Direct Contribution	Increased trawling at Sacramento and Chipps Island in 2019	\$587,100	1.00	0.00	\$587,100	DWR	SC	Increased trawling at Sacramento and Chipps Island for estimating efficiency and catching genetic winter, spring and fall run for estimating abundance in 2019. The funding was added to the Delta Juvenile Fish Monitoring Programs' three-year agreement which started in January of 2017.
Agreement	Agreement with NMFS to purchase 1800 acoustic tags and to tag fish	\$588,203	1.00	0.06	\$623,495	FWS	CVPRF	Agreement with NMFS - Santa Cruz to purchase 1800 acoustic tags and to implant them in hatchery fish (winter run at Livingston Stone Fish Hatchery,

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
								fall run from Coleman, Nimbus and Mokelumne River hatchery for spring of 2019.
Labor	Project Management	\$239,150	0.05	0.00	\$11,958	FWS	CVPRF	Funds to administer agreements and to do project management
Research								
In-Kind Agreement	Increased sampling	\$587,100	1.00	0.00	\$587,100	DWR	SC	Funding as part of IEP agreement between DWR and FWS.
In-Kind Agreement	Agreement to NMFS to purchase tags and for tagging	\$583,309	1.00	0.00	\$583,309	BOR	BDF	Agreement with NMFS-Santa Cruz to purchase 1800 acoustic tags and to implant them into hatchery fish to estimate efficiency at Sacramento and Chipps Island trawls in spring of 2018. Funding would be a cost share from USBR-Bay-Delta IEP funds if budget request is funded.
In-Kind Agreement	Agreements with USGS and Fish Metrics to analyze 2018 data	\$103,000	1.00	0.06	\$109,180	BOR	BDF	Funding from USBR's Bay-Delta IEP budget to conduct analyses for study conducted in 2018.

Fiscal Year 2019

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
Research								
Agreement	USGS agreement for data analyses for 2020 data	\$54,636	1.00	0.06	\$57,914	FWS	CVPRF	To complete the analyses of data collected in 2020. The analyses will be a shared partnership between USGS and Fish Metrics.
Agreement	Data analyses agreement with Fish Metrics	\$54,636	1.00	0.06	\$57,914	FWS	CVPRF	To complete the analyses of data collected in 2020. The analyses will be a shared partnerships between USGS and Fish Metrics.

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
Direct Contribution	Increased trawling at Sacramento and Chipps Island in 2020	\$604,713	1.00	0.00	\$604,713	DWR	SC	Increased trawling effort at Sacramento and Chipps Island for estimating efficiency and the abundance of juvenile salmon at those locations. This assumes DWR will continue to fund the increased trawling in 2020 as they have in 2017-2019.
Agreement	Agreement with NMFS to purchase 1800 acoustic tags and to tag fish	\$593,243	1.00	0.06	\$628,838	FWS	CVPRF	Acoustic tag fish to be released with coded wire tag fish to estimate trawl efficiency at Sacramento and Chipps Island for spring of 2020.
In-Kind Agreement	Genetic processing of tissue samples caught in the trawl	\$0	0.00	0.00	\$0	BOR	BDF	Samples are identified genetically using an agreement USBR has with Cramer Fish Sciences to process samples from the Tracy Fish Facilities.
Labor	Project Management	\$239,150	0.05	0.05	\$12,555	FWS	CVPRF	For project management and to oversee agreements. FY19 funds needed are estimated based on FY18 rate plus 5%

Fiscal Year 2020

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
Research								
Agreement	Data analyses agreement with Fish Metrics	\$56,275	1.00	0.06	\$59,652	FWS	CVPRF	To complete the analyses of data collected in 2021. The analyses will be a shared partnership between USGS and Fish Metrics.
Agreement	USGS agreement for	\$56,275	1.00	0.06	\$59,652	FWS	CVPRF	To complete the analyses of data collected in 2021. The analyses will be a shared partnership between USGS and Fish Metrics.

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
	data analyses for 2021 data							
Labor	Project Management	\$239,150	0.05	0.10	\$13,153	FWS	CVPRF	For project management and to oversee agreements. FY20 funds needed are estimated based on FY18 rate plus 10%.
Direct Contribution	Increased sampling at Sacramento and Chipps Island	\$622,854	1.00	0.00	\$622,854	DWR	SC	Increased trawling effort at Sacramento and Chipps Island for estimating efficiency and the abundance of juvenile salmon at those locations. This assumes the DWR will continue to fund the increased trawling at Sacramento and Chipps Island in 2021 as they have in 2017-2019.
Agreement	Agreement with NMFS to purchase 1800 acoustic tags and to tag fish	\$598,434	1.00	0.06	\$634,340	FWS	CVPRF	Acoustically tag juvenile salmon for efficiency estimates at Sacramento and Chipps Island using an agreement with NMFS for spring of 2021
In-Kind Agreement	Genetic processing of tissue samples caught in the trawls	\$0	0.00	0.00	\$0	BOR	BDF	Genetic identification of samples using an agreement USBR has with Cramer Fish Sciences to process samples from the Tracy Fish Facilities.

Stanislaus River Rotary Screw Trap Monitoring

Quantify production of juvenile Chinook salmon and the abundance of juvenile steelhead in the Stanislaus River (Caswell State Park) using rotary screw traps.

DCN: AFRP2131
 Classification: Performance Monitoring, Performance Monitoring
 Location: Stanislaus River
 Funding Years: 2017 - 2019
 Benefits Start Year: 2018
 Priority: SIT Support

Authority

Provision	Percentage	Comment
(b)(15) CAMP	100.0%	Comprehensive Assessment and Monitoring Program

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 using monitoring data that are collected with rotary screw traps.

Deliverables

Date	Title
Sep. 2018	annual Stanislaus River - Caswell State Park rotary screw trap report

Narrative

The rotary screw trap monitoring activities in the Stanislaus River provide data that can be used to assess the biological response to habitat management activities in that 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. The annual reports associated with the rotary screw trap operations on the Stanislaus River are currently available on the CAMP website at: http://www.fws.gov/sacramento/Fisheries/CAMP-Program/Documents-Reports/fisheries_camp-program_documents-reports.htm PMT: Felipe Carrillo (USFWS), Cesar Blanco (USFWS), John Hannon (USBR)

Data Management

The Stanislaus River rotary screw trap data will be stored in the CAMP Rotary Screw Trap Platform. Data summaries from the Platform can be provided to CVPIA managers, stakeholders, and the public.

Risks

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

Cost Estimate

Year	Fund	Total	BOR	FWS
2018	CVPRF	\$220,000	\$0	\$220,000
2019	CVPRF	\$220,000	\$0	\$220,000

Total Cost: \$440,000

Internal Agency Resources Table

Fiscal Year 2018

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
<i>Monitoring</i>								
Agreement	TBD	\$220,000	1.00	0.00	\$220,000	FWS	CVPRF	NA

Fiscal Year 2019

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
<i>Monitoring</i>								
Agreement	TBD	\$220,000	1.00	0.00	\$220,000	FWS	CVPRF	NA

Sturgeon Population Dynamics and Demographics Evaluation

This research evaluates the population demographics and dynamics of White Sturgeon, develops an age-structured population model, evaluates different management and habitat restoration alternatives, and projects a realistic timeline for achieving doubling.

DCN: AFRP2132

Classification: Research, Reconnaissance

Location: 38.12437, -121.24662, Central Valley Wide

Funding Years: 2018 - 2021

Benefits Start Year: 2019

Priority: SIT Priority: Green Sturgeon – 1 Adaptively manage flows, habitats, and/or temperature to increase juvenile recruitment

Partners: CDFW, USGS

Related Programs: Interagency Ecological Program

Authority

Provision	Percentage	Comment
3406 (b)(15) Comprehensive Assessment and Monitoring Program	100.0%	Both White and Green Sturgeons are included as anadromous species under CVPIA, with unique doubling goal targets and actions/evaluations in the Final Restoration Plan. However, limited resources have resulted in a highly limited understanding of the status of these populations and how we might recover them or manage their habitats. Beginning to understand some of the structure of these populations and how they are impacted by current management and the environment is needed to inform any future work that CVPIA and our partners may do with these fish.

Metrics

Name	Value	Units	Comment
Doubling progress evaluation	1	number of reports	

Deliverables

Date	Title
Dec. 2017	Management implications annual report
Dec. 2018	Management implications report

Narrative

White Sturgeon are an anadromous fish species "identified for restoration in the CVPIA" (Final Restoration Plan 2001). Accordingly, a doubling goal has been established, and the Final Restoration Plan for the Anadromous Fish Restoration Program includes six stated general objectives that need to be met to achieve the program goal. Two of those general objectives support the need for this project: collect fish population, health, and habitat data to facilitate evaluation of restoration actions; integrate habitat restoration efforts with harvest and hatchery management.

Information on the population demographics and dynamics of White Sturgeon is highly limited currently. This research will identify critical periods in the life history of these fish and provide an understanding to evaluate different management and habitat restoration alternatives by providing managers with current, system-specific data on White Sturgeon population demographics and dynamics in the Central Valley of California that should lead to achieving the doubling goal. Specifically, we will use data on the population demographics (e.g., age at maturity, sex ratio, spawning frequency) and dynamics (e.g., growth, mortality) to develop an age-structured population model. Research leading to an understanding of the complexities of White Sturgeon ecology is essential to achieve the doubling goal. The model will identify critical periods in the life history of White Sturgeon in the system and serve as a platform to evaluate different management and habitat restoration alternatives that should lead to achieving the doubling goal, as well as projecting a realistic timeline. This project will also result in scientifically defensible DSM model parameter estimates.

Data Management

Data and resulting reports will be archived at the Lodi FWO.

Risks

Risk	Likelihood	Impact
Permitting needed to conduct new research, if needed. Existing data is likely sufficient, so this is low risk, low impact.	1	1

Cost Estimate

Year	Fund	Total	BOR	FWS
2018	CVPRF	\$121,900	\$0	\$121,900
2020	CVPRF	\$121,900	\$0	\$121,900

Total Cost: \$243,800

Internal Agency Resources Table

2018

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
<i>Research</i>								
Agreement	Graduate student project	\$115,000	1.00	0.06	\$121,900	FWS	CVPRF	Funding graduate student project; year 1 of 2.

2020

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
<i>Research</i>								
Agreement	Graduate student project	\$115,000	1.00	0.06	\$121,900	FWS	CVPRF	Funding graduate student project; year 2 of 2. No funding received in 2017.

Battle Creek Winter-Run Chinook Re-Introduction and Battle Creek Coleman weir passage project

Design and construction of the infrastructure (monitoring, trapping, holding, and sampling) for the Battle Creek (BC) winter-run “jump-start” re-intro

DCN: AFRP2100

Classification: Improvement, Fish Passage

Location: 40.4007, -122.1449, Battle Creek

Funding Years: 2020 - 2021

Benefits Start Year: 2016

Priority: SIT Priority: Steelhead – 2 Remove barriers to passage on Battle Creek

Partners: CDFW, Battle Creek Working Group, NMFS, BOR Technical Service Center, Denver, PG&E, USBR

Related Programs: NMFS-RPAs, CDFW, NMFS-RP

Authority

Provision	Percentage	Comment
(b)(1) AFRP	100.0%	

Metrics

Name	Value	Units	Comment
Adult passage	15200	number of fish	BCRP goals for adult salmonid (WCS, SCS, LFCS, STT) escapement into the restoration area.
Construction Design Drawings	1	completion	Project will result in construction design drawings to provide WCS passage at Coleman weir and facilities to support Battle Creek WCS re-introduction (trapping, sampling, and holding).
Natural Origin Adult Salmon Broodstock	450	Number of fish	Estimated number of natural origin returning adult salmon to support restoration efforts

Deliverables

Date	Title
Jul. 2016	Alternative Analysis Complete
Dec. 2018	Complete Construction Designs
Dec. 2019	Permits Acquired
Sep. 2020	Phase 1 Construction Completed
Sep. 2021	Phase 2 Construction Completed
Sep. 2022	Phase 3 Construction Completed

Narrative

Background: The Battle Creek Salmon and Steelhead Restoration Project (BCRP) will re-open over 48 stream miles to salmon and steelhead when completed. Battle Creek sustains small populations of natural Spring-run Chinook salmon and Central Valley (CV) Steelhead, and historically sustained a Winter run Chinook. Reintroduction of Winter-run Chinook to Battle Creek is a priority action of the NMFS recovery plan and one of the BCRP restoration goals. A Battle Creek winter-run Chinook reintroduction plan was completed by a multi-agency team in 2016 and a Winter run Chinook jumpstart program was initiated with the release of over 200,000 smolts in March 2018.

Battle Creek is a unique upper Sacramento tributary in that it is the only Sacramento River tributary below Keswick dam that is spring fed and could support strong, self-sustaining populations of Winter and Spring-run Chinook salmon and Central Valley steelhead, as well as fall run and late-fall run, once it is fully restored. Full restoration would require completion of the ongoing BCRP as well as 1) removal of natural barriers above the BCRP area in the north fork and 2) volitional passage at Coleman weir below the BCRP. The BCRP includes removal (e.g. Wildcat Dam) and remediation (e.g. construction of fish ladders and fish screening diversions) of fish passage barriers, as well as elimination of transbasin water transfer from North Fork BC into South Fork BC (a necessary piece to establishing a self-sustaining run of Winter-run Chinook salmon in North Fork BC). This charter aims at providing volitional passage at Coleman weir.

Need: (1) Coleman weir is located at river mile 5.97 on Battle Creek. Currently, there is not adequate infrastructure at Coleman weir to provide adequate (volitional) adult salmonid passage during 6 months of the year (while CNFH is collecting broodstock). During these 6 mo., access to and above the 48 miles of restored stream habitat is blocked at the Coleman weir and delays all natural migrating adult chinook and steelhead. (2) Based on the Battle Creek winter-run chinook reintroduction plan, returning adult winter-run, Chinook will need to be monitored, trapped, sampled and held annually during Phase I and II of the plan (5-25 years). Currently, there is no infrastructure available to carry out Phase I and II.

Project goals: The project will complete the permitting and construction to (1) provide volitional passage to upper Battle Creek at Coleman weir for returning winter-run Chinook, spring-run Chinook, Fall and late-fall Chinook and Central Valley steelhead spawners, and to (2) monitor, trap, collect samples, and hold winter-run Chinook Salmon.

Project phases and status: The project was initiated in 2014, after a team of FWS biologists completed an assessment of facilities in the Pacific Northwest, and is divided into three phases: I. Analysis and Feasibility phase; II. Design phase; and III. Construction Phase.

Phase I - Engineering analysis and Feasibility Study (123,000 USFWS): This portion of the project was conducted by McMillen and Jacobs Associates (under contract) and a Project Management Team composed of CDFW, NMFS, FWS, BOR, and BOR TSC engineers and biologists experts, and was completed on July 2016 (McMillen Jacobs Associates, July 2016 Final Report: "Coleman National Fish Hatchery Trapping and Sorting Facility Alternatives Analysis").

Phase II - Construction Design (\$695,000): This portion of the project was funded by CVPIA program (58% cost share) and the FWS (42%). Stantec was selected as the contractor in July 2017, and the contract was awarded December 2017. The design (Phase II) is expected to be completed by March 2019.

Phase III - Construction Phase: This portion of the project remains un-funded and estimated construction cost is \$8.6 million (FY2018 dollars). Because of financial constraints, we are directing the construction design contractor to assume three construction phases for project implementation, which results in an \$0.8

million increase in overall project construction cost (5% annual inflation rate and 20% contingency cost are included in all estimates). Construction phases for the full project build-out are: (1) Construction Phase 1 (FY2019): \$3.0M to secure contract for permitting and construction; (2) Construction Phase 2 (FY2020): \$2.7M for construction; and (3) Construction Phase 3 (FY2021): \$3.9M for construction. We are soliciting construction funds to implement the full build-out of Phase 1 of project construction (\$3.0 M), groundbreaking in FY2019-20.

The proposed facility will accomplish a number of critical functions in support of wild fish recovery efforts (i.e., provide volitional access to Battle Creek Restoration Project area and provide ability to monitor and sample natural origin migrating adult salmonids). The facilities are needed to support the BC winter run “jump-start” reintroduction initiated in March-April 2018 (adult holding; monitoring; sampling facilities), implement the full BC Winter run CS reintroduction plan. The facilities will provide year-round volitional passage above Coleman weir for migrating natural origin salmonids as well as native non-salmonid fish year-round.

Data Management

Final construction design drawings will be kept in electronic format USFWS Engineering (Portland OR) and the USBOR Technical Science Center (Denver CO). A hard copy will be kept at CNFH, and additional hard copies will be made available upon request. Metadata associated with developing construction design (meeting notes; requirements; reports, etc.) will be kept by USFWS in electronic format the Red Bluff FWO, Regional Office in Sacramento or CNFH.

Final permits will be stored on a computer hard drive and backed up on an agency server. Copies will be made available to AFRP.

There will be tech team meetings with the PMT and the contractor through the entire project, however, involvement will vary based on the activity (permitting and implementation). A contracting officer with an engineering background will be on-site during construction to ensure that the design plans are followed.

Risks

Risk	Likelihood	Impact
Funding might not be available for the project.	2	3
BC WCS Reintroduction may be delayed	2	3
Recovery of BCRP target fish may be delayed	2	2

Cost Estimate

Year	Fund	Total	BOR	FWS
2020	CVPRF	\$1,000,000	\$0	\$1,000,000
2021	CVPRF	\$2,000,000	\$0	\$2,000,000

Total Cost: \$3,000,000

Internal Agency Resources Table

2020

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
<i>Construction</i>								
Agreement	Construction Contract	\$1,000,000	1.00	0.00	\$1,000,000	FWS	CVPRF	

2021

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
<i>Construction</i>								
Agreement	Construction Contract	\$2,000,000	1.00	0.00	\$2,000,000	FWS	CVPRF	

Identifying and Reducing Impacts of Riparian Water Diversions

Development of a model that ranks lower Mokelumne River (LMR) diversions that warrant screening or modifications and identifies the target species at each location and the corresponding type of screening or modifications needed, resulting in the modification or screening of the three highest priority LMR diversions.

DCN: AFRP2101
 Classification: Improvement, Diversion Screening
 Location: Mokelumne River
 Funding Years: 2019 - 2021
 Benefits Start Year: 2019
 Priority: SIT Support
 Partners: EBMUD
 Related Programs: CDFW

Authority

Provision	Percentage	Comment
(b)(1) AFRP	100.0%	Project will identify and begin remediation of high priority diversion screening projects on a non-CVP river.

Metrics

Name	Value	Units	Comment
Screened Diversions	3	number screened	The three highest priority LMR diversions (having landowner support) will be modified or screened with appropriate materials.
Technical Report re: Lower Mokelumne Diversions and Prioritization	1	number of reports	One technical report will be produced that describes the model development and output including objectives, methods, and results.
Number of diversions identified and ranked by model	76	N/A	As of 2012, 76 water diversions exist on the LMR from Camanche Dam (rkm 103) to the town of Thornton (rkm 46, approximate end of LMR tidal influence). The model will quantify how many of these diversions reduce juvenile anadromous fish populations and rank them according to their estimated impact.

Deliverables

Date	Title
Sep. 2019	Finalized Model and Technical Report
Sep. 2021	Complete diversion screening or modification of 3 high priority sites

Narrative

Juvenile anadromous fishes may encounter up to 76 water diversions during their outmigration from the uppermost reaches of the LMR (rkm 90-103) to the tidally influenced LMR (rkm 46) (EBMUD, unpublished data). In addition, native fishes exhibiting non-migration-related movement may encounter a subset of these diversions in the LMR. Four of these diversions are operated by local irrigation districts, including a large gravity-fed canal managed by Woodbridge Irrigation District. The remaining diversions consist of small surface water pumps ranging from 3 to 16 inches in diameter. The majority of these pumps exist in the upper reaches of the LMR, above Lodi Lake (rkm 62), and many lack screens to prevent losses of fish. Although riparian water users may operate any time of the year, the highest volume of water is diverted from April through September. Juvenile outmigration and juvenile fish community data on the LMR demonstrate overlapping time frames between rearing, emigration, and the operation of riparian water diversions (Workman 2003; Merz and Saldate 2004; Bilski et al. 2010). However, variation in pump size, infrastructure, configuration, diversion timing, and location make it difficult to identify which diversions are most likely to have adverse impacts to native anadromous fishes on the LMR.

The goal of this project is to analyze recent and historic data from riparian diversions, hydraulic mapping, salmonid redd emergence timing, juvenile outmigration monitoring, and juvenile fish community surveys to identify and rank water diversions that may reduce native anadromous fish populations on the LMR. The study will also identify which species and life stages are the most vulnerable at each location as well as time frames when species are the most vulnerable. Focal species and life stages will include fall-run Chinook salmon fry and smolts, steelhead fry, parr, and smolts, and Pacific lamprey ammocoetes and juveniles. Once sites are ranked and prioritized, the top three locations will be identified for modifications and/or screening.

For purposes of testing the CVPIA DSMs, completion of this charter is expected to reduce losses of native anadromous juvenile fish (Chinook, steelhead, and Lamprey) directly due to entrainment by as much as 3-5%.

Data Management

1. Objective specific monitoring will assess the efficacy of each diversion modification with respect to juvenile fish losses and/or entrainment. Monitoring will be performed before and after each modification takes place.
2. Long-Term Trend monitoring (LTT) will continue on the lower Mokelumne River. Two rotary screw traps and one bypass smolt trap are operated by EBMUD on the LMR each season from approximately mid-December through June or July (water year type dependent). Juvenile salmonid catch and abundance data have been collected since 1990. Incidental species, including Pacific Lamprey, are also enumerated on a daily basis when the traps are in service.

All data collected and analyses completed as part of this charter will be maintained and securely stored by EBMUD and the USFWS-Lodi Fish and Wildlife Office. This information will also be provided to CVPIA Fisheries.

Risks

Risk	Likelihood	Impact
Site access for monitoring/assessment. EBMUD maintains positive working relationships with landowners and irrigators who routinely allow access for annual monitoring.	1	1
Site access for implementation. In addition to EBMUD's current relationships related to monitoring and other access, AFRP and AFSP have been working with EBMUD to begin a diversion screening effort in the watershed the last 2 years	2	1

Cost Estimate

Year	Fund	Total	BOR	FWS	Local
2019	CVPRF	\$169,600	\$0	\$169,600	\$0
2020	CVPRF	\$169,600	\$0	\$169,600	\$0
2021	CVPRF	\$169,600	\$0	\$169,600	\$0
2018	Other	\$255,000	\$0	\$0	\$255,000

Total Cost: \$763,800

Internal Agency Resources Table

2018

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
<i>Environmental Compliance and Permitting</i>								
In-Kind Labor	EBMUD	\$150,000	1.00	0.00	\$150,000	Local	Other	EBMUD will complete environmental documentation and permitting for 3 sites to be improved under this charter. Will also pursue programmatic documents and permitting that would facilitate future efficiency.
<i>Management</i>								
In-Kind Labor	EBMUD	\$30,000	1.00	0.00	\$30,000	Local	Other	EBMUD will provide general project oversight and management for 3 implementation projects to be completed under this charter.
<i>Monitoring</i>								
Direct Contribution	EBMUD	\$75,000	1.00	0.00	\$75,000	Local	Other	EBMUD will provide \$25,000/project for pre-project and post-project fisheries monitoring. Funding will include fish tags, fish traps, cameras, other monitoring equipment, and labor.

2019

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
<i>Implementation</i>								
Agreement	Grant or cooperative agreement	\$160,000	1.00	0.06	\$169,600	FWS	CVPRF	Financial assistance agreement to complete implementation of diversion modification/screening. Assumes standard designs will be used requiring only minimal site-specific design work.

2020

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
<i>Implementation</i>								
Agreement	Grant or cooperative agreement	\$160,000	1.00	0.06	\$169,600	FWS	CVPRF	Financial assistance agreement to complete implementation of diversion modification/screening. Assumes standard designs will be used requiring only minimal site-specific design work.

2021

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
<i>Implementation</i>								
Agreement	Grant or cooperative agreement	\$160,000	1.00	0.06	\$169,600	FWS	CVPRF	Financial assistance agreement to complete implementation of diversion modification/screening. Assumes standard designs will be used requiring only minimal site-specific design work.

River Lighting Impacts

Implementation and Management of the River Lighting Impacts Project

DCN:	AFRP2102
Classification:	Improvement, Other Habitat Restoration
Location:	Sacramento River, Butte Creek, Feather River, Central Valley Wide
Funding Years:	2019
Benefits Start Year:	2019
Priority:	SIT Priority: Fall Chinook – 4 Adaptively manage reduction/imp. predator contact points
Partners:	Golden Gate Salmon Association, NMFS, TSC, CDFW, DWR

Authority

Provision	Percentage	Comment
(b)(1) AFRP	100.0%	

Metrics

Name	Value	Units	Comment
Public outreach/awareness	10	N/A	
Improvement of DSM model	0	N/A	
Quantification of impacts of predatory points of contact on salmonids	0	N/A	
Quantification of predatory points of contact for salmonids	10	N/A	
Case studies	10	N/A	
Consensus of agencies on river lighting impacts/mitigation strategies	10	N/A	

Deliverables

Date	Title
Jul. 2018	Feather River and Butte Creek Inventory
Sep. 2018	Administrative Agency Memo
Sep. 2018	Case Studies
Aug. 2019	Outreach Summary Document -FY19

Narrative

This action consists of creating mitigation and monitoring activities associated with potential predatory points of contact at river lighting structures along the Sacramento River and select upper tributaries under

the Anadromous Fish Restoration Program (AFRP). The action builds upon activities undertaken by the FY17 Assess Impacts of River Structure Lighting (AIRSL) Project including: (1) inventory and subsequent data of river lighting structures from Keswick to Freeport on the Sacramento River; (2) literature review by Reclamation’s Technical Service Center (TSC) concerning river lighting impacts on salmonid predation.

Data Management

Information resulting from activities funded under this charter, including all reports, will be permanently housed at BOR’s Mid-Pacific Regional Office in Sacramento. Inventory data will be collected on previously designed and accepted formats; resulting data will be transcribed into kmz format, excel format, and format compatible with Reclamations GIS interface.

Risks

No Data.

Cost Estimate

Year	Fund	Total	BOR	FWS
2019	CVPRF	\$109,000	\$109,000	\$0

Total Cost: \$109,000

Internal Agency Resources Table

2019

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
<i>Implementation</i>								
Agreement	New contract #	\$109,000	1.00	0.00	\$109,000	BOR	CVPRF	

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

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, Reconnaissance
 Location: Sutter Flood Control Bypass, Butte Creek
 Funding Years: 2019 - 2023
 Benefits Start Year: 2019
 Priority: SIT Support
 Partners: Metropolitan Water District, NMFS, UC-Davis, DWR, Golden Gate Salmon Association
 Related Programs: AFRP, NMFS-RP

Authority

Provision	Percentage	Comment
(b)(1) AFRP	95.0%	DWR will Provide In-kind labor to about 5%

Metrics

Name	Value	Units	Comment
Evaluation of Fish Growth	1	percentage of fish	Chinook will be evaluated for enhanced fish condition.
Evaluation of Survival	1	percentage of fish	Tagged Fish will be evaluated for percentage of survival

Deliverables

Date	Title
Dec. 2020	Annual Report
Dec. 2021	Annual Report
Dec. 2022	Final Report

Narrative

To provide management recommendations that will help enhance the abundance of Chinook salmon populations in the Central Valley, it is crucial first to have a better understanding of what mechanisms and locations create high-quality habitat for juvenile salmonids. We propose to address the following questions:

1. How does the hydrology of Lower Butte Creek and the Sutter Bypass benefit juvenile salmonids?

Preliminary results from a salmon growth and food web pilot study, conducted by UC Davis during winter 2018 (study funded by DWR and the State Water Contractors Association), found that hydrological conditions in the lower Butte Creek watershed varied widely during the course of the experiment. The authors also identified flow conditions that allowed the inundation of lower Sutter Bypass floodplain habitat, potentially providing additional floodplain habitat to salmon juveniles from the Sacramento and Feather Rivers without weir overtopping. To answer question 1) and complement partial information gathered from the 2018 pilot study, we propose to investigate the following points:

- Habitat capacity during low flow and flooding events
- Habitat mapping
- Flooding frequency and flow evaluation assessment.
- Gage installation along lower Butte Creek watershed and Sutter Bypass.
- Water demand evaluation during irrigation season (primarily important for migrating adult Butte Creek spring-run Chinook salmon.)

2. What are the growth benefit for juvenile salmonids rearing in Butte Creek and the Sutter Bypass?

Floodplain rearing of juvenile salmon in the Yolo Bypass has been shown to enhance growth rates of juveniles compared to fish in the Sacramento River (Sommer et al. 2001, 2005, Katz et al. 2017). The 2018 cage growth pilot study allowed researchers to investigate the relative performance of juvenile Chinook rearing at different locations in the Sacramento River, the lower Feather River, and the Sutter Bypass. Preliminary results show that caged fish growth rates vary with location and that 2018 Sutter Bypass growth rate is much lower than the rates reported by Ted Sommer and collaborators for the Yolo Bypass. Therefore, it is crucial to identify how growth benefits in the Sutter Bypass vary with water year type, different hydrological conditions, habitat types, and whether floodplain food web production and growth performance are similar in the Sutter and the Yolo Bypasses. The pilot year provided researchers with insight into flow dynamics of the Sutter Bypass, and appropriate adjustments will be implemented in following years to maximize information collection.

- A continuation of the 2018 caged juvenile experiment is proposed to estimate and compare growth rate at different sites. Feather River Hatchery fry will be placed in cages in a variety of habitats and locations. Each fish will be PIT tagged to estimate individual growth. At the end of the experiment, fish will be euthanized, and gut and muscle tissue samples will be collected for isotope analysis to assess incorporation of various food resources as well as identifying rearing locations.
- Food web sampling will be performed at each site during the growth experiment and will entail sampling for water quality, chlorophyll-a, and zooplankton.

3. What runs of Chinook salmon utilize the bypass?

Fish monitoring during weir overtopping could help identifying how the various timing of flooding of flood events determines which populations of Chinook salmon are able to access the floodplain.

Otoliths from the wild juvenile salmon will also be collected and analyzed to evaluate growth, movement patterns, and stream/hatchery of origin. In addition, this will allow to compare growth rates of caged versus wild fish.

Data Management

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

Risks

Risk	Likelihood	Impact
Impacts to wild spring Chinook	2	1

Cost Estimate

Year	Fund	Total	BOR	FWS
2019	CVPRF	\$387,551	\$0	\$387,551
2020	CVPRF	\$388,169	\$0	\$388,169
2021	CVPRF	\$409,320	\$0	\$409,320

Total Cost: \$1,185,040

Internal Agency Resources Table

2019

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
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	PIT Tagging and Trapping
Labor	Travel	\$3,000	1.00	0.00	\$3,000	FWS	CVPRF	Travel for Meetings
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 and Otolith Analysis

2020

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
Management								
Labor	Labor USCS	\$142,812	1.00	0.00	\$142,812	FWS	CVPRF	PIT Tagging and Trapping
Labor	Overhead CESU	\$60,600	1.00	0.00	\$60,600	FWS	CVPRF	Overhead @18.5%
Labor	Labor USD	\$155,057	1.00	0.00	\$155,057	FWS	CVPRF	Growth Study
Labor	Travel	\$3,000	1.00	0.00	\$3,000	FWS	CVPRF	Travel for meetings
Research								
Agreement	Data Analysis	\$20,000	1.00	0.00	\$20,000	FWS	CVPRF	Genetic and Otolith Analysis
Equipment or Materials	Juvenile Rearing Cages and PIT supplies	\$6,700	1.00	0.00	\$6,700	FWS	CVPRF	Juvenile Rearing Cages and PIT supplies

2021

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
Management								
Labor	Labor UCD	\$167,117	1.00	0.00	\$167,117	FWS	CVPRF	Growth Study
Labor	Overhead CESU	\$63,902	1.00	0.00	\$63,902	FWS	CVPRF	Overhead @18.5%
Labor	Travel	\$3,000	1.00	0.00	\$3,000	FWS	CVPRF	Travel for Acoustic Tagging
Labor	Labor UCSC	\$148,601	1.00	0.00	\$148,601	FWS	CVPRF	Acoustic Tagging Labor includes staff from UCD and NOAA
Research								
Agreement	Data Analysis	\$20,000	1.00	0.00	\$20,000	FWS	CVPRF	Genetic and Otolith Analysis
Equipment or Materials	Juvenile Rearing Cages and PIT supplies	\$6,700	1.00	0.00	\$6,700	FWS	CVPRF	Juvenile Rearing Cages and PIT supplies

Feather River Sunset Pumps Sturgeon and Salmon Passage

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

DCN: AFRP2104

Classification: Improvement, Fish Passage

Location: Feather River

Funding Years: 2019 - 2022

Benefits Start Year: 2019

Priority: SIT Priority: Fall Chinook – 2 Yuba River, Improve/increase spawning and juvenile rearing habitat; Spring Chinook – 5 Yuba River, Increase juvenile rearing habitat

Partners: CDFW, CDWR, NMFS, Sutter Extension Water District

Related Programs: CDFW, CDWR

Authority

Provision	Percentage	Comment
(b)(1) AFRP	100.0%	\$2.75M over 5 or more years includes planning, design, permitting, and initial implementation and monitoring.

Metrics

Name	Value	Units	Comment
Habitat	28	miles	Access to this habitat will be increased.
Barrier Removal	1	number of improvements	One barrier will be removed.
Green Sturgeon	1	number of fish	Actually number of eggs. Large values will not save. See explanation in narrative.
Chinook Salmon	1	number of fish	Actually number of eggs. Large values will not save. See explanation in narrative.

Deliverables

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

Narrative

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 outmigrating juvenile Chinook salmon and steelhead. This multi-year project ultimately 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 removal of Sunset Pumps is specifically identified as a FY2018 Core Team priority for both spring-run Chinook salmon and green sturgeon. This action would benefit these two listed species, contributing to their Central Valley doubling goals, as well as other migratory fishes. 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.'

Explanation of fish population metrics:

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.

Data Management

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.

CDWR has provided \$180K for project management including staff time and website services. SEWD has provided \$80K for initial designs. AFRP has provided \$20K for staff time and modeling. Future contributions from other sources totaling about \$18M are anticipated for full implementation.

Risks

Risk	Likelihood	Impact
Full implementation will cost about \$20M 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
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 Beth Campbell (USFWS), Steve Brumbaugh (CDWR), and Lynn Phillips (SEWD); and technical experts Mark Gard (USFWS), Colin Purdy (CDFW), Tracy McReynolds (CDFW), Mike Healey (CDFW), and Ruth Goodfield (NMFS).	1	1

Cost Estimate

Year	Fund	Total	BOR	FWS	DWR
2019	CVPRF	\$1,180,800	\$0	\$1,180,800	\$0
2020	CVPRF	\$957,200	\$0	\$957,200	\$0
2021	CVPRF	\$957,200	\$0	\$957,200	\$0
2019	SC	\$18,000,000	\$0	\$0	\$18,000,000
2019	SIK	\$95,000	\$0	\$0	\$95,000

Year	Fund	Total	BOR	FWS	DWR
2020	SIK	\$95,000	\$0	\$0	\$95,000
2021	SIK	\$95,000	\$0	\$0	\$95,000

Total Cost: \$21,380,200

Internal Agency Resources Table

2019

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
<i>Design</i>								
Agreement	New agreement, if funded, Agreement # TBD	\$1,053,600	1.00	0.00	\$1,053,600	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.
Agreement	Contract or Agreement	\$18,000,000	1.00	0.00	\$18,000,000	DWR	SC	The activities the State would be funding are canal lining, automated gates and weirs, and Rio Bonita Road bottleneck replacement. Funding would be \$18,000,000 in State cash; years would be 2019-2023. The activities the State would be funding are canal lining, automated gates and weirs, and Rio Bonita Road bottleneck replacement. Funding would be \$18,000,000 in State cash; years would be 2019-2023.
<i>Management</i>								
Agreement	New agreement, if funded, Agreement # TBD	\$20,000	1.00	0.06	\$21,200	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.
<i>Monitoring</i>								

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
Agreement	New agreement, if funded, Agreement # TBD	\$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.

2020

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
<i>Environmental Compliance and Permitting</i>								
Agreement	New agreement, if funded, Agreement # TBD	\$830,000	1.00	0.00	\$830,000	FWS	CVPRF	Environmental compliance (CEQA, NEPA, etc.) and permitting for both removal of the Sunset Pumps facilities from the Feather River and improvements to the Sutter-Butte Main Canal.
<i>Management</i>								
Agreement	New agreement, if funded, Agreement # TBD	\$20,000	1.00	0.06	\$21,200	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.
<i>Monitoring</i>								
Agreement	New agreement, if funded, Agreement # TBD	\$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.

2021

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
Construction								
Agreement	New agreement, if funded, Agreement # TBD	\$830,000	1.00	0.00	\$830,000	FWS	CVPRF	Start of initial modifications to Sutter-Butte Main Canal.
Management								
Agreement	New agreement, if funded, Agreement # TBD	\$20,000	1.00	0.06	\$21,200	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.
Monitoring								
Agreement	New agreement, if funded, Agreement # TBD	\$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.

North Fork Battle Creek Natural Barrier Removal

North Fork Battle Creek natural barrier removal permitting and implementation

DCN: AFRP2105
 Classification: Improvement, Fish Passage
 Location: Battle Creek
 Funding Years: 2019 - 2020
 Benefits Start Year: 2019
 Priority: SIT Priority: Steelhead – 2 Remove barriers to passage on Battle Creek
 Partners: NMFS, Battle Creek Working Group, CDFW, PG&E, USBR
 Related Programs: NMFS-RP, NMFS-RPAs, CALFED, California Drought Response

Authority

Provision	Percentage	Comment
(b)(1) AFRP	100.0%	

Metrics

Name	Value	Units	Comment
Fish Passage	2	number of improvements	Improvement of passage at the two barriers are critical to the restoration and recovery of listed salmonids
Fish Passage	100	percentage of fish	Currently, these barriers are blocking 100% of the salmonids that reach the further most downstream site. Upon modification (and in combination with the Battle Creek Salmon and Steelhead Restoration Project), approximately 100% of the fish will be able to access habitat upstream
b1 actions	1	number of actions	High Priority Action identified in Final Restoration Plan
River miles	8	miles	This is the number of miles between the upstream barrier and the Restoration Project boundary on North Fork Battle Creek

Deliverables

Date	Title
Dec. 2016	Fish passage evaluation report
Dec. 2018	Permits acquired
Oct. 2020	Barriers Removed

Narrative

Large boulders in North Fork Battle Creek (NFBC) form natural barriers that impede upstream passage of salmon and steelhead. Through the Battle Creek Salmon and Steelhead Restoration Project (BCRP), efforts have been made to improve fish passage at several hydropower diversion dams located in NFBC (i.e. removal of Wildcat dam [river mile (rm) 2.48] and construction of new fish ladders and screens at Eagle Canyon dam [rm 5.23] and North Battle Creek Feeder dam [rm 9.42]), however fish are unable to migrate upstream as envisioned in the development of the BCRP. The Adaptive Management Plan for the BCRP (RPA Action I.2.6) calls for the Resource Agencies to provide funding to monitor, evaluate, and physically modify natural barriers. Of particular concern are barriers located in NFBC, one downstream of Eagle Canyon Dam (rm 5.06), and the other located upstream of Eagle Canyon Dam (rm 5.41). This action would allow winter Chinook access to the area that was designated as the highest quality based on the Restoration Plan. Full life-cycle modeling conducted for the Coleman National Fish Hatchery Adaptive Management Plan found that improving passage at the natural barriers was essential to the success of winter Chinook reintroduction in Battle Creek.

Improving passage at natural barriers in Battle Creek is qualified as a steelhead priority for FY18 and FY19 by the CVPIA SIT and a winter-run and spring-run Chinook priority by the CVPIA Core Team. Priorities for Battle Creek include: (1) remove barriers to passage on Battle Creek; (2) improving fish passage, flow conditions, and water temperatures to provide suitable winter-run habitat in NFBC; (3) advancing efforts to reintroduce winter-run to NFBC; and, (4) improve adult fish passage on Battle Creek. This action works towards meeting all these priorities. Drought relief funding received by the Department of Fish and Wildlife in 2015 funded the completion of passage evaluations and 100% designs to modify/remove the barriers and improve fish passage.

The project would include the completion of the environmental permitting and implementation. Currently, Tehama Environmental Solutions, INC. has been contracted to complete the environmental documents and permitting. All required surveys are being completed, and the permitting and compliance will be completed in December 2018, allowing us to begin the contract process and prepare for implementation in FY19. The quantitative target for the action is to provide 100% passage at the natural barriers as determined by telemetry studies planned to occur after the BCRP is complete. This project would have both Central Valley-wide and watershed level effects. This project will provide another locale for winter Chinook spawning, which has been highlighted as a critical action under the National Marine Fisheries Service Central Valley Salmonid Recovery Plan, and will provide access to an additional 4.36 miles of high quality habitat for winter-run and spring-run Chinook and steelhead, with an additional 3.64 miles of moderate quality habitat for steelhead. This effort, in combination with the BCRP, is essential in recovery of the listed salmonids in the Central Valley. Completion of this project within in the given timeframe would allow for immediate passage for 95-100% of salmonids at these locations, and fish passage would improve once BCRP project flows are provided.

This action is designed to increase adult holding habitat and spawning habitat. This action would be implementing the best management action to increase fish passage into the upper portion of the watershed. Without completion of the project, restoration on Battle Creek will not be complete. This project is supported by all the stakeholders that participate in the Greater Battle Creek Working Group and is regarded as one of the top issues within the watershed. There is one concern with a landowner, who was not cooperative with CDFW. However, USFWS has had a good working relationship with this landowner, and there is a plan for consulting the landowner throughout the process.

STOS: There will be tech team meetings with the PMT and the contractor through the entire project, however, involvement will vary based on the activity (permitting and implementation). A contracting officer with an engineering background will be on-site during construction to ensure that the design plans

are followed. The objective is to provide reliable upstream fish passage at these locations. In combination with spawning surveys (determine if spawning occurred above barriers), a telemetry study will also be conducted to determine the effectiveness (% fish passage) of the project as discussed in the BCRP Adaptive Management Plan.

LTT: In conjunction with monitoring that will occur as described in the BCRP Adaptive Management Plan (adult and juvenile monitoring) there will also be monitoring associated with the reintroduction of winter Chinook. These monitoring efforts will provide data to determine whether fish passage was improved at these locations and if the conditions change over time.

Data Management

All data and associated project documents (permits and reports) will be stored on a computer hard drive and backed up on an agency server. Copies will be made available to AFRP.

Risks

Risk	Likelihood	Impact
Landowner may not permit access or permission to one barrier	2	2
Geologic uncertainties	1	2
Permitting may be delayed based on regulatory agencies priorities	2	2

Cost Estimate

Year	Fund	Total	BOR	FWS	DFW
2016	CVPRF	\$123,471	\$0	\$123,471	\$0
2017	CVPRF	\$106,000	\$0	\$106,000	\$0
2018	CVPRF	\$0	\$0	\$0	\$0
2019	CVPRF	\$1,563,511	\$0	\$1,563,511	\$0
2020	CVPRF	\$1,908,225	\$0	\$1,908,225	\$0
2016	SIK	\$900,000	\$0	\$0	\$900,000

Total Cost: \$4,601,207

Internal Agency Resources Table

2016

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
<i>Environmental Compliance and Permitting</i>								
Agreement	CDFW Drought Funding	\$900,000	1.00	0.00	\$900,000	DFW	SIK	Up to 900,000.00 of CDFW drought funding provided for Battle Creek is being used on this project to assess the existing situation and design restoration.
<i>Inventory/Reconnaissance</i>								
Labor	RBFWO staff - Fish biologists/technicians	\$246,844	0.41	0.22	\$123,471	FWS	CVPRF	This includes multiple staff from the Red Bluff Fish and Wildlife Office. Staff will implement a radiotelemetry study to evaluate fish passage alternatives at natural barriers in North Fork Battle Creek. Requires additional labor beyond what is currently funded via CVPIA admin for RBFWO staff.

2017

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
<i>Environmental Compliance and Permitting</i>								

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
Agreement	Contract for environmental compliance and permitting	\$100,000	1.00	0.06	\$106,000	FWS	CVPRF	Contract for environmental compliance and permitting

2018

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
Implementation								
Agreement	Contract for Fish Barrier removal	\$0	1.00	0.00	\$0	FWS	CVPRF	\$2,462,337 requested but not funded. Contract will implement fish passage improvements identified in 2015 CDFW contract for studies and use the 100% designs that were submitted. The implementation would occur over a two year period.

2019

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
Implementation								
Agreement	Contract for Fish Barrier removal	\$1,563,511	1.00	0.00	\$1,563,511	FWS	CVPRF	Contract will implement fish passage improvements identified in 2015 CDFW contract for studies and use the 100% designs that were submitted. The implementation would occur over a two year period.

2020

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
Implementation								
Agreement	Contract for Fish	\$1,908,225	1.00	0.00	\$1,908,225	FWS	CVPRF	Contract will implement fish passage improvements identified in 2015 CDFW

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
	Barrier removal							contract for studies and use the 100% designs that were submitted. The implementation would occur over a two year period.

Sacramento River Tisdale Weir sturgeon and salmonid passage

Reducing or eliminating opportunities for fish to be stranded in the stilling basin and throughout Tisdale bypass

DCN: AFRP2106

Classification: Improvement, Fish Passage

Location: Sacramento Lower Mainstem

Funding Years: 2019 - 2023

Benefits Start Year: 2019

Priority: SIT Priority: Fall Chinook – 4 Adaptively manage reduction/imp. predator contact points

Partners: FWS, NMFS, USBR, CDFW, CDWR

Related Programs: AFRP, CDFW

Authority

Provision	Percentage	Comment
(b)(1) AFRP	100.0%	\$3.31M over 5 or more years includes planning, design, permitting, and construction; CDWR \$7M over 2 years; CDFW \$40,000 for fish rescue

Metrics

Name	Value	Units	Comment
Habitat	4	miles	Improved access to the Sutter Bypass West Borrow and to the Sacramento River to eliminate adult and juvenile stranding of SCS, WCS, sturgeon, and lamprey.
Passage Barrier Improved	1	number of actions	

Deliverables

Date	Title
Sep. 2019	Feasibility Study
Sep. 2020	Designs and Permits
Sep. 2023	Final Report
Sep. 2022	Construction Progress Report

Narrative

Tisdale Weir overflowed multiple times each year from 1991-2005 except during 1994. Overflow events during those years were most common in January - March, but occurred as early as November and as late as June (ICF Jones & Stokes 2008). It is unlikely that upstream passage at the Tisdale Weir occurs during

most flood events as a result of the physical dimensions of the weir (11 feet high) and inadequate hydraulic conditions below and above the weir. Spring-run, Winter-run and fall-run Chinook salmon, green sturgeon, Central Valley steelhead and Sacramento splittail, have been found trapped in Tisdale Weir’s stilling basin following the flood recession. The method of entry into the weir’s stilling basin has not been verified. A likely scenario is confirmed by video footage showing an unidentified species being washed over the concrete overflow section from the Sacramento River. Another possible scenario is that fish swim upstream from the Sutter Bypass through the Tisdale Bypass and cannot pass the weir to return to the Sacramento River.

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.

The Tisdale Weir is identified as a FY19 Core Team priority for winter, spring and fall (continued FY17 NMFS and CDFW recommendations) Chinook salmon. Improving fish passage at Tisdale Weir would also improve the viability of the green sturgeon population. A FY18 Core Team 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. 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 Core Team 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.

This action would benefit these three listed species as well as other migratory fishes. 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

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 AFRP.

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	\$450,000	\$0	\$450,000	\$0	\$0
2020	CVPRF	\$1,060,000	\$0	\$1,060,000	\$0	\$0
2021	CVPRF	\$1,800,000	\$0	\$1,800,000	\$0	\$0
2019	SIK	\$2,140,000	\$0	\$0	\$2,100,000	\$40,000
2020	SIK	\$5,000,000	\$0	\$0	\$5,000,000	\$0

Total Cost: \$10,450,000

Internal Agency Resources Table

2019

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
<i>Implementation</i>								
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.
<i>Monitoring</i>								
In-Kind Labor	Monitoring and fish rescues	\$40,000	1.00	0.00	\$40,000	DFW	SIK	CDFW has contributed at least \$20K to date and will continue to contribute monitoring of fish presence and stranding at the site.
<i>Planning and Analysis</i>								
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

2020

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
<i>Design</i>								
Agreement	Design contract	\$265,000	1.00	0.00	\$265,000	FWS	CVPRF	
<i>Environmental Compliance and Permitting</i>								
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

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
Agreement	Environmental Compliance Documents and Permit Contracts	\$795,000	1.00	0.00	\$795,000	FWS	CVPRF	

2021

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
<i>Construction</i>								
Agreement	Construction contract	\$1,800,000	1.00	0.00	\$1,800,000	FWS	CVPRF	

Sutter Bypass Weir 1 Restoration

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

DCN: AFRP2107

Classification: Improvement, Fish Passage

Location: 39.03478 -121.7436, Butte Creek

Funding Years: 2019 - 2023

Benefits Start Year: 2019

Priority: SIT Priority: Fall Chinook – 2 Yuba River, Improve/increase spawning and juvenile rearing habitat; Spring Chinook – 5 Yuba River, Increase juvenile rearing habitat

Partners: FWS, NMFS, USBR, CDFW, DWR

Related Programs: NMFS-RPAs

Authority

Provision	Percentage	Comment
(b)(1) AFRP	100.0%	This site limits access to many upstream AFRP fish passage improvements in Butte Creek.

Metrics

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

Deliverables

Date	Title
Sep. 2019	Final Report Planning and Designs
Sep. 2020	Final Report Environmental Compliance and Permitting
Sep. 2023	Final Report

Narrative

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 all runs (fall, late-fall, winter, and spring) of Chinook salmon and Central Valley steelhead, is impeded by the last remaining historic weir and ladder structure at Weir 1, Sutter Bypass.

The Sutter Bypass, which is part of the Lower Butte Creek drainage system, is primarily a flood control facility designed in the early 1900s to alleviate excessive wintertime flood flows from Butte Creek, the Feather River, and the Sacramento River via the Tisdale Bypass, Colusa Weir, and Moulton Weir. Floodwaters are conveyed downstream to re-enter the Sacramento River near Verona, California.

Five weirs were installed in the early 1900s. These structures were designed to hold upstream water levels at specific elevations for upstream diversions for agriculture and other uses. The Lower Butte Creek-Sutter Bypass West Side Channel Project (SCH#2002032149) included the rehabilitation of fish ladders and fish screens approved by California Department of Fish and Wildlife and National Marine Fisheries Service at the East-West Weir, Weir No.5, Weir No. 3, Guisti Weir and Weir No. 1 to improve the passage of anadromous fish. An addendum to the MND/IS (2004) was issued when Restoration of both the Guisti and Weir No. 1 structures was abandoned when rerouting of water delivery was designed and completed for the Guisti Farm. The original Weir No. 1 fish ladder structure remains.

Since 1992, over \$50 million dollars has been spent on Butte Creek restoration projects. The Weir No.1 structure is the last structure to be restored, as part of the Lower Butte Creek Project. Rehabilitation of the Weir No. 1 site will improve adult and juvenile passage of anadromous fish species and in-stream water management. Restoration of this site is vital to maintaining viable and sustainable populations of anadromous fish. The need for rehabilitation at this site was affirmed when 45 adult SRCS carcasses were discovered downstream in 2012 and 2013. A dilapidated fish ladder and non-operable weir structure impeded fish passage during critically dry water years. This number could have potentially been higher due to not observing other carcasses. In addition, a delay in SRCS migration at Weir 1 could have potentially caused the fish to stray to other systems.

The project addresses AFRP Final Restoration Plan to; 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.

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 water temperatures as was the case in 2008, 2009, 2010, 2012 and 2013 where nearly 500 adult spring-run arrived in late June late and subsequently died prior to spawning.

Data Management

www.fws.gov/redbluff/afrp.html

Risks

Risk	Likelihood	Impact
restore fish passage	1	1

Cost Estimate

Year	Fund	Total	BOR	FWS
2019	CVPRF	\$350,000	\$0	\$350,000
2020	CVPRF	\$1,272,000	\$0	\$1,272,000

Total Cost: \$1,622,000

Internal Agency Resources Table

2019

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
<i>Environmental Compliance and Permitting</i>								
Agreement	Grant or cooperative agreement	\$350,000	1.00	0.00	\$350,000	FWS	CVPRF	Financial assistance agreement to complete compliance and permitting

2020

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
<i>Implementation</i>								
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.

Sacramento River Redd & Early Life History Monitoring

Continue monitoring redds and juvenile salmonids during the first few weeks of their life history.

DCN: AFRP2108

Classification: Performance Monitoring, Performance Monitoring

Location: Sacramento Upper Mainstem

Funding Years: 2019 - 2023

Benefits Start Year: 2019

Priority: SIT Priority: Winter Chinook – 2 Sacramento River below Red Bluff, increase juvenile rearing habitat; Fall Chinook – 1 Sacramento Mainstem below Bend Bridge, Improve/increase juvenile Chinook rearing habitat; SIT Support

Partners: Pacific States Marine Fisheries Commission, CDFW, FWS

Related Programs: EWP, NMFS-RP

Authority

Provision	Percentage	Comment
(b)(1) AFRP	100.0%	Implementation of habitat restoration projects will benefit juvenile salmonids following prior years of data collection.
(b)(2) Dedicated Yield	0.0%	The past work done with funds from b (1) and b (2) collected data related to flow management and its impact on juvenile salmonids.

Metrics

Name	Value	Units	Comment
Stream miles monitored	50	miles	
Juvenile rearing	10000	number of fish	This value is the Best Professional Judgment from some of the PMT.

Deliverables

Date	Title
Sep. 2019	Annual Report
Sep. 2020	Annual Report
Sep. 2021	Annual Report
Sep. 2022	Annual Report

Narrative

The purpose of this project is to continue to monitor dewatered redds and juvenile fish stranding and share the information with managers. Redd dewatering and stranding of early-life-stage emerging

juveniles can have significant impacts on a large portion of the annual production of salmon. The data on redd dewatering and juvenile stranding will continue to aid management of flow releases from Keswick Dam. Real-time monitoring of redd dewatering and stranding due to flow reductions is beneficial to managers to assist daily decision making based on actual conditions in the river. The timing of flow reductions can often be critical to the survival of large numbers of naturally spawned eggs or juveniles. Up-to-date information can provide fishery managers with the assurances they need to make decisions to mitigate flow changes if the data shows that the biological consequences will be significant.

In low water years, managers will continue to be provided with real-time monitoring updates of redd dewatering and stranding due to flow reduction to assist decision making based on actual conditions on the river. The timing of flow reductions can often be critical to the survival of large numbers of eggs or juveniles. Up-to-date information can provide fishery managers with the assurances they need to make decisions to mitigate flow changes if the data shows that the biological consequences will be significant. River flows are vitally important to the early life history (egg incubation to emergence from the gravel) of salmonids. After emergence from the redd, juvenile salmon can become stranded in shallow, isolated water and be exposed to poor environmental conditions as well as increased predation. For the eggs and juveniles to survive, they need water, of a suitable temperature, velocity and water quality, at all times.

During 2012-2017, the monitoring conducted by Pacific States Marine Fish Commission (PSMFC) provided valuable data to managers regarding the impacts of various flow scenarios in the Upper Sacramento River. Recently, in 2016, some mainstem rearing habitat was restored with projects completed under the b (13) program.

This study meets the intent of Action 2 for the Upper Mainstem Sacramento River as identified in the AFRP Final Restoration Plan. It is also a SIT priority.

Data Management

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 monitoring. Based on annual river and streamflow conditions, some work may be postponed until the following years.	2	1

Cost Estimate

Year	Fund	Total	BOR	FWS
2019	CVPRF	\$139,920	\$0	\$139,920
2020	CVPRF	\$139,920	\$0	\$139,920
2021	CVPRF	\$139,920	\$0	\$139,920
2022	CVPRF	\$139,920	\$0	\$139,920
2023	CVPRF	\$139,920	\$0	\$139,920

Total Cost: \$699,600

Internal Agency Resources Table

2019

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
<i>Monitoring</i>								
Agreement	Financial Assistance Agreement with PSMFC (Pacific States Marine	\$132,000	1.00	0.06	\$139,920	FWS	CVPRF	Continue agreement with PSMFC to monitor and assess water operation impacts and associated habitat condition/availability. Work is coordinated with CDFW Region 1.

2020

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
<i>Monitoring</i>								
Agreement	Financial Assistance Agreement with PSMFC (Pacific States Marine Fisheries Commission)	\$132,000	1.00	0.06	\$139,920	FWS	CVPRF	Continue agreement with PSMFC to monitor and assess water operation impacts and associated habitat condition/availability. Work is coordinated with CDFW Region 1.

2021

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
<i>Monitoring</i>								
Agreement	Financial Assistance Agreement with PSMFC (Pacific States Marine Fisheries Commission)	\$132,000	1.00	0.06	\$139,920	FWS	CVPRF	Continue agreement with PSMFC to monitor and assess water operation impacts and associated habitat condition/availability. Work is coordinated with CDFW Region 1.

2022

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
<i>Monitoring</i>								
Agreement	Financial Assistance Agreement with PSMFC (Pacific States Marine Fisheries Commission)	\$132,000	1.00	0.06	\$139,920	FWS	CVPRF	

2023

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
<i>Monitoring</i>								
Agreement	Financial Assistance Agreement with PSMFC (Pacific States Marine Fisheries Commission)	\$132,000	1.00	0.06	\$139,920	FWS	CVPRF	

American 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:	Performance Monitoring, Performance Monitoring
Location:	38.63556, -121.22610, American River
Funding Years:	2019 - 2023
Benefits Start Year:	2020
Priority:	SIT Priority: Fall Chinook – 5 American River, Improve/increase juvenile rearing habitat (floodplain); Winter Chinook – 3 Create/improve juvenile rearing habitat in non-natal tributaries
Partners:	Cramer Fish Sciences, Sacramento Water Forum, cbec, inc., CDFW
Related Programs:	CVPIA b13, CVPIA b2

Authority

Provision	Percentage	Comment
(b)(13) Gravel	33.0%	SDM model would support b13 decisions
(b)(2) Dedicated Yield	33.0%	SDM model would support b2 decisions
(b)(3) Instream Flows	34.0%	SDM model would support b3 decisions

Metrics

Name	Value	Units	Comment
Abundance of recruits produced by spawning adults in restored habitats	0	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	0	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	0	acres	Task 2: ESHE modeling. This task builds off of 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

Name	Value	Units	Comment
			Chinook Salmon. This task will estimate current juvenile rearing capacity, a DSM model information gap.
Abundance of juvenile salmonids	0	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	0	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

Date	Title
Dec. 2019	LAR SDM meeting (Task 1.1)
Dec. 2019	ESHE modeling final report (Task 2.1)
Dec. 2019	AFS symposium proceedings (6 manuscripts)(Task 3.2)
Jan. 2020	Year 3 otolith and genetic data report (Task 3.1)
Feb. 2020	AFS research symposium (Task 3.2)
Dec. 2021	Genetics and otolith data report
Dec. 2021	Juvenile rearing data report
Dec. 2021	Sediment budget report

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.
3. 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.

4. See Metrics and Deliverables sections.
5. 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
6. 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.
7. 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.
8. This charter will help fill key information gaps in current DSMs; refer to Metrics section for specifics.

9. 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

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	\$975,200	\$0	\$975,200	\$0
2020	CVPRF	\$180,200	\$0	\$180,200	\$0
2021	CVPRF	\$180,200	\$0	\$180,200	\$0
2019	Other	\$150,000	\$0	\$0	\$150,000

Total Cost: \$1,485,600

Internal Agency Resources Table

2019

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
<i>Monitoring</i>								
Agreement	Juvenile Rearing Study	\$120,000	1.00	0.06	\$127,200	FWS	CVPRF	Tagging and recapture efforts on the LAR.
<i>Planning and Analysis</i>								
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
<i>Research</i>								
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

2020

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
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

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
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.

Garden Highway MWC Fish Screen

Implementation Phase of an on-going AFSP fish screen project

DCN: AFSP2100

Classification: Improvement, Diversion Screening

Location: Feather River

Funding Years: 2019

Benefits Start Year: 2019

Priority: Core Team Priority

Partners: Garden Highway MWC, NMFS, CDFW, Family Water Alliance

Related Programs: AFRP, CDFW

Authority

Provision	Percentage	Comment
3406 (b)(19) Anadromous Fish Screen Program	100.0%	Authority number revised from (b)(21) to (b)(19) due to WIIN Act

Metrics

Name	Value	Units	Comment
Fish Screens	1	number screened	
Stream miles fully open	6	miles	Existing diversion is a partial barrier to fish migration on the Feather River.

Deliverables

Date	Title
Sep. 2019	Fish Screen Funding Agreement (mod. to add funding)
Jan. 2019	Begin Quarterly Construction Progress Reports
Apr. 2020	Fish Screen Operations and Maintenance Manual

Narrative

This represents the implementation phase of an on-going AFSP fish screen project to assist the State of California (CDFW) in screening a key priority unscreened diversion (100 cfs) on the Feather River in the Central Valley. As part of the California Water Action Plan, CDFW has published a list of priority unscreened diversions (2017) that includes the Garden Highway Mutual Water Company (GHMWC) Feather River diversion in Sutter County. The existing diversion is considered a priority for screening based on the 1) watershed location, 2) size of diversion (largest unscreened diversion on Feather River), and 3) type of diversion (major irrigation channel off of the river channel). Partial funding for this implementation project was provided by the AFSP using CVPIA Restoration Funds in FY17.

There is a current funding agreement between the Bureau of Reclamation (Reclamation) and the Family Water Alliance, Inc. (FWA) (R17AC00075) for \$1,027,835. In FY17, \$500,000 was obligated under this agreement. The federal contribution for project implementation has been matched by a State of California Natural Resources Agency Proposition 1 grant agreement for \$1,159,183.

In addition to the fish screen, a debris deflector/fish guidance structure will be installed at the opening of the intake channel. Project implementation includes finalization of the project design, environmental compliance and permitting, and the manufacture, installation, and monitoring of the fish screen system.

The project will provide important fishery benefits through screening and will be complementary to current efforts to restore fall- and spring-run Chinook salmon (*Oncorhynchus tshawytscha*), Central Valley steelhead (*Oncorhynchus mykiss*), green sturgeon (*Acipenser medirostris*) and other resident “at-risk” fish populations in California’s Central Valley. Spring-Run Chinook salmon, Central Valley steelhead and green sturgeon are listed by the State and/or Federal Endangered Species Acts as being in critical need of protection.

Project Management will be performed by FWA with oversight by the Anadromous Fish Screen Program (AFSP) and CDFW. CDFW is the lead agency for CEQA, and Reclamation is the federal lead agency for NEPA. GHMWC has provided an in-kind contribution to fund the preparation of an Initial Study/Mitigated Negative Declaration to meet CEQA compliance. All environmental compliance, permitting and design is estimated to be completed by December 2018, with fish screen installation between August-December 2019.

Data Management

Information resulting from activities funded by this charter, including all program reports, will be permanently housed at Reclamation's Mid-Pacific Regional Office in Sacramento, and USFWS's Pacific Southwest Regional Office in Sacramento.

Project monitoring will be identified and implemented consistent with the NEPA/CEQA and FESA/CESA requirements. Monitoring of the fish screen performance will be performed by the contractor for one year after construction. Periodic post-construction inspections of the fish screen will occur by NMFS and/or CDFW.

Risks

Risk	Likelihood	Impact
Screen projects require cost share match	1	1

Cost Estimate

Year	Fund	Total	BOR	FWS
2019	CVPRF	\$527,835	\$527,835	\$0

Total Cost: \$527,835

Internal Agency Resources Table

2019

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
<i>Construction</i>								
Agreement	Construction Funding	\$527,835	1.00	0.00	\$527,835	BOR	CVPRF	FY19 cost share funding towards project construction. The requested \$527,835 plus \$500,000 provided in FY17, results in a federal contribution of 45% (\$1,027,835) of the total estimated construction cost (\$2,294,161).

West Stanislaus Irrigation District Joint Use Intake Fish Screen

Implementation phase of an ongoing AFSP fish screen project to serve West Stanislaus Irrigation District & San Joaquin River National Wildlife Refuge

DCN: AFSP2101

Classification: Improvement, Diversion Screening

Location: 37.361800,-121.104104, San Joaquin Lower Mainstem

Funding Years: 2019 - 2021

Benefits Start Year: 2022

Priority: Core Team Priority

Partners: NMFS, SJRNWR, CDFW, CDWR

Related Programs: AFRP, CDFW

Authority

Provision	Percentage	Comment
3406 (b)(19) Anadromous Fish Screen Program	100.0%	Authority number revised from (b)(21) to (b)(19) due to WIIN Act

Metrics

Name	Value	Units	Comment
Fish Screens	1	number screened	
Stream miles fully open	5	miles	Existing diversion is a partial barrier to fish migration on the San Joaquin River

Deliverables

Date	Title
Sep. 2019	Fish Screen Funding Agreement
Jan. 2021	Begin Quarterly Construction Progress Reports
Apr. 2022	Fish Screen Operations and Maintenance Manual
Apr. 2022	Fish Screen Hydraulic Evaluation Report

Narrative

The West Stanislaus Irrigation District Joint Use Intake Fish Screen Project (Project) is an on-going AFSP project to screen a key priority unscreened diversion (347 cfs) on the San Joaquin River in the Central Valley.

The Project, currently in the implementation phase, will result in significant fishery benefits based on its key location along a major fish migration route on the San Joaquin River that includes fall-run Chinook

salmon, spring-run Chinook salmon, Central Valley steelhead, and white sturgeon. Significant agency and stakeholder involvement has occurred in development of the Project that optimizes fishery and ecological benefits while maintaining water supply reliability for WSID and the San Joaquin River National Wildlife Refuge (SJRNR).

The existing unscreened diversion at WSID is considered a fish screening priority based on the: 1) diversion location in the watershed, 2) percent of river discharge diverted, 3) timing of diversions (i.e., year-round), 4) type of diversion (major irrigation channel off of a river); 5) the irrigation channel width and fish exposure duration, and 6) expected high potential for entrainment or predation of fish entering the irrigation channel.

Project fishery benefits include:

- a) Eliminate entrainment of salmonids and minimizes entrainment of smaller, weaker-swimming fish into WSID's intake canal and internal water distribution system.
- b) Eliminate predation on juvenile salmonids in the WSID's intake canal.
- c) Protect and support the significant fishery restoration efforts and investments (including CVPIA funding) being made on the San Joaquin River through the San Joaquin River Restoration Program (SJRRP). The SJRRP is a comprehensive long-term effort to restore flows to the San Joaquin River from Friant Dam to the confluence of Merced River and to restore a self-sustaining Chinook salmon fishery in the river. The Project will address a key fishery constraint on the lower San Joaquin river in support of the SJRRP efforts to restore the salmon fishery on the San Joaquin River.
- d) Provide improved wildlife access between Lara and Hagemann tracts on the SJRNR through wildlife crossings to be installed across WSID's intake canal.

The Project design is complete. The Project includes the following elements: (1) cone screens located at the mouth of the existing WSID intake canal; (2) a low-lift pump station at the same location; (3) approximately 2,100 feet of underground pipeline from the proposed pump station to the intake canal; (4) sediment removal and management along the length of the intake canal; (5) upgrading of existing roads along the intake canal; (6) two wildlife crossings of the intake canal; and (7) facilities for providing late fall-water deliveries to the Refuge.

Total Project cost is \$32M. WSID has submitted a State of California Natural Resources Agency Proposition 1 funding request (June 2018) for \$2.25M for implementation of specific Project elements. Per the CPIVA 34-6(b)(19) authority, any federal funding for ASFP projects, including this Project, require a minimum 50% cost share.

Data Management

Information resulting from activities funded by this charter, including all program reports and any raw data, will be permanently housed at Reclamation's Mid-Pacific Regional Office in Sacramento, and USFWS's Pacific Southwest Regional Office in Sacramento.

Monitoring of the fish screen will include a hydraulic evaluation of the screens to assure consistency with the approved project design. Additional project monitoring will be identified and implemented consistent with NEPA/CEQA and FESA/CESA requirements.

Risks

Risk	Likelihood	Impact
Screen projects require cost share match	1	1

Cost Estimate

Year	Fund	Total	BOR	FWS
2019	CVPRF	\$1,000,000	\$1,000,000	\$0
2020	CVPRF	\$1,000,000	\$1,000,000	\$0
2021	CVPRF	\$1,400,000	\$1,400,000	\$0

Total Cost: \$3,400,000

Internal Agency Resources Table

2019

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
<i>Construction</i>								
Agreement	Construction Funding	\$1,000,000	1.00	0.00	\$1,000,000	BOR	CVPRF	FY 2019 cost share funding towards project construction. Total construction costs, estimated at \$32M, and is expected to be provided by State, Federal (including non-CVPIA) and local sources.

2020

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
<i>Construction</i>								
Agreement	Construction Funding	\$1,000,000	1.00	0.00	\$1,000,000	BOR	CVPRF	FY 2020 cost share funding towards project construction.

2021

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
<i>Construction</i>								
Agreement	Construction Funding	\$1,400,000	1.00	0.00	\$1,400,000	BOR	CVPRF	FY 2021 cost share funding towards project construction.

State Habitat Resource Coordinators

DCN: AFRP2133
Classification: Administration
Location: Central Valley Wide
Funding Years: 2019
Benefits Start Year: 2019
Priority: Core Team Priority

Authority

Provision	Percentage	Comment
(b)(1) AFRP	100.0%	

Metrics

No Data.

Deliverables

Date	Title
Dec. 2019	Contributions to CVPIA annual accomplishment report

Narrative

Cost includes three full time senior level or equivalent biologists with CDFW.

Data Management

All relevant data/information related to AFRP annual contributions to prior FY program accomplishments, current FY proposed projects and activities and future FY annual work plan development will be submitted to CVPIA when annual calls for these data are issued. The AFRP program manager and assistant program manager will also keep secure backups of all correspondence, data and additional information provided to the CVPIA program whenever possible.

Risks

No Data.

Cost Estimate

Year	Fund	Total	BOR	FWS
2019	CVPRF	\$703,796	\$0	\$703,796

Total Cost: \$703,796

Internal Agency Resources Table

2019

Type	Name	Rate	Frac.	MU	Total	Agency	Fund	Description
<i>Planning and Analysis</i>								
Agreement	Cooperative Agreement for 3 CDFW Senior-level biologists (State HRCs)	\$663,959	1.00	0.06	\$703,796	FWS	CVPRF	\$96,896 X 3 = \$290,6888 + temp help \$19,500 and staff benefits \$156,809 = \$466,998 + general expense \$45,000 and FWS indirect rate \$151,961 = \$663,959 + 6% FWS rate