

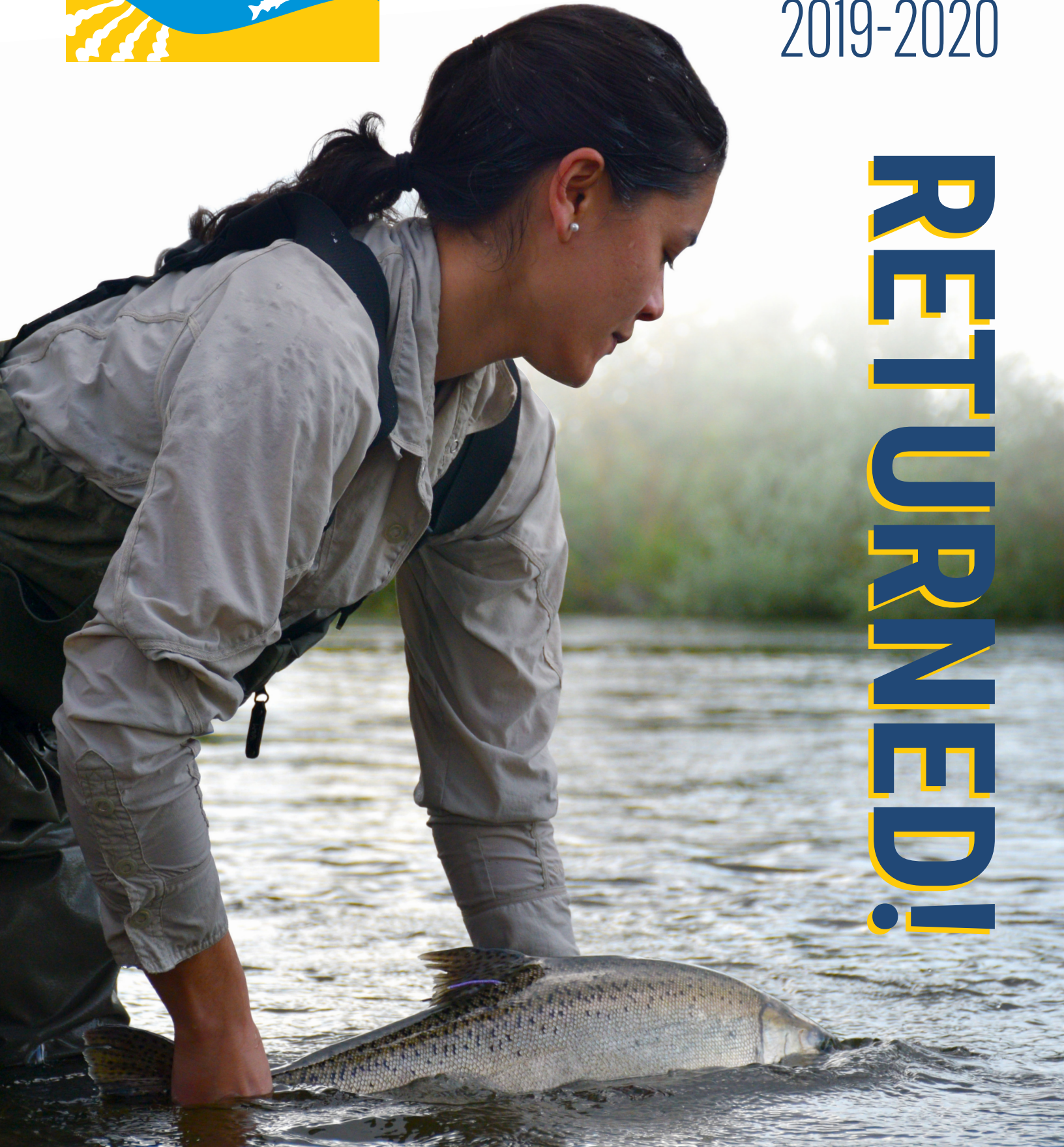
SAN JOAQUIN RIVER  
RESTORATION PROGRAM



# ANNUAL REPORT

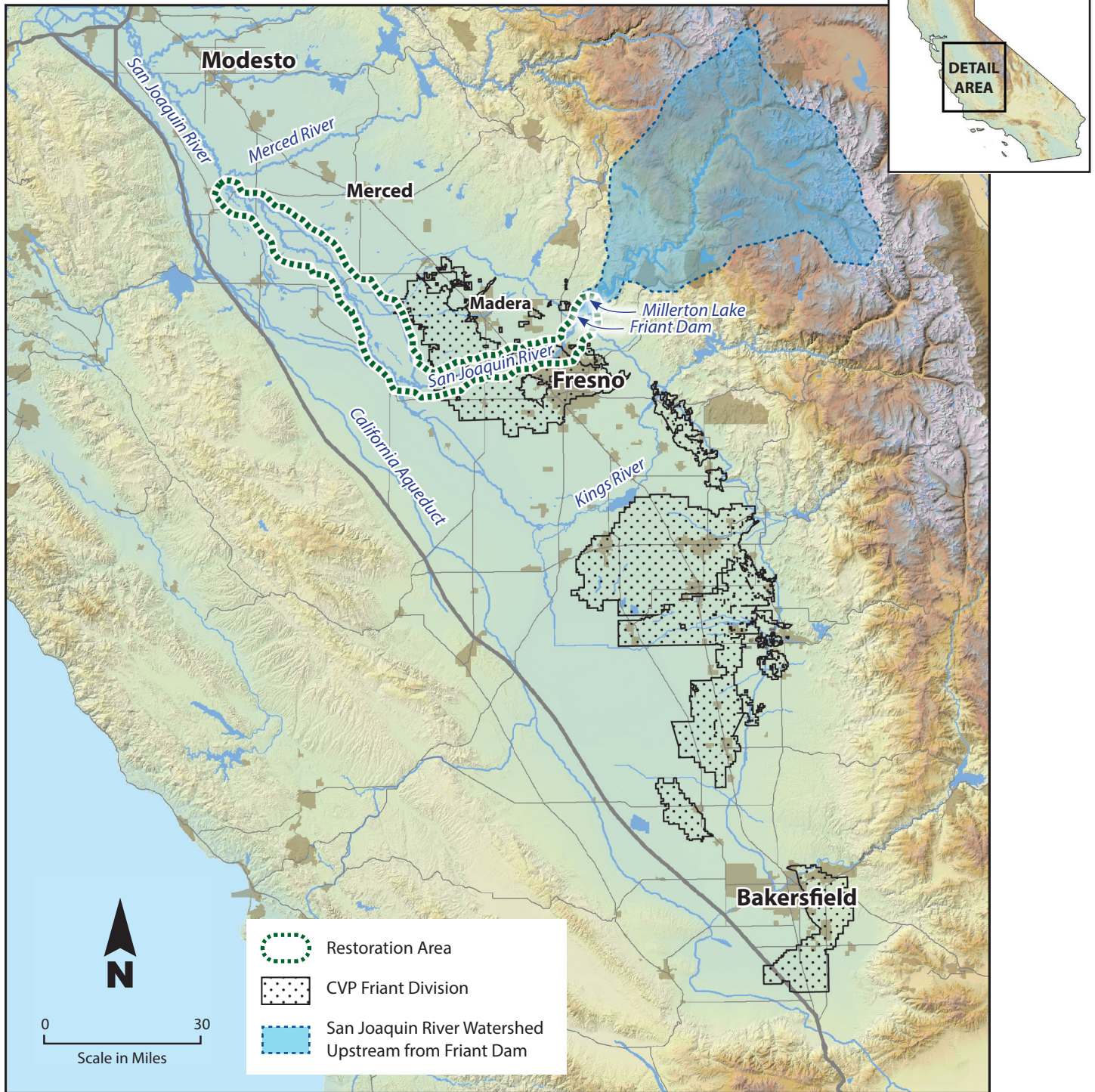
## 2019-2020

**RETURNED!**



*The San Joaquin River Restoration Program is a comprehensive, long-term effort to restore flows to the San Joaquin River from Friant Dam to the confluence with the Merced River, restoring a self-sustaining Chinook salmon population while reducing or avoiding adverse water supply impacts from Restoration Flows.*

## SAN JOAQUIN RIVER RESTORATION AREA





## A major milestone for the San Joaquin River Restoration Program was achieved in 2019: for the first time in the history of the Program, spring-run Chinook salmon — a species extirpated from the river for over 60 years — returned to California’s second longest river to spawn.

This was not the first time the species spawned in the river since the start of the Program. In 2017, we confirmed, using adults raised at the Salmon Conservation and Research Facility and released to the river, that spring-run could survive the Central Valley's summer months and successfully spawn in Reach 1 of the Restoration

Area. So, when the fish returned from the Pacific Ocean during wet conditions in spring 2019, while elated, Program staff were not entirely surprised as we knew the fish were capable of surviving and naturally spawning in the river. But what was revelatory was the number, resilience, and capabilities of those fish, under wet conditions, to get past multiple barriers in the Restoration Area – barriers that in drier years present obstacles to migration. The results of that wet year illustrated a key point: even in a heavily altered and diverted river, and a little boost from the Program, nature still finds a way. This momentous occasion verified our restoration vision for the river and that the Program will be successful once Restoration Flows maintain a connected river, fish passage obstacles are alleviated, and our conservation facility is providing the numbers of spring-run juveniles needed to kickstart natural production goals.

A major responsibility of the Program is to assist nature in accomplishing what it evolved to achieve: survive and reproduce. It was encouraging to see the fish return again in 2020, proving that 2019 was not a casual occurrence, but a continuing pattern of the natural system.

Even with these successes, the Program still has many challenges ahead. The 2019 returns occurred during a "Wet" Restoration Year Type (See Figure 3-1, Page 15). High flow conditions inundated structures within the river and diverters removed barriers for safe passage of water that allowed spring-run Chinook to move upstream where in drier-type water years, those structures block volitional passage for fish. Projects to provide permanent volitional passage around three major barriers — Eastside Bypass Control Structure, Mendota Dam, and Sack Dam — must be accomplished to meet obligations of the San Joaquin River Settlement Act (Public Law 111-11) and to create the naturally reproducing, self-sustaining fish population called for in the Settlement. Program staff and our partner Implementing Agencies continue to make important strides to accomplish these objectives and bring a thriving salmon population back to the San Joaquin River.

It is building on these budding successes that the Program continues to move towards its goals of bringing back iconic Chinook salmon populations and restoring the river while reducing or avoiding adverse water supply impacts to Friant Division water users. Despite the inherent complicated and constant challenges, the Program remains, as it has since its inception, committed to those goals and to seeing continued Program success through implementing the Settlement. Please be sure to visit our website at [www.restoresjr.net](http://www.restoresjr.net) and to follow us on Twitter at [@sanjoaquinresto](https://twitter.com/sanjoaquinresto) to stay informed of the latest Program developments.

Sincerely,

A handwritten signature in black ink that reads "Donald E. Portz".

Donald E. Portz, Ph.D.

Program Manager  
San Joaquin River Restoration Program  
Interior Region 10 · California-Great Basin

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BUREAU OF  
RECLAMATION

Bureau of Reclamation  
(U.S. Department of the Interior)  
DONALD PORTZ



U.S. Fish & Wildlife Service  
(U.S. Department of the Interior)  
DONALD RATCLIFF



National Marine Fisheries Service  
(U.S. Department of Commerce)  
ERIN STRANGE



California Dept. of Water Resources  
(California Natural Resources Agency)  
PAUL ROMERO



California Dept. of Fish & Wildlife  
(California Natural Resources Agency)  
GERALD HATLER

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# SECTION 1: 2019-2020 MAJOR ACCOMPLISHMENTS

## The San Joaquin River Restoration Program (SJRRP or Program) accomplished numerous major milestones in 2019-2020. The Program's major accomplishments are highlighted in this section.

### The Fish Came Back!

A stated goal of the Settlement is to restore a “naturally-reproducing and self-sustaining population of salmon,” with a focus on spring-run Chinook. Towards this goal, the Program has released juvenile spring-run Chinook salmon to the river since 2014 in the hopes to see adult spring-run return and spawn in the San Joaquin River. This objective came to fruition on April 9, 2019 when returning spring-run Chinook salmon made an appearance in the San Joaquin River for the first time in more than 65 years.

Captured in a fyke net stationed in the Eastside Bypass upstream of the San Joaquin River confluence with Bear Creek, this first fish had a clipped adipose fin (indicates a hatchery released fish) and a coded wire tag (inserted in the snout of a juvenile fish to denote origin). Further genetic sampling performed by the National Marine Fisheries Service's Southwest Fisheries Science Center in Santa Cruz, California confirmed the fish was released by the Program. Success!

The captured fish was among 23 recovered in early April as part of adult trap and haul operations by the Program to assist migrating salmonids around major barriers: Sack Dam and Mendota Dam. These activities were suspended later in April as Friant Dam flood releases filled the river and bypass channels, making fyke net operations impossible. These high flows, however, provided conditions where adult salmon were able to volitionally pass migration barriers and access Reach 1 spawning grounds.

By the time the 2019 migration season was over and spawning season ended, biologists counted 209 redds (fish nests) in the river. Taking a conservative estimate based on two adult fish per redd, Program biologists believe that at least 418 adult spring-run Chinook spawned in Reach 1 that year. Genetic testing of recovered carcasses continues to provide greater information about fish origin. Thus far, these fish have been primarily traced to a March 2017 release of 2016 brood year (BY, the year fish were hatched at the hatchery) juvenile spring-run Chinook salmon from the interim Salmon Conservation and Research Facility (iSCARF) in Friant, CA.

The 2019 returns raise an intriguing question: Could Program spring-run Chinook have returned undetected in 2017 — the watershed's [second wettest year](#)<sup>1</sup> on record? At present, initial genetics of tissue samples collected from fish carcasses found in 2019 have not confirmed that all of these fish are from a March 2017 study where 89,100 juvenile spring-run Chinook salmon were released to the San Joaquin River (38,106 from the Feather River Fish Hatchery and 51,044 from the iSCARF). As spring-run Chinook typically live in the ocean for two to three years before completing their lifecycle, this lack genetic confirmation means juvenile salmon released to the river since 2014 may have returned undetected in 2017.

Despite the drier conditions in 2020, the spring-run continued to return to the Restoration Area with 57 fish captured during trap and haul operations. Forty-eight of these fish were released to Reach 1, along with 285 adult broodstock from the iSCARF. When spawning began in September, biologists counted 73 redds, leading Program biologists to confirm that hatchery-raised adult fish can successfully spawn in the river. Interestingly, 2020 returns appeared more genetically varied than 2019 returns, with fish from both 2016 and 2017 brood years. As such, the Program reached another milestone by proving that the Program's returns are beginning to be representative of a natural population which would contain multiple generations of fish that made it out as juveniles in both hydrologically wetter (2017) and drier (2016) years — giving future generations the greatest chance for survival regardless of water year type.



Releasing one of the first 2019 returning spring-run Chinook to Reach 1 of the San Joaquin River.

## REACHES OF THE SAN JOAQUIN RIVER RESTORATION AREA

The Restoration Area starts at the Friant Dam and ends at the confluence of the San Joaquin River with the Merced River.

### REACH 5: Eastside Bypass/Bear Creek Confluence to the Merced River Confluence

Reach 5 includes levees and receives flows from Mud and Salt Sloughs before reaching its confluence with the Merced River. This reach runs through agricultural, state and federal wildlife refuges, and private waterfowl hunting club lands.



### REACH 4: Sack Dam to Confluence of Bear Creek and the Eastside Bypass

Reach 4 is subdivided into three distinct sub-reaches. Reach 4A is bordered by levees and terminates at the Reach 4B Headgates at the Sand Slough Control Structure. The majority of Reach 4B1 is heavily vegetated from these gates to the confluence with the Mariposa Bypass. While much of Reach 4B1 has been perennially dry since early 1970, Reach 4B2 is bordered by levees and terminates at the Bear Creek/Eastside Bypass confluence. Restoration Flows released from Sack Dam through Reach 4A are currently routed to the Eastside Bypass at Sand Slough and rejoin the San Joaquin River at the Bear Creek/Eastside Bypass confluence.



### REACH 3: Mendota Dam to Sack Dam

Reach 3 conveys flows from the Mendota Dam through predominately agricultural area to the Arroyo Canal diversion at Sack Dam. Bordered by levees, this sandy-bed channel usually conveys a combination of flows from the San Joaquin River and the Delta-Mendota Canal. The channel additionally collects Kings River flood flows that enter Mendota Pool at Fresno Slough and conveys flows to the Arroyo Canal diversion at Sack Dam.



### REACH 2: Gravelly Ford to Mendota Dam

Reach 2 is a meandering, low-gradient channel that begins at Gravelly Ford and is subdivided by two sub-reaches. Reach 2A is bordered by levees of the State Plan of Flood Control (SPFC) and extends to the San Joaquin River and Chowchilla Bypass Control Structures. Reach 2B extends between the river control structure to Mendota Dam. During flood control releases, all or a portion of flood flows may be diverted through the Chowchilla Bypass Control Structure and managed within the Chowchilla, Eastside and Mariposa bypasses.



### REACH 1: Friant Dam to Gravelly Ford

Reach 1 begins at Friant Dam where the Bureau of Reclamation (Reclamation) makes releases to maintain continuous flows to Gravelly Ford, providing deliveries to water rights holders. Reach 1A is the principal area identified for salmon spawning, with Reach 1B serving as spawning and rearing habitat depending on flow and climate conditions. Reach 1 does not have levees.



## Initiated and Completed Projects

In 2019 and 2020, the Program continued to make strides in the implementation of projects to fulfill Program objectives and targeted the projects outlined in the Funding Constrained Framework for Implementation (Framework). Released in May 2018, the Framework represents a multi-staged strategy for achieving the Restoration and Water Management Goals of the Settlement and the Settlement Act. Stage 1 of the Framework is focused on projects that achieve the two primary goals: provide for volitional fish passage throughout the Restoration Area in order to allow for fish to complete their lifecycle; and improve river corridor conditions capable of handling river flows of 2,500 cubic-feet-per-second (cfs) – the minimum estimated by the Program to sustain a healthy population of fish for both water temperature and habitat. See Table 2-1. Key SJRRP Major Construction Actions (Page 9) and Figure 2-1. Major Components of the Funding Constrained Framework for Implementation (Page 10) for additional information.

Stage 1 and other projects implemented during 2019 and 2020 are highlighted below and discussed further in the subsequent sections.

- **Merced Wildlife Refuge, Lower Weir Removal** In 2019, the Program removed one of two weirs on the Merced National Wildlife Refuge as part of the Eastside Bypass Improvements Project. The weir removal will help facilitate fish passage within the Eastside Bypass.
- **Eastside Bypass Improvements Projects – Reach O Levee Improvement Project** In coordination with the Department of Water Resources (DWR), the Program restored two miles of levee along the Eastside Bypass near the community of El Nido. The project purpose was to improve the existing levee to meet SJRRP seepage and stability requirements to allow for higher Restoration Flows. The work began in April 2020 and was completed in November 2020.
- **Mendota Pool Levee Repair Project** In late 2018, portions of a dirt road separating a drainage ditch from a Reclamation-owned field were overtopped and eroded. The Program performed emergency repairs to maintain dry ground conditions in the field and the dirt road in an operational condition. The repairs were completed in 2019.
- **Friant-Kern Canal (FKC) Middle Reach Capacity Correction Project** The FKC Middle Reach Capacity Correction Project, as authorized under the Settlement Part III, will restore the capacity of a 33-mile section of canal. Reclamation is the lead federal entity for National Environmental Policy Act (NEPA) compliance and through the Program submitted the joint Environmental Impact Statement/ Environmental Impact Report for review. Reclamation signed a Record of Decision in October 2020, providing environmental clearance.



# SECTION 2: FRAMING A PROGRAM

Section 2 describes the Program approach to meeting the Settlement.

## THE SETTLEMENT

In 1988, a coalition of environmental groups, led by the Natural Resources Defense Council (NRDC), filed a lawsuit challenging the renewal of the long-term water service contracts between the United States and the Central Valley Project Friant Division contractors.

After more than 18 years of litigation, a Settlement was reached on September 13, 2006 and subsequently approved by the court on October 23, 2006. The “Settling Parties” are NRDC, Long-term contractors of the Friant Division of the Central Valley Project (CVP), the Friant Water Authority (formerly the Friant Water Users Authority), the Department of the Interior, and the Department of Commerce.

The Settlement’s two goals are:

- **Restoration Goal:** To restore and maintain fish populations in “good condition” in the San Joaquin River main stem, below Friant Dam to the confluence of the Merced River, including naturally reproducing and self-sustaining populations of salmon and other fish.
- **Water Management Goal:** To reduce or avoid adverse water supply impacts to all Friant Division long-term contractors that may result from Restoration Flows provided for in the Settlement.

The San Joaquin River Restoration Settlement Act (Public Law 111-11), signed in March 2009, authorizes and directs the Secretary of the Interior to implement the Settlement. The SJRRP was established to do that, and the Implementing Agencies responsible for its management including Reclamation, USFWS, NMFS, DWR and CDFW (see the Program management structure chart on Page 12).

## RESTORATION ADMINISTRATOR AND TECHNICAL ADVISORY COMMITTEE

The Settlement specified the roles and responsibilities for a Restoration Administrator (RA) to provide timely input and recommendations on technical issues related to the Restoration Goal. The Restoration Administrator is supported by a Technical Advisory Committee (TAC).

**RESTORATION ADMINISTRATOR:** The RA, selected jointly by the FWA and the plaintiffs (NRDC), provides recommendations to the Secretary of the U.S. Department of the Interior (Secretary), in consultation with the Technical Advisory Committee, regarding specific elements of the Settlement and certain issues related to the SJRRP Restoration Goal.

**TECHNICAL ADVISORY COMMITTEE:** The TAC consists of six voting members selected by FWA and NRDC, two of which represent FWA, two of which represent NRDC, and two independent members. The voting members of the TAC assist and advise the RA regarding areas outlined in the Settlement, have relevant technical or scientific background or expertise in fields related to river restoration or fishery restoration, and serve for three years. The state agencies have two liaisons to the TAC, and the federal agencies have three liaisons to the TAC to ensure coordination and information sharing with the Implementing Agencies.

**FLOW RECOMMENDATIONS:** The release of water from Friant Dam for the SJRRP depends upon the amount of unimpaired runoff to Millerton Lake. Reclamation evaluates the runoff forecast and issues monthly allocations of water to the SJRRP from January through June. The RA then makes recommendations on the timing of Restoration Flow releases based on river conditions and the specific restoration goals and objectives at that time. Before an increase in Restoration Flows, the SJRRP analyzes the likely effects on the fishery, river and surrounding lands and documents the results with a Flow Bench Evaluation. Following an affirmative evaluation, the SJRRP approves the flow increases and communicates the release change to Friant Dam.





### RESTORATION ADMINISTRATOR AND TECHNICAL ADVISORY COMMITTEE

#### RESTORATION ADMINISTRATOR

Tom Johnson

#### TECHNICAL ADVISORY COMMITTEE

Chuck Hanson  
Hanson Environmental

Mark Tompkins  
FlowWest

Peter Vorster  
The Bay Institute

Rene Henery  
Trout Unlimited

Scott McBain  
McBain Associates

Bill Luce  
Bill Luce Consulting  
representing  
Friant Water Authority

#### AGENCY LIAISONS

Gerald Hatler  
California Department of Fish  
& Wildlife (CDFW)

Paul Romero  
California Department of  
Water Resources (DWR)

Erin Strange  
National Marine Fisheries  
Service (NMFS)

Donald Ratcliff  
U.S. Fish & Wildlife Service (USFWS)

Donald Portz  
U.S. Bureau of Reclamation  
(Reclamation)

## PROGRAM MANAGEMENT STRUCTURE

The Settlement includes explicit commitments that the Settling Parties and downstream water and land interests (referred to as Third Parties) would be involved in developing and implementing plans by the Secretary. With court approval of the Settlement, the Settling Parties initiated MOUs with the State and the Third Parties. These MOUs form the basis of a program structure to provide for effective oversight, management, and transparency of the SJRRP.

**STATE MOU:** Signed at the same time as the Settlement, the State MOU recognizes that, through CDFW, DWR, the Natural Resources Agency, and the California Environmental Protection Agency (Cal/EPA), the State will play a major, collaborative role in the planning, design, funding, and implementation of the actions on the San Joaquin River called for by the Settlement.

**THIRD-PARTY STAKEHOLDER MOU:** Signed in February 2007, this MOU recognizes that the Third Parties will play a collaborative role in the planning, design, implementation, and potential adaptation of the actions on the San Joaquin River called for by the Settlement and in the implementing legislation.

**THE SJRRP TEAM:** The SJRRP team is a multi-tiered group that includes staff from the Implementing Agencies. Roles and responsibilities of this group include the following.

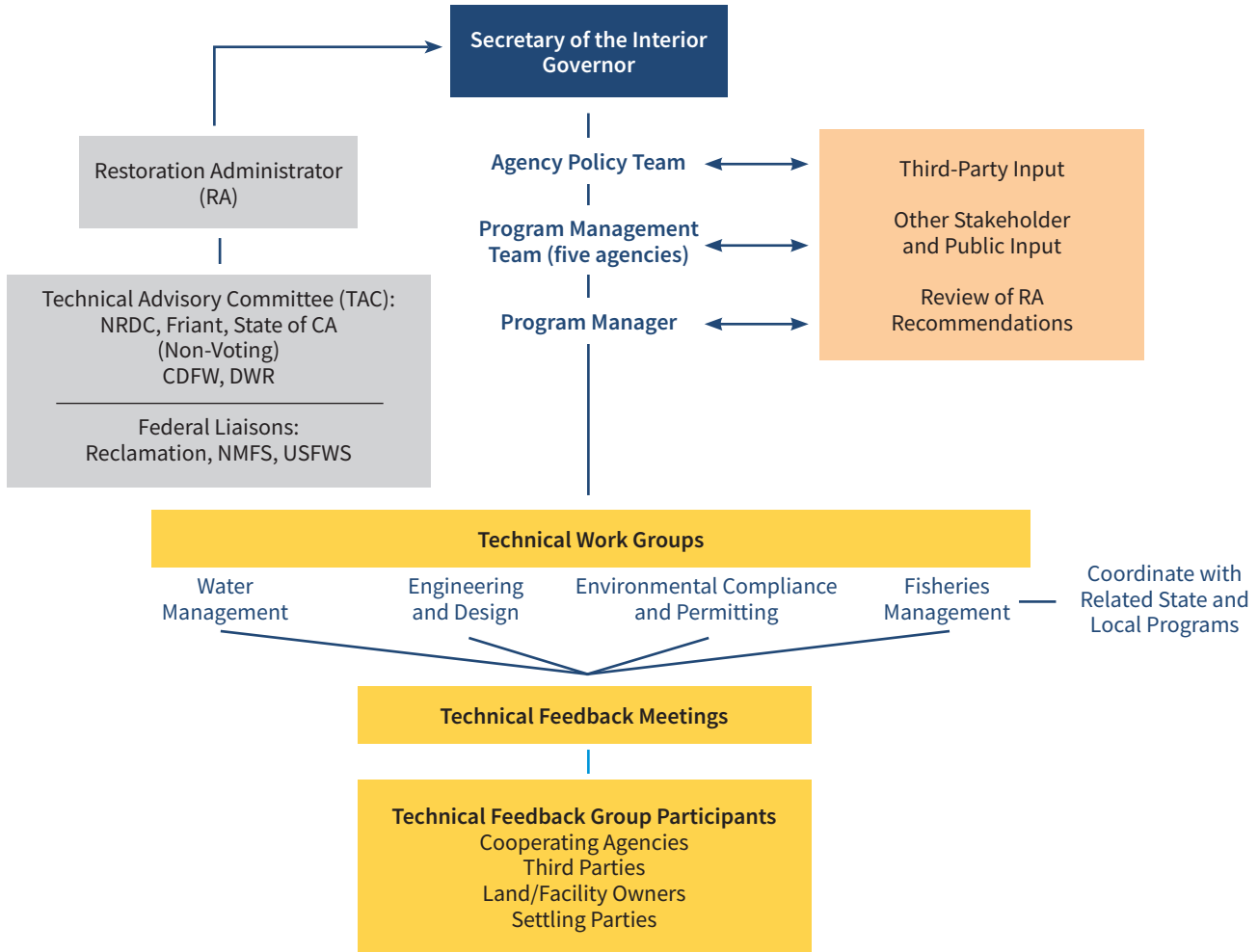
- **PROGRAM MANAGEMENT TEAM:** Includes executives from the Implementing Agencies and is responsible for overall direction and coordination of the SJRRP.
- **PROGRAM MANAGER:** Provides direction and management of the Technical Work Groups (TWG) and serves as chair of the Program Management Team.
- **TECHNICAL WORK GROUPS:** The SJRRP includes four primary TWGs, each supported by various subject-matter-specific subgroups. The four TWGs consist of the following.
  - Water Management
  - Engineering and Design
  - Environmental Compliance and Permitting
  - Fisheries Management



Aerial view of Fresno Slough (bottom of frame), Mendota Pool, and Mendota Dam - the starting point of Reach 3 of the Restoration Area.

## 2: FRAMING A PROGRAM

Program structure and organizational chart that reflects the provisions of the Settlement and subsequent MOUs



THIRD-PARTY MOU SIGNATORIES		
ENTITIES ALONG THE SAN JOAQUIN RIVER	DOWNSTREAM TRIBUTARY WATER USERS	OTHER CVP WATER USERS
<ul style="list-style-type: none"> <li>San Joaquin River Exchange Contractors Water Authority</li> <li>Central California Irrigation District</li> <li>Firebaugh Canal Water District</li> <li>San Luis Canal Company</li> <li>Columbia Canal Company</li> <li>San Joaquin River Resource Management Coalition</li> </ul>	<ul style="list-style-type: none"> <li>Merced Irrigation District</li> <li>Turlock Irrigation District</li> <li>Modesto Irrigation District</li> <li>Oakdale Irrigation District</li> <li>South San Joaquin Irrigation District</li> <li>San Joaquin Tributaries Association</li> </ul>	<ul style="list-style-type: none"> <li>Westlands Water District</li> <li>San Luis &amp; Delta-Mendota Water Authority</li> </ul>



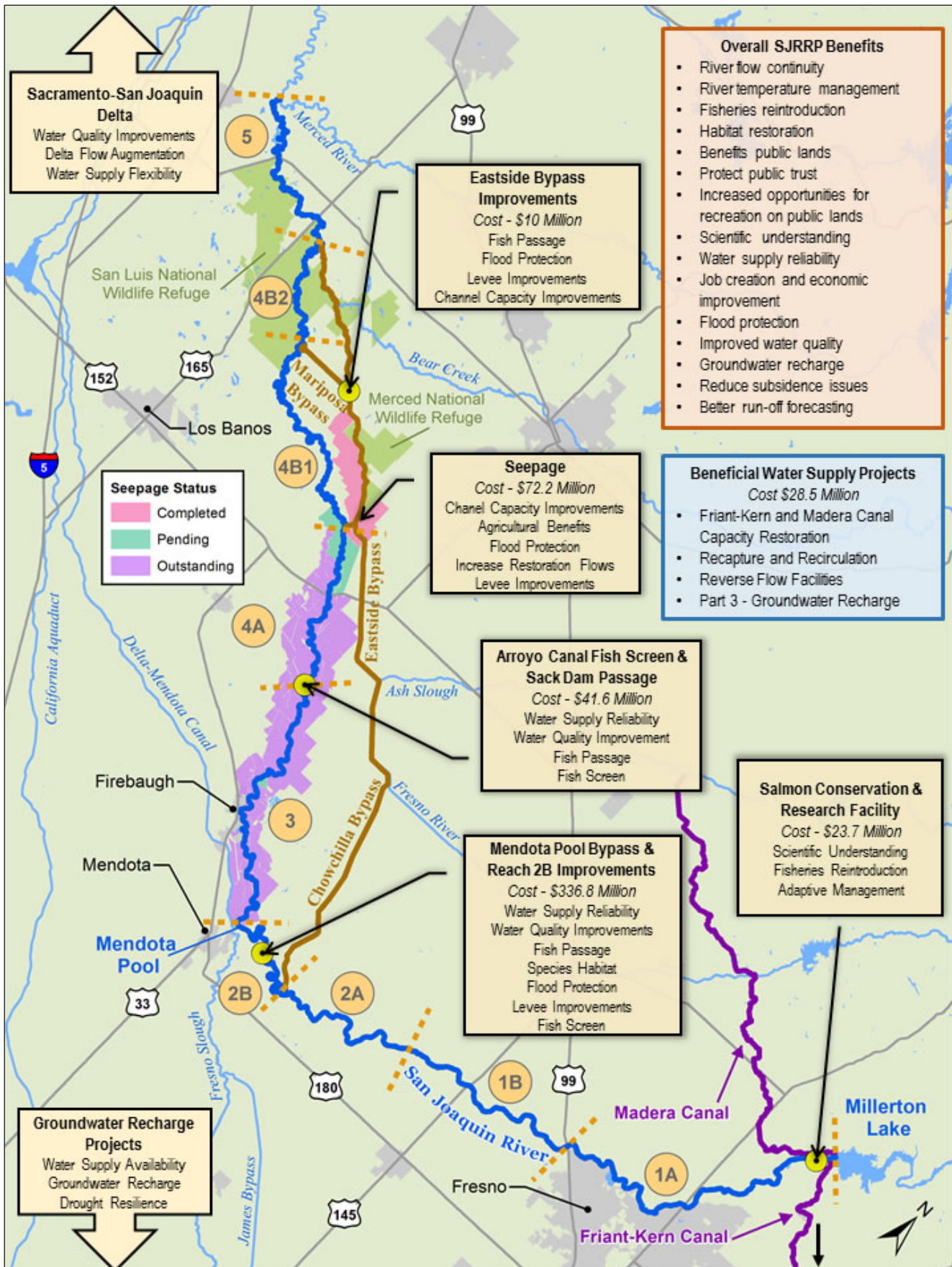
## PROGRAM IMPLEMENTATION APPROACH

In 2015, the Program published the Revised Framework for Implementation which laid out a 15-year vision for Program actions needed in order to fulfill the Settlement. That vision was supplemented by the 2018 Funding Constrained Framework which lays out Program priorities given realistic budget parameters. Since the development of the two documents, the Program timeline has again shifted, primarily due to design delays as a result of land subsidence and the challenges associated with acquiring land necessary for implementation of the Mendota Pool Bypass and Reach 2B Improvements Project. That said, significant progress has been made toward fulfillment of the original “Five-Year Vision” outlined in the 2015 Framework including installation of a low-flow valve on the Madera Canal; environmental documentation for a project to restore water delivery conveyance capacity of the Friant-Kern Canal; and actions to improve river channel capacity throughout the Restoration Area. In addition, the Program continues to make strides towards the Funding Constrained Framework Stage 1 goals as outlined below (See Table 2-1).

**Table 2-1. Key SJRRP Major Construction Actions in Stage 1 of the Funding Constrained Framework**

STAGE 1 ACTIVITIES	
PRIMARY GOAL	
Begin the reestablishment of spring- and fall-run Chinook salmon through volitional fish passage, sufficient flows to manage temperatures, and providing for the basic habitat needs of the species.	
<b>FLOW-RELATED ACTIVITIES</b>	<ul style="list-style-type: none"> <li>• Seepage projects up to 2,500 cfs</li> <li>• Levee stability projects up to 2,500 cfs</li> </ul>
<b>RESTORATION GOAL ACTIVITIES</b>	<ul style="list-style-type: none"> <li>• Mendota Pool Bypass and associated structures</li> <li>• Mendota Pool Fish Screen</li> <li>• Levees in Reach 2B to convey 4,500 cfs through Reach 2B; in-channel control structure designed to divert up to 2,000 cfs into the Mendota Pool</li> <li>• Fish passage improvements to the San Joaquin River Control Structure located at the head of Reach 2B</li> <li>• Arroyo Canal Fish Screen and Sack Dam Fish Passage</li> <li>• Salmon Conservation and Research Facility</li> <li>• Fish passage actions in the Middle Eastside Bypass, such as the Reach O Levee Improvement Project and the Merced Wildlife Refuge - Lower Weir Removal Project.</li> </ul>
<b>WATER MANAGEMENT GOAL ACTIVITIES</b>	<ul style="list-style-type: none"> <li>• Award remaining funding to non-federal partners to move forward with the construction of the Friant-Kern Canal and Madera Canal Capacity Correction projects</li> </ul>

Figure 2-1. Major Components of the Funding Constrained Framework for Implementation (published 2018)



# SECTION 3: PROGRESS AND ACTIVITIES

Section 3 describes progress for the following activities in 2019-2020:

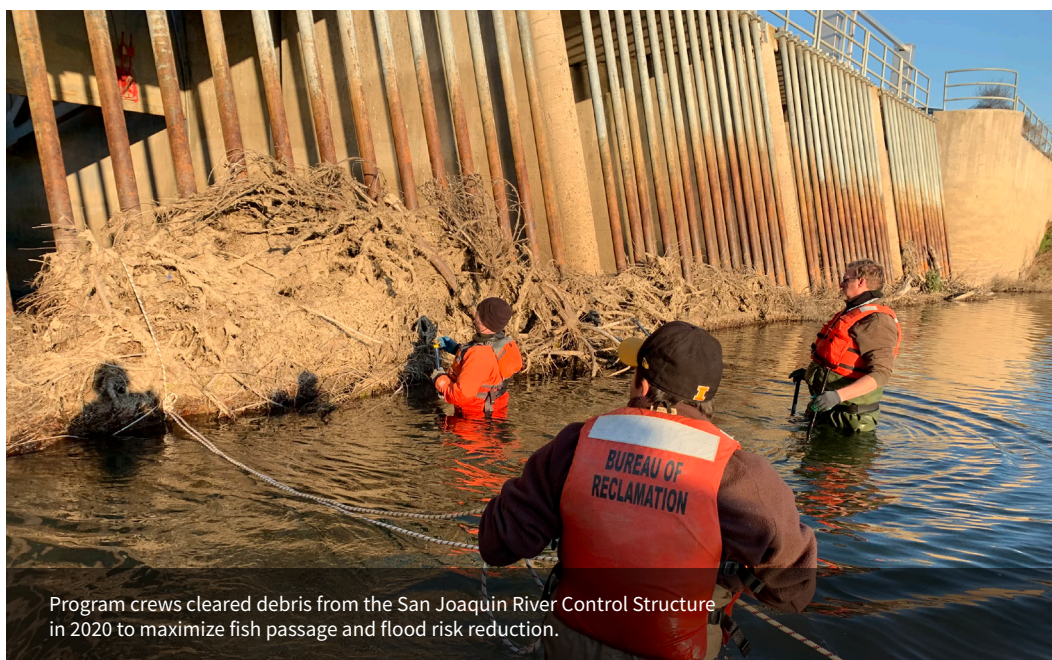
- **Flow Actions**
- **Channel and Structural Improvements**
- **Fish Reintroduction**
- **Water Management**
- **Monitoring and Analysis**
- **Conservation Strategies and Flow-related Mitigation Measures**

## FLOW ACTIONS

Action to reconnect the San Joaquin River to the Merced River confluence began in 2009 with the initiation of Interim Flows. These flows were intended, in part, to evaluate the hydrologic and hydrogeologic effects in advance of the Program's transition to Restoration Flows in January 2014. Restoration Flows are a specific volume of water to be released from Friant Dam under the Settlement. Restoration Flows allow the Program to support initial fish introduction actions and collect relevant data concerning flows, temperatures, fish needs, and seepage losses. Recapture, recirculation, and reuse of Restoration Flows are addressed in the Water Management section on Page 25.

### Flow Management and Monitoring

Each year, Reclamation and the SJRRP manage releases and monitor flows in the San Joaquin River, including the Restoration Flows specified in the Settlement and Settlement Act. The Settlement identifies six different water year types based on hydrologic conditions (see Figure 3-1. SJRRP Restoration Flow schedule, Page 15). Each water year type determines the amount of Restoration Flows to be made available



Program crews cleared debris from the San Joaquin River Control Structure in 2020 to maximize fish passage and flood risk reduction.

for the SJRRP and were established, in part, to mimic the San Joaquin River's hydrology prior to construction of Friant Dam. The formal "water year" in California is a 12-month period that extends from October 1 to September 30. While this is consistent with the period used to determine the Restoration Year Type, the Restoration Year for the purposes of Restoration Allocations cycles from March 1 to February 28/29. Water year discussions in this document typically refer to the Restoration Year Type unless otherwise stated.

For 2019, the Restoration Water Year was classified as "Wet," producing a final Restoration Allocation of 556,542 acre-feet as measured at Gravelly Ford. Gravelly Ford is a flow compliance point located 38 miles downstream of Friant Dam and serves as the terminus of Reach 1 of the Restoration Area. The 2020 Restoration Water Year was classified as "Dry," producing a final Restoration Allocation of 202,197 acre-feet as measured at Gravelly Ford.

As part of annual flow management actions, the SJRRP monitors and manages Unreleased Restoration Flows (URF), Recaptured and Recirculated Restoration Flows, unexpected seepage losses, and other flow and seepage data.



## Unreleased Restoration Flows

Reclamation has developed and implemented a 10-year plan (water contract years 2016 to 2025) to sell and exchange Unreleased Restoration Flows. These flows are generated when SJRRP Restoration Flows cannot be released into the San Joaquin River channel due to channel capacity constraints and remain stored in Millerton Reservoir behind Friant Dam. Since its inception, the SJRRP has been addressing downstream constraints, such as seepage, that limit Restoration Flows. Consequently, the quantity of Unreleased Restoration Flows is expected to decline as channel capacity constraints are improved. However, it is anticipated that these constraints will persist at some level until 2030. Until the channel constraints in the San Joaquin River and other conditions are addressed to allow full release of Restoration Flows, the Program anticipates continued availability of Unreleased Restoration Flows depending on Restoration Water Year type. Per the Settlement, these flows will be used to support the Water Management Goal, including selling or exchanging water, with priority given to Friant Division long-term contractors. The Program completed a 10-year Environmental Assessment for the Unreleased Restoration Flow Plan in 2016. See Table 3-1. 2019-2020 URF Program Summary for additional information.

Table 3-1. 2019-2020 URF Program Summary

Restoration Year	Number of Participants	Gross URFs Available (TAF)	Gross URFs Sold (TAF)	Gross URFs Exchanged (TAF)	URFs Returned from Previous Exchanges (TAF)	URF Program Revenue
<b>2019</b>	17 Friant Contractors	342.252	<b>326.955</b>	<b>16.297</b>	<b>0</b>	<b>\$6,699,966</b>
<b>2020</b>	28 Friant Contractors	65.502	<b>43.500</b>	<b>20.002</b>	<b>0.487</b>	<b>\$10,174,111</b>

## CREEK FIRE AND IMPACTS ON WATERSHED MANAGEMENT

In 2020 the Creek Fire, the largest single-source fire in California history, burned nearly 380,000 acres covering about 35 percent of the San Joaquin River Watershed. The Creek Fire damaged critical snow sensors, creating uncertainty with typical runoff forecasting tools.

Changes to soil and loss of brush and canopy biomass can make a difference in the amount of snow accumulation and rate of runoff.

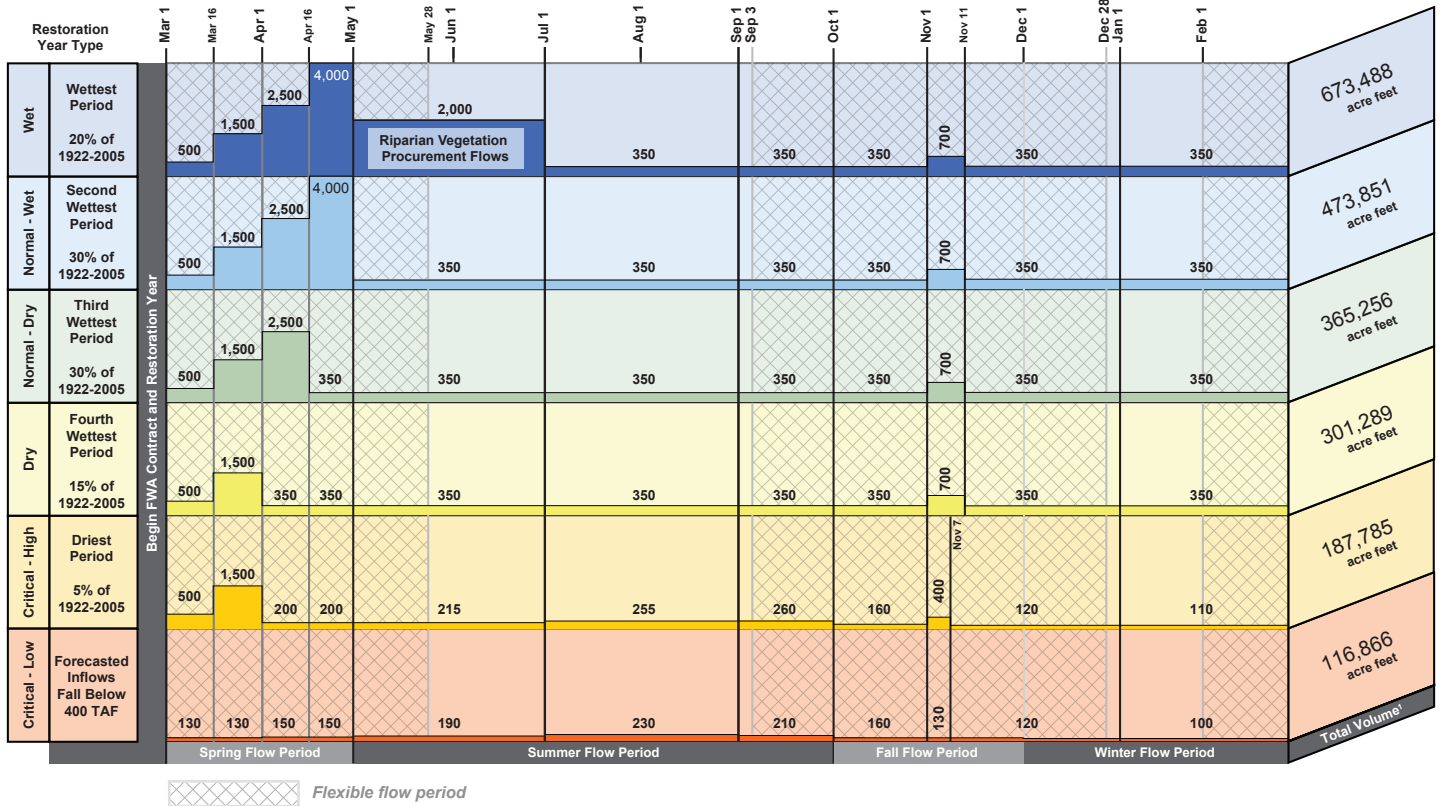
Higher levels of snow accumulation and faster rates of runoff make it challenging to manage river flows. These changes in runoff can also make it difficult for water managers to maintain cold water for later in the season when it is necessary for salmon habitat.

The Creek Fire increased the need for the Airborne Snow Observatory (ASO) flights to establish a new snow baseline of the San Joaquin River Watershed in November 2020. Continued ASO flights are planned for 2021 and will provide hydrologists with the data they need to accurately forecast San Joaquin River watershed runoff.



Aerial view of a portion of the Sierra National Forest south of Shaver Lake, Calif., burned by the 2020 Creek Fire. (Photo courtesy: U.S. Forest Service)

Figure 3-1. SJRPP Restoration Flow schedule is based on the hydrologic conditions in the San Joaquin River watershed.



1. Restoration Year Type totals prepared for planning purposes consistent with Exhibit B Restoration Hydrographs (Stipulation of Settlement NRDC v. Rodgers). Actual volumes represent a proportional share of available supply, with Wet Restoration Year Type as the maximum allocation for Restoration purposes.



Department of Water Resources staff, in coordination with the Restoration Administrator, conducted synoptic flow surveys at the Sand Slough flume in 2019 as part of a study to assess effects on Restoration Flows by channel seepage. Conducted in Reaches 4A and 5, and the Eastside Bypass, the surveys help to determine whether these sections are gaining or losing surface water to groundwater. (Photo courtesy: McBain and Assoc.)

#### Understanding the nexus between seepage, channel capacity and flows

In the latter half of the 19th century following the California Gold Rush, agricultural development of the Central Valley blossomed in unprecedented fashion. To maximize the amount of irrigable land, the San Joaquin River was channelized and constrained using levees, most of which were constructed by landowners shifting soil into embankments to keep the river at bay. However, compared with modern levees, older levees were typically non-engineered soil berms and were – in many instances – unstable during flooding events. As the river was developed for human uses and, in particular with the advent of Friant Dam, river flows were more easily managed and controlled. As entire sections of the San Joaquin River were completely dried out due to upstream consumption, levee stability became a lower priority, affecting available channel capacity today.



Another limitation on channel capacity is groundwater seepage. When the Program started Interim Flows, it was identified that restoring flows to the river channel could raise groundwater levels below agricultural fields through seepage to an area that once was an alluvial floodplain. To mitigate impacts to adjoining riverine landowners, the Program initiated a Seepage Management Program. This program includes realty actions, such as seepage easements or fee title acquisitions, or physical projects, such as interceptor lines. Realty actions have been the preferred seepage project to date. These compensate landowners and allow Restoration Flows to seep into the adjacent groundwater table. These realty actions allow for channel capacity where groundwater seepage is a concern, while other actions – such as levee improvements – allow for higher channel flows (See 3: Progress and Activities, Page 18).

Because the Program does not yet have the agreements or projects in place to resolve all levee stability and seepage impacts, the full capacity of 4,500 cfs (or the 2,500 cfs of Restoration Flows called for in the Funding Constrained Framework) cannot be released to the river. Consequently, these flows remain in Millerton Reservoir and available for Program use and management, including sale to CVP-Friant Division contractors as Unreleased Restoration Flows. Funding from the sales is used to meet Program requirements. In the future, as channel capacity is increased through levee improvements and seepage projects, higher Restoration Flows will be released to the river and available Unreleased Restoration Flows will decline.



The movement and accumulation of sediments in the San Joaquin River channel can alter channel capacity and affect seepage on adjoining lands. This sequence of photos in Reach 2A illustrates the sediment transport potential of the river. (Photo courtesy: DWR)



## CONSERVATION STRATEGIES AND FLOW-RELATED MITIGATION MEASURES

### Channel Capacity Advisory Group (CCAG)

Reclamation and DWR, in consultation with the CCAG, released Channel Capacity Reports in January 2019 and 2020 (See Table 3-2. 2019-2020 Levee Stability Thresholds by River Reach). This annual report, first published in 2014, describes and updates estimates of “then-existing channel capacities” so that Restoration Flows are managed to current channel capacities. “Then-existing channel capacity” is the channel capacity that corresponds to flows that would not significantly increase flood risk from Restoration Flows in the Restoration Area. The report provides the CCAG, which is tasked with independent review of recommendations developed by Reclamation, and the public with a summary of the prior Restoration Year data, methods, and estimated channel capacities. The report additionally captures CCAG recommendations for monitoring and management actions for the following year. This information helps ensure that the release of Restoration Flows does not significantly increase flood risk in the Restoration Area.

The 2019 report adds two DWR studies related to subsidence and capacity, involving the Chowchilla Bypass, Eastside Bypass, and Reach 4A of the San Joaquin River. The studies present measured change in levee freeboard and channel capacity (informed by geotechnical exploration and analysis) as well as estimations for future change over the next several years due to the release of Restoration Flows. The 2020 report clarifies the findings of the 2019 studies, indicating that 2.5 miles of levee in Reach 4A and the Middle East Bypass require improvements due to ongoing subsidence and 9 miles of levee in Reach 4B2 and the Mariposa Bypass require improvement to convey Restoration Flows. The 2020 report also recommends increases to “then-existing channel capacities” in Reach 4B2 from 930 cfs to 4,300 cfs, the Middle Eastside Bypass from 580 cfs to 1,070 cfs, and the Mariposa Bypass from 350 cfs to 1,800 cfs.

No changes from previous “then-existing channel capacities” were recommended in the 2019 report. The 2020 report provided the update to the “then-existing channel capacities,” for Reach 4B2, the Middle Eastside Bypass, and the Mariposa Bypass (listed above). The Reach 4B2 and Mariposa Bypass channel capacities were increased due to levee evaluations in one of the two 2019 studies. The recommended change in channel capacity for the Middle Eastside Bypass resulted from the removal of one of two weirs that had previously diverted water to the Merced National Wildlife Refuge and was removed in 2019. The 2020 report also highlighted future studies and data gaps that would be key in informing future channel capacities and meeting the 4,500 cfs target capacity from the Settlement. Specifically, the report mentioned improvements which would increase flow capacities in the Middle Eastside Bypass and Reach 2B.

Table 3-2. 2019-2020 Levee Stability Thresholds by River Reach (in CFS)

REACH	2019 <sup>1</sup>	2020 <sup>1</sup>
<b>REACH 2A</b>	6,000 <sup>2</sup>	6,000 <sup>2</sup>
<b>REACH 2B</b>	1,210	1,210
<b>REACH 3</b>	2,860 <sup>3</sup>	2,860 <sup>3</sup>
<b>REACH 4A</b>	2,840 <sup>4</sup>	2,840 <sup>4</sup>
<b>REACH 4B1</b>	Not Analyzed	Not Analyzed
<b>REACH 4B2</b>	930	4,300
<b>REACH 5</b>	2,350	2,350
<b>MIDDLE EASTSIDE BYPASS</b>	580	1,070
<b>LOWER EASTSIDE BYPASS</b>	2,890	2,890
<b>MARIPOSA BYPASS</b>	350	1,800

1. Then-existing channel capacity shown in this table is based on levee stability only and does not consider Restoration Flow limitations related to agricultural seepage.
2. Capacity not assessed for flows greater than 6,000 cfs. Restoration Flows are limited to approximately 2,140 cfs due to agricultural seepage.
3. Restoration Flows are limited to approximately 720 cfs due to agricultural seepage.
4. Restoration Flows are limited to approximately 300 cfs due to agricultural seepage.

### Seepage Management Program

The goal of the Seepage Management Program is to manage Restoration Flow releases based on groundwater seepage thresholds on lands within the Restoration Area. These thresholds are based on local crop type or historical water levels and are designed to keep groundwater levels below levels that could impact adjacent landowners. To increase channel capacities in the San Joaquin River, the Seepage Management Program initiates a seepage project on any affected lands. Seepage project options include the purchase of land affected by groundwater seepage from willing sellers, the purchase of permanent seepage easements to allow for elevated groundwater tables beneath adjacent land as a result of Restoration Flows, and physical seepage projects. The purpose of implementing the proposed actions, which was guided by landowner input, is to account for potential seepage impacts and enable Restoration Flow releases.

In 2019 and 2020, Reclamation engaged in work on various permanent seepage projects in Reach 3 and Reach 4A. In Reach 3, 294 acres were acquired in fee title for seepage projects, and between Reaches 3 and 4, a total of approximately 4,000 acres were being evaluated for additional seepage projects. Existing projects are anticipated to be completed as seepage easements with landowners. Once complete, the Program anticipates Restoration Flows in Reach 4A of up to 500 cfs. Upstream of Mendota Dam, Reclamation repaired an earthen embankment in Reach 2B in 2019. This project maintained channel capacity of 1,210 cfs in Reach 2B.

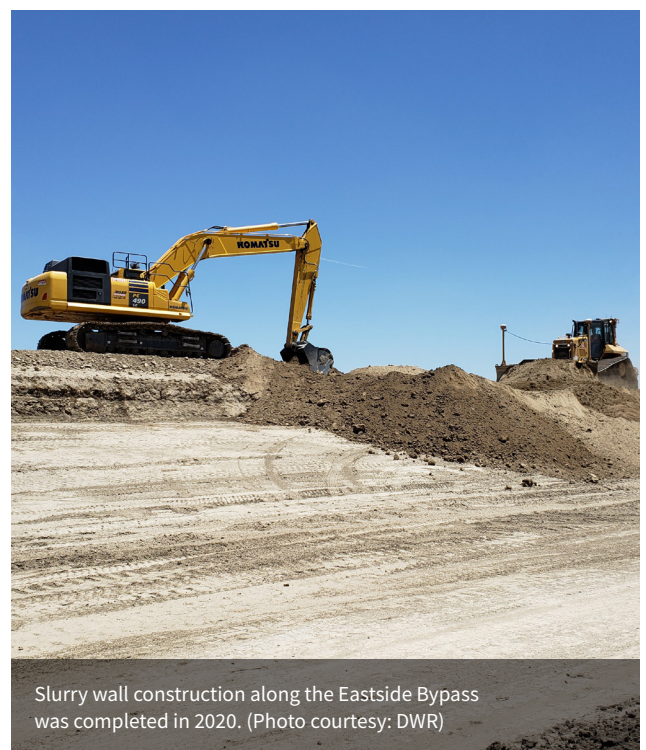
### Financial Assistance for Seepage Projects

The Seepage Management Plan outlines two project approaches for addressing seepage within the Restoration Area: realty actions and physical projects. To date, all completed seepage projects have been realty actions, either fee title acquisition or a seepage easement. Reclamation coordinated with landowners in 2019 who have expressed interest in a physical project, utilizing a financial assistance agreement with Central California Irrigation District for design and construction. Two physical seepage projects were considered for preliminary designs, however, no physical projects were executed as the project cost exceeded the value of the land. Seepage projects in Reach 3, whether realty actions or physical projects, will allow for increased Restoration Flow releases in this reach when irrigation demands otherwise utilize channel capacity.

## CHANNEL AND STRUCTURAL IMPROVEMENTS

The San Joaquin Levee Evaluation Project is implemented by DWR. Under the project, DWR staff conduct geotechnical evaluations of the flood control system integrity associated with levee seepage and stability on high-priority levees in the Restoration Area. To limit the risk of levee failure due to the release of Restoration Flows, channel capacities are limited to flow levels that would meet the U.S. Army Corps of Engineers (USACE) factors of safety for levee slope stability and underseepage. If data on the levees is not available to evaluate seepage and stability conditions, flows are limited to those that would remain “in-channel” until adequate data is available. From the initial geotechnical analysis findings, high flood hazards were identified for most SJRRP levees. DWR has prioritized its geotechnical exploration based on current channel capacity limitations and anticipated Restoration Flow routing.

In addition to actions addressed through the Priority 1 levee evaluations, Priority 2 levee evaluations were completed in 2019 and include about 30 miles of levees in Reach 4B2 and the Mariposa Bypass. The evaluations included reconnaissance-level geotechnical explorations, soils testing, and seepage and stability



Slurry wall construction along the Eastside Bypass was completed in 2020. (Photo courtesy: DWR)

analyses at multiple water surface elevations along multiple levee segments. Information gathered from these evaluations will be used to help inform flow routing decisions and eventual implementation when funding become available.

### Reach O Project

Based on information gathered during Priority 1 levee evaluations, in April 2020, DWR began work on approximately two miles of levee along the Eastside Bypass, formerly known as the Reach O Project.

The project's purpose was to improve seepage and stability requirements to allow for higher Restoration Flows. DWR installed slurry cutoff walls in 10,000 feet of levee to reduce levee seepage and underseepage, as well as replaced six functionally obsolete culverts with concrete reinforced pipe. While originally scheduled for completion in 2021, the Reach O Project was completed ahead of schedule in November 2020. The improvements increase capacity in the Middle Eastside Bypass, with the updated channel capacity to be published in the 2022 Channel Capacity Report.

### Mendota Pool Bypass and Reach 2B Improvements Project

Heading downstream from Friant Dam, there are multiple projects underway to ensure salmonids have volitional passage up and down the river in order to complete their lifecycle. A key component for the Program – and its largest fish passage project – is the Mendota Pool Bypass and Reach 2B Improvements Project (Project).

The Project is the Program's largest fish passage and water management control structure and will be the first of the Phase 1 projects identified in the Settlement to move to the construction phase. The Project is integral to Program success as migrating adult salmonids are unable to pass over Mendota Dam and out-migrating juvenile fish face predators and poor habitat at the pool. When completed, the Project will provide for fish passage around Mendota Dam and Mendota Pool – a major agricultural diversion point. In addition to providing improved fish passage, the Project provides critical habitat for migrating fish through creation of an additional 823 acres of floodplain habitat between Mendota Pool and San Joaquin River Control Structure. Consistent with the Settlement, the Project will increase the Reach 2B channel capacity from 1,300 cfs to 4,500 cfs. The Project will include a fish screen and control structure designed to allow Reclamation to deliver up to 2,000 cfs of water to senior water right holders on the San Joaquin River. Construction of the Reach 2B levees and the associated floodplain habitat is projected to begin in 2025.



Crews installed the first sheet pile in the Fresno Slough on December 9, 2020, as part of efforts to replace Mowry Bridge. Replacement of the bridge is a key component for the Mendota Pool Bypass and Reach 2B Improvement Project.



Construction of preliminary features of the Project, initiated in 2020 with the demolition of Mowry Bridge, a timber structure that spans the Fresno Slough of Mendota Pool. Originally constructed to provide access to agricultural lands east of Fresno Slough, the bridge also carries a pipeline that delivers drinking water to the City of Mendota. Deemed unsafe for vehicle passage, the Program partnered with the City of Mendota to replace the old bridge with a concrete structure that will continue to carry the city's water supply line and allow for passage of heavy equipment to construct and later operate and maintain the Mendota Pool Fish Screen and Control Structure. The bridge replacement project is expected to be completed in summer of 2021.

Acquisition of land for the Project continued during the period, with two parcels acquired to compliment the former Mitigation Lands Trust property acquired in 2018. These acquisitions bring the Program's total landholding in the Reach 2B area to 358 acres. As land comes under federal control, Reclamation also becomes responsible for the management of this land. This land will remain in agricultural use through short-term leases until construction begins, however, minor repairs and yearly maintenance of certain existing features also are Reclamation's responsibility. Maintaining the Reach 2B footprint lands in 2019 involved the repair of a portion of the earthen embankment adjacent to Mendota Pool (see Mendota Pool Levee Repair, Page 7). These levee repairs were important steps to manage seepage from Mendota Pool onto adjacent property in advance of construction of the Mendota Pool Fish Screen and Control Structure.

#### **Arroyo Canal Fish Screen and Sack Dam Fish Passage Project**

Before adult salmon navigate around Mendota Dam, they will first have to pass around Sack Dam.

Located at the upstream terminus of Reach 3, Sack Dam provides the river impoundment needed to gravity feed Arroyo Canal — the primary water supply intake for area farms and other uses such as the Merced Wildlife Refuge. Creating fish passage at Sack Dam is a high-priority fish passage project for the Program. To maintain continued operations of the Arroyo Canal and avoid straying of migrating salmonids, the Settlement authorized the construction of a fish screen and fish passage facility as part of the modifications at Sack Dam.

The original project schedule was delayed by the discovery of significant land subsidence that impaired gravity flow conditions in the Arroyo Canal, the river and the bypass system. In May 2012, Reclamation began monitoring regional land subsidence across the San Joaquin Valley to understand this large-scale change in ground surface elevation. The resulting subsidence and the inability of Reclamation to build a new on-stream dam required a new design approach for the Arroyo Canal Fish Screen and Sack Dam Fish Passage Project (Project).

As such, the Program initiated a new design for the Project in 2020 that incorporates construction of a fish screen at Arroyo Canal and a separate bypass channel around Sack Dam that would mimic a natural river channel, an approach similar to the Compact Bypass in Reach 2B. Design of the facility is anticipated to be completed in 2022 with construction slated to begin in late 2023.



Sack Dam is one of three remaining major riverine and bypass structures that affect volitional passage of fish.



#### Reach 4B, Eastside Bypass, and Mariposa Bypass Channel and Structural Improvements

Reach 4B of the San Joaquin River is a 32.5-mile stretch that begins at a flood control gate installed at the head of Sand Slough and extends to the river's confluence with Bear Creek and the Eastside Bypass. Referred to as the Reach 4B Headgate, the gate was constructed in 1966 as one of the many structures constructed as part of a network of State Plan of Flood Control levees in the region. Reach 4B has two distinct segments:

- Reach 4B1 begins at the Reach 4B Headgates at Sand Slough and extends to the Mariposa Bypass Drop Structure
- Reach 4B2 begins at the Mariposa Bypass Drop Structure and extends to the confluence of the Bear Creek and the Eastside Bypass

The Reach 4B Headgate severed the mainstem of the San Joaquin River and was exclusively designed for flood management purposes. As use of the levee facilities connected to Sand Slough became favored by the facility's local maintaining agency, the Reach 4B1 channel was largely abandoned for flood management and river flow purposes by the early 1970s. As a consequence, Reach 4B1 is heavily vegetated and constricted by private levees. These elements have effectively eliminated access to Reach 4B1 by migrating salmonids. To address fish passage constraints at Reach 4B1 and 4B2, the Program has executed flowage easements with landowners in the Eastside Bypass between Sand Slough and the Bear Creek confluence to the mainstem San Joaquin River. These agreements allow for the conveyance of Restoration Flows and refuge water supply flows in the Eastside Bypass in perpetuity.

Due to the numerous fish barriers present within the Eastside Bypass, most native anadromous fish species cannot access the reaches upstream of this channel except in the wetter years when they are able to swim over obstructions.

As envisioned in the Settlement, the Reach 4B and Eastside Bypass (Reach 4B/ESB) projects consist of conveyance of at least 475 cfs through Reach 4B, routing of Restoration Flows of 4,500 into Reach 5, and modifications to support native fish passage. A decision to the method to achieve these flow targets, however, has been deferred until after Stage 1 improvements called for in the Funding Constrained Framework are substantially complete and additional funding is made available. For the interim, the Program has proceeded with completing activities included in the Eastside Bypass Improvements Environmental Assessment/Impact Statement. This document supports activities described in Eastside Bypass Improvements Project, which includes:

- Improvements to two miles of levees along the bypass to improve flow conveyance (Reach O Project) which was completed in November 2020.
- Modifications to the Eastside Bypass Control Structure. This project will remove the stop logs, flow structures, and incorporate a rock ramp. Construction is anticipated to begin in 2022 or 2023.
- Continue evaluations of potential modifications of the Dan McNamara Road low-water crossing for fish passage purposes.
- Removal of two Merced National Wildlife Refuge weirs to improve fish passage. The lower, larger weir was removed in 2020 and the upper weir will be removed in 2021.



A concrete rubble weir in the Eastside Bypass near the confluence with Reach 5 affects volitional passage of fish during low flow periods.



## FISH REINTRODUCTION: SPRING-RUN CHINOOK SPAWN!

### Fisheries Framework

To meet the goal of returning a self-sustaining Chinook salmon fishery to the San Joaquin River, major planning and permitting initiatives are underway. One of the ways the Restoration Goal is being advanced is through work at the interim Salmon Conservation and Research Facility (iSCARF). The iSCARF is a captive breeding program currently being implemented below Friant Dam by the California Department of Fish and Wildlife. To help guide actions at the iSCARF and other fisheries priorities, the Program developed the Fisheries Framework in 2018. This document outlines the goals and objectives for establishing spring- and fall-run Chinook salmon populations in the Restoration Area, identifies the necessary habitat that will support naturally-reproducing, self-sustaining salmon populations, provides the science behind these planned management actions, and outlines the proposed implementation plan and adaptive management process for fishery actions.

As described in the report introduction, for the first time in over 60 years, spring-run Chinook salmon successfully spawned within the Restoration Area in 2017 — a Program milestone. Progeny of these fish are among an estimated 418 adults that returned from the Pacific Ocean in 2019 to complete their lifecycle. Because high flows in the river and bypass system halted trap and haul activities in April, the 2019 spring-run Chinook spawning estimate is based on a doubling of the 209 redds (i.e. 50:50 sex ratio; 209 females + 209 males = 418 fish) counted in 2019. The estimate includes 20 fish trap and haul fish and 114 excess broodstock released to Reach 1.

The 2020 trap and haul efforts saw 48 of the 57 fish released to the river to spawn. This return was supplemented with the release of 285 broodstock from the SCARF. As the 2020 redd count reached 73 (e.g. more fish nests than could be produced by the release of adult fish from trap and haul efforts alone), staff confirmed that natural returns and hatchery-released adult fish can inter-spawn in the river. See Table 3-3. Fish Counts 2019 and 2020 for more details.

Table 3-3. Fish Counts 2019 and 2020

	2019	2020
<b>JUVENILE SPRING-RUN RELEASED</b>	211,025	243,059
<b>YEARLING SPRING-RUN RELEASED</b>	10,451	5,094
<b>EXCESS BROODSTOCK RELEASED (ADULT, REACH 1)</b>	114	285
<b>SPRING-RUN ADULT TRAP AND HAUL</b>	23	57
<b>SPRING-RUN ADULT TRAP AND HAUL RELEASED REACH 1</b>	20	48
<b>ESTIMATED TOTAL SPAWNING SPRING-RUN ADULT</b>	418+	333
<b>CARCASSES RECOVERED</b>	168	48

### TRAP AND HAUL

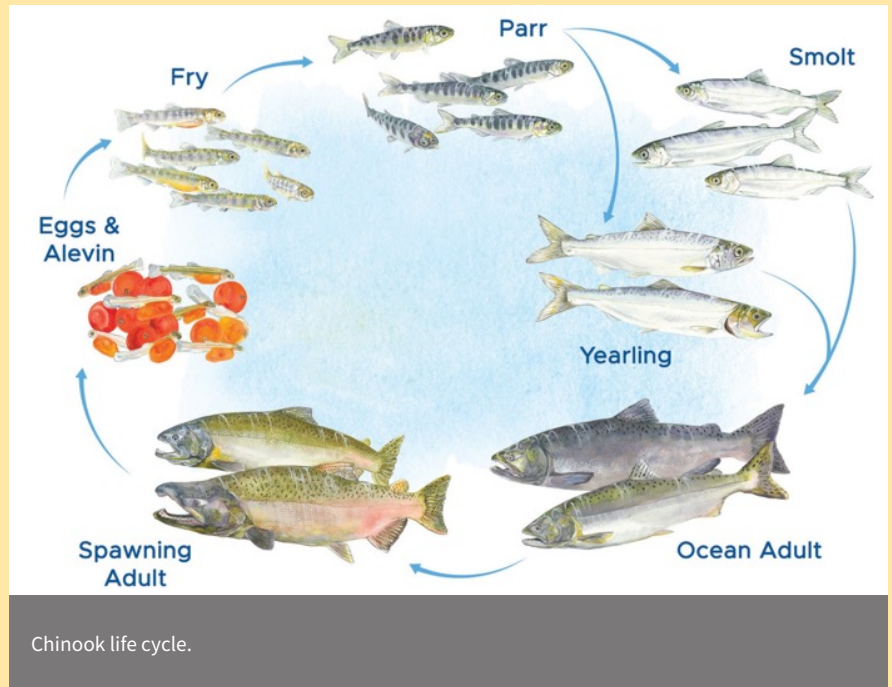


Fall-run Chinook salmon trap and haul program upstream of the Hills Ferry Barrier.

Trap and haul is the process by which adult Chinook salmon are captured during spawning migration and are transported via tanker truck to Reach 1 of the Restoration Area — the only suitable spawning habitat within the Restoration Area due to its available habitat and cold water releases from Friant Dam. The truck transport is necessary as the fish are unable to get past several in-stream structures, such as the Eastside Bypass Control Structure, Sack Dam and Mendota Dam. These structures limit upstream passage in all but the wettest of years. Monitoring typically takes place during the upstream migration from the ocean, usually between the months of April and June, dependent on river conditions.

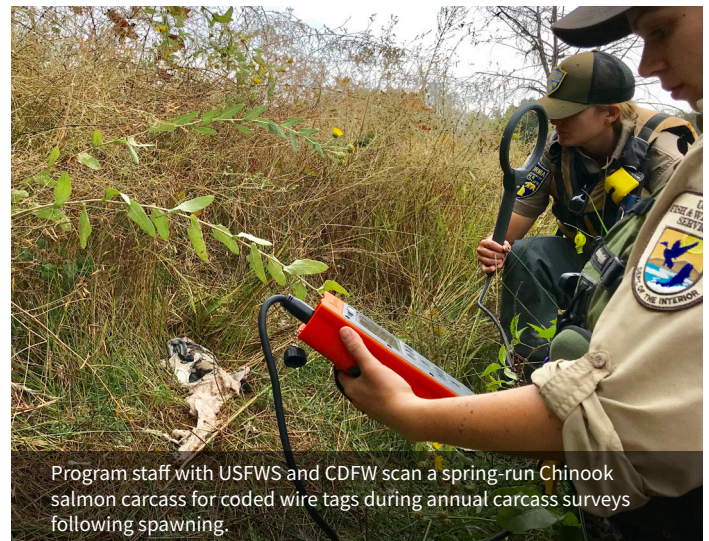
## LIFE CYCLE OF A SPRING-RUN CHINOOK

Spring-run Chinook salmon evolved to live in both fresh and salt water environments. Hatched from an egg in rivers, streams and creeks, they advance as fry, parr and eventually juveniles, rearing and growing larger, until they emigrate to the cooler tidal water of the Sacramento-San Joaquin Delta and to the Pacific. Some of the generation hold back and stay in the freshwater system for an additional year – appropriately called “yearlings” – when they migrate to ocean the following year. This is thought to be a resiliency life history strategy in response to environmental conditions, such a drought. Once the juveniles (or yearlings) migrate to the ocean, they mature into adults before migrating back to their natal stream, where they spawn and die, completing their lifecycle. Spring-run are unique from other runs of salmon in that adults typically arrive in early spring (April), hold all summer in the upper flows while not eating, before spawning in late fall (September - October) and dying.



U.S. Fish and Wildlife Service and California Department of Fish and Wildlife conducted surveys in Reach 1 to evaluate the summer holding behavior, spawning habitat, egg survival, emergence rates, and incubation habitat quality. Acoustic telemetry tags were implanted in hatchery adult broodstock and naturally returning spring-run to track their movements. Redd capping studies were conducted in Reach 1 which involved covering the redds with a mesh screen, also referred to as an emergence cap. As the eggs hatch and the fry emerge from the gravel, the mesh screen captures the fry allowing Program to staff evaluate the quality of spawning habitat and calculate egg-to-fry survival; important metrics for measuring success toward meeting the Restoration Goal.

To count, study, tag and release migrating salmonids, the Program deploys rotary screw traps (large, rotating metal mesh cones placed in the river) in key locations of the San Joaquin River. This equipment allowed Program biologists to capture 409 juvenile spring-run Chinook salmon from November 1 through June 30 in 2018- 2019, and 10,796 in 2019-2020. The traps can help determine not only the number of fish, but also survival rates, migration timing, life history migration strategies, salmon production relationships among river flows and temperature, and an overall view of which river locations are preferred by rearing juvenile salmon. All of this information will help the Program better understand what is needed to bring a naturally reproducing and self-sustaining, salmon population back to the river.





## OTHER ANADROMOUS NATIVE SPECIES



White sturgeon capture in steel fyke nets installed in Reach 5.

Incidental catches of other fish species have occurred during the 2019 and 2020 sampling. In March 2019, a 1.5-meter-long white sturgeon was captured in a fyke trap placed in the San Joaquin River approximately 350 meters upstream from the confluence with the Merced River. The healthy sturgeon was released and swam away freely upstream of the fyke trap.

In April 2020, both a green and a white sturgeon were captured in a fyke trap as part of adult salmonid monitoring in the San Joaquin River near the confluence with the Merced River. This is the first documented green sturgeon in the main stem San Joaquin and in the Restoration Area. Pacific lamprey were captured in both years using rotary screw traps. These fish are a California state species of special concern.

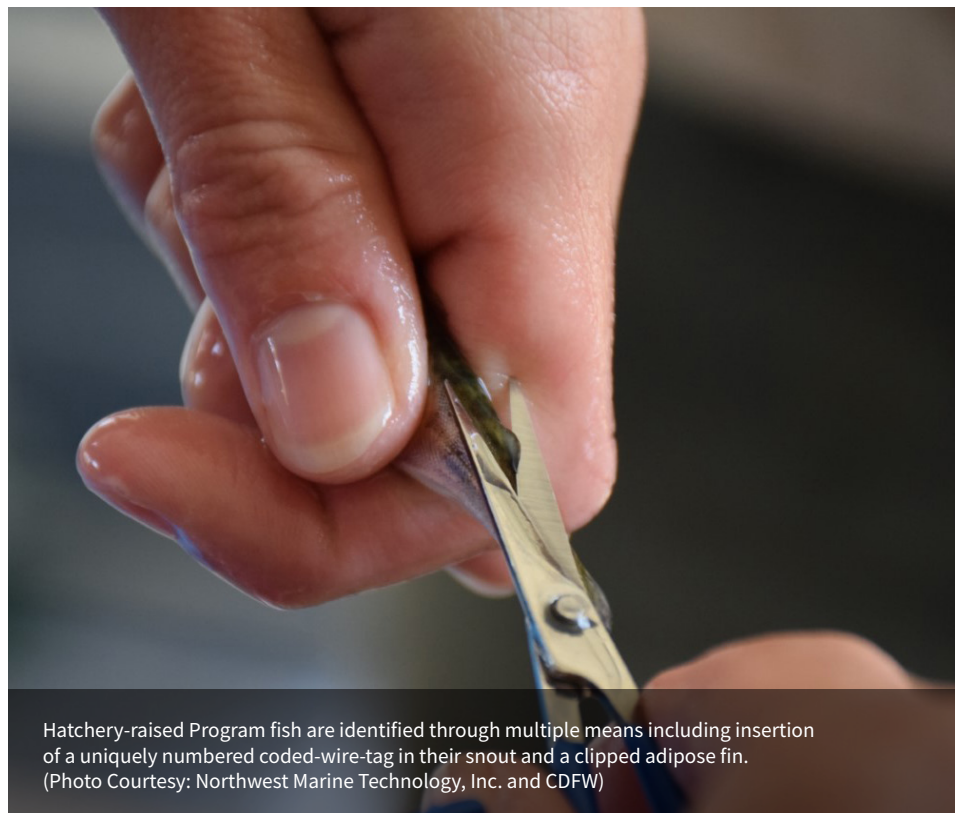
Like salmon, sturgeon and Pacific lamprey are native anadromous species, spawning in freshwater and migrating as juveniles to the ocean to rear before returning to freshwater.

After being caught in the rotary screw trap, the juvenile fish are measured, weighed, and have a tiny tissue sample taken for genetic identification before being released back to the river. The genetic information helps Program biologists determine the parentage of each fish in the river. The value of this information is two-fold: a better understanding of which fish have the genetics for the greatest chance of survival in the San Joaquin River ecosystem and, the ability to track the fish back to a specific redd to analyze which locations have the best survival rates and why. Additional fish reintroduction activities included several juvenile fish releases into the Restoration Area in 2019, consisting of a release of 211,025 spring-run Chinook salmon, and 10,451 yearlings. Juvenile releases in 2020 included a release of 243,059 juvenile spring run and 5,094 yearlings.

For monitoring purposes, all released fish were adipose fin-clipped and coded wire tagged and yearlings were implanted with Passive Integrated Transponder (PIT) tag.

To support ongoing efforts to restore and maintain fish populations in the Restoration Area, construction of the new SCARF began in spring of 2017, adjacent to the existing San Joaquin Hatchery, located one mile downstream of Friant Dam. Construction of the new SCARF is projected to be completed in 2022. The facility will be able to produce up to 1.25M juvenile spring-run Chinook salmon annually in order to help recolonize the Restoration Area.

Between December 1 and April 30, in both 2019 and 2020, Reclamation conducted a steelhead monitoring and detection plan in the Restoration Area using electrofishing, fyke traps, and trammel nets (2020 only). There were no steelhead detected in either year.



Hatchery-raised Program fish are identified through multiple means including insertion of a uniquely numbered coded-wire-tag in their snout and a clipped adipose fin. (Photo Courtesy: Northwest Marine Technology, Inc. and CDFW)



## WATER MANAGEMENT

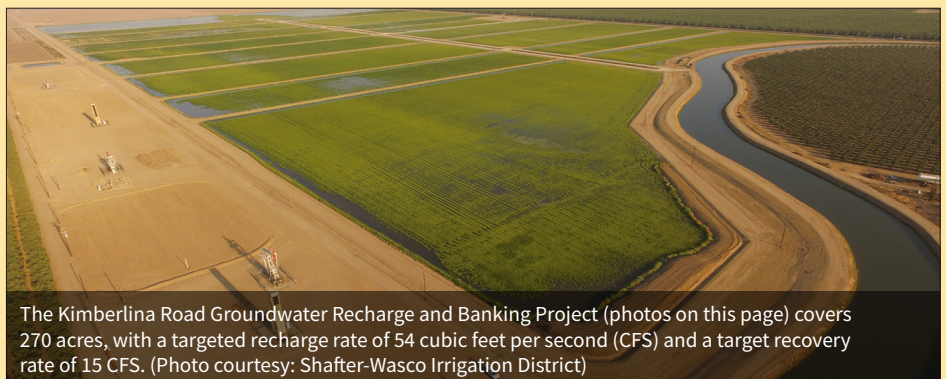
**FRIANT-KERN CANAL CAPACITY CORRECTION PROJECT:** The Friant-Kern Canal (FKC) delivers water to more than one million acres of highly productive farmland. However, a 33-mile section of the 152-mile-long facility within the Tulare and Kern Counties, has experienced a 60 percent loss in conveyance capacity due to widespread land subsidence and other factors. To address the capacity loss, and support the Water Management Goal of the Program, Reclamation and the Friant Water Authority (FWA) have partnered on the FKC Middle Reach Capacity Project. The project is intended to restore original design capacity of the canal in affected reaches.

**RECAPTURE AND RECIRCULATION:** Recapture of Restoration Flows in 2019 and 2020 took place at the Mendota Pool and at existing facilities on the lower San Joaquin River owned by Banta-Carbona and Patterson Irrigation Districts. The amount of Restoration Flows recaptured each year depends on hydrologic conditions, the availability of Restoration Flows, and capacity at pumping and conveyance facilities. Reclamation recaptured approximately 25,540 acre-feet in 2019 and 23,350 acre-feet in 2020.

## FINANCIAL ASSISTANCE FOR GROUNDWATER BANKING FACILITIES

Groundwater banking and recharge projects are designed to help offset the water supply impacts to Friant Contractors from the release of Restoration Flows, as outlined in the Settlement and Settlement Act. The projects capture water that would otherwise go downstream in wet years and store it underground for future extraction in lieu of surface diversions during dry years. These projects also have benefits for drought relief, as they improve the region’s collective capability to capture water supplies in wet years and store it underground, offsetting the effects of surface diversions in future droughts and potential subsidence as a result of overpumping groundwater. The SJRRP provided approximately \$7 million in financial assistance to support three groundwater management projects. In total, these projects will offset approximately 300,000 acre-feet of water supply reduction over their 30 year life cycle, as well as provide additional local groundwater management benefits.

Project	Sponsor	Total Project Cost (Millions)	Partner Cost Share Funding (Millions)	Status
<b>CORDENIZ BASIN GROUNDWATER STORAGE PROJECT/CONJUNCTIVE EXCHANGE PROGRAM</b>	Tulare Irrigation District	\$3.8	\$1.9	Construction Complete
<b>PORTERVILLE IN-LIEU PROJECT SERVICE AREA 1&amp;2</b>	Porterville Irrigation District	\$2.8	\$1.2	Construction Complete
<b>KIMBERLINA ROAD GROUNDWATER RECHARGE &amp; BANKING</b>	Shafter-Wasco Irrigation District	\$11.9	\$4.2	Construction Complete



The Kimberlina Road Groundwater Recharge and Banking Project (photos on this page) covers 270 acres, with a targeted recharge rate of 54 cubic feet per second (CFS) and a target recovery rate of 15 CFS. (Photo courtesy: Shafter-Wasco Irrigation District)

### MONITORING AND ANALYSIS

Monitoring and analysis activities are an important part of planning, implementing, and evaluating the SJRRP. Every year, the Program has a variety of annual and multi-year studies under way in all aspects of Program planning and implementation. The following descriptions summarize some of the important studies and monitoring that took place in 2019 and 2020.

#### Flow Conveyance and Fish Passage

Evaluation and monitoring studies were conducted for many features that affect the capacity to manage irrigation flows, Restoration Flows, and flood flows in the river channel. These studies included levee seepage and stability evaluations in Reach 2A, Reach 4A, and the Middle Eastside Bypass; the effects of varied vegetation types in the river channel on flows; water surface elevation monitoring; subsidence impacts on flows and channel capacity; and modeling of channel seepage of Restoration Flows.

Studies also reviewed and modeled potential non-structural barriers for fish migration, including critical riffle depths, temperature barriers, and false migration pathways, such as agricultural drains and tributaries to the river. In August 2019 through September 2019, studies were conducted that included conducting supplemental topographic surveys, photography to understand how the flows are receding, flow measurements, and water surface elevation measurements. The results were used to determine flow thresholds to meet different flow connectivity and ecological objectives, such as fish passage.

#### Spawning, Incubation, and Rearing Habitat

Many of the studies related to salmon spawning, incubation, and rearing are being conducted in Reach 1. These studies include evaluating the effects of flows on the physical conditions to support salmon spawning, ongoing development of a model of habitats suitable for salmon spawning, monitoring the cold-water pool in Millerton Reservoir, and evaluating the emergence and survival of salmon and river conditions.

Other studies in Reach 1 focus on sediment movement effects on habitat suitability, including the impact of flows on fine silt deposition, flow forces needed to mobilize sediment of the appropriate size to support salmon spawning beds, use of advanced acoustic technology to monitor movement of cobble- and gravel-sized sediment, sediment transport in two major tributaries below Friant Dam, and sand accumulation in spawning areas.

Two other studies look beyond Reach 1, including sediment monitoring in Reach 2A and 2B to support forecasts for reach response following levee setbacks and re-surveying Reach 1 and 2 channel cross sections to identify changes in channel geometry and substrates resulting from Restoration Flows. Channel conditions following each flow season were documented with photographs.



#### FISH TAGGING

The SJRRP provided 700 fish to researchers at the University of California Davis to conduct an experiment evaluating the movement and survival of juvenile fish originating from the Restoration Area. These fish are tagged with acoustic transmitters which allows the researchers to determine the location and movements of tagged fish. This project provides SJRRP with important information about the effects of environmental conditions on fish health, reach-specific sources of mortality, and route selection as juvenile fish emigrate from the Restoration Area, through the Delta, and into the San Francisco Estuary.

# SECTION 4: PUBLIC INVOLVEMENT AND OUTREACH

Section 4 describes SJRRP's efforts to inform and engage the public.

## SJRRP PUBLIC OUTREACH ACTIVITIES

- Landowner Coordination
- Technical Feedback Groups
- Public Review of Program Documents
- Stakeholder Briefings
- Press Releases and Media Advisories
- Program Informational Materials
- Community Events

The SJRRP public outreach program provides a wide variety of public outreach activities intended to promote both informational mechanisms for stakeholders, including members of the general public, the media, landowners, elected officials and others, and opportunities for those stakeholders to provide input towards key aspects of the Program. These activities are guided by a Public Involvement Plan, a document that describes how the five federal and state agencies implementing the SJRRP would inform and involve all levels of the community with the Program. Effective communication and coordination ensures that stakeholders and the general public are informed and have an opportunity to provide meaningful input.

## LANDOWNER COORDINATION

Landowner coordination is a critical component of the Program's public outreach efforts. Within the Restoration Area, there is a diverse array of residential, agricultural, commercial, non-profit, and local, state and federal government agency landowners and managers. A proactive coordination effort with landowners affected by the Program ensures that property owners are aware of Program activities in their area, have meaningful input on the activities that affect their property, and learn how such Program activities contribute to the Settlement Act.

The Program frequently has dozens of studies and field activities under way at a given time, including biological investigations, water quality and aquatic invasive species sampling, and studies to better understand salmonid spawning habitat quality and the efficiency of the salmon trap and transport efforts.

The Program also investigates the physical integrity of the river system through levee penetration surveys, geological investigations and topographic surveys of various reaches, and subsidence monitoring surveys. In combination, these surveys provide data about project areas that support the design of Program elements, such as seepage mitigation, revegetation, Restoration Flows, fish reintroduction, permitting, and environmental review of proposed projects.

## SJRRP SCIENCE MEETING

In 2020, the SJRRP held its fourth SJRRP Science Meeting on October 14 and 15. The objective of the Science Meeting is for those conducting scientific research and monitoring for the Program to showcase their discoveries, as well as provide an opportunity for stakeholders to learn more about the survey methods, results, and application to the Restoration and Water Management Goals. Due to the COVID-19 pandemic, the two-day event was held virtually and featured 30 speakers and 230 attendees. The event included two panel sessions, seven detailed presentations, 13 five-minute "pop-up" presentations, and 18 poster presentations. A video of the meeting, as well as presentation materials and posters, was posted on the Program website and can be accessed at: <https://www.restoresjr.net/science/science-meeting/>. Topics covered during the meeting included salmon reintroduction, flow modeling, Airborne Snow Observatory, progress on Stage 1 fish passage projects at Mendota Pool, Sack Dam and the Eastside Bypass, isolation of abandoned gravel mining pits, and a variety of other topics.

**Water Temperature Limitations - 2019**

Criteria From Figure 9 of the Fisheries Framework 2017.  
\* Month Range modified

Life Stage	Threshold	Temperature Range	Month Range
Adult Holding	Optimal	< 13.0°C (55°F)	
	Critical	17.0 - 20.0°C (62.6 - 68.0°F)	Apr - Aug*
Spawning	Optimal	< 13.0°C (55°F)	
	Critical	15.5 - 17.0°C (60.0 - 62.6°F)	Sept - Nov*

2020 SJRRP Science Meeting was held virtually as a COVID-19 precaution.

## 4: PUBLIC INVOLVEMENT AND OUTREACH

Where such activities occur on private property or state/federal refuges, the Program's Landowner Coordinator assists Implementing Agencies and their support staff by securing access and exchange information between the SJRPP and affected property owners.

In advance of surveys, studies, or other field activities, the Program provides owners and their representatives detailed information on planned activities and responds to any issues or concerns. Where substantive activities occur, the Program prepares and posts field activity advisories to the Program website. In addition, as the Program moves into more construction-focused activities, the Program has real estate interests on lands within the Restoration Area required to support various projects. Coordination with the owners and managers of these lands is a critical component of the planning process. The Program real estate team and landowner coordination team work closely together to ensure all parties are well informed and negotiations are able to take place. In 2019/2020, these coordination activities led to total land area acquired in fee title or via seepage easements by the Program to reach 9,453 acres.

In specific areas, the Program coordinates with landowners on the planning and design of channel improvements and other restoration activities. In 2019, the Program continued its engagement with landowners for the location of new levees and agricultural irrigation facilities planned for the Mendota Pool Bypass and Reach 2B Improvements Project.

While no substantial interruption of salmonid spawning habitat quality and the efficiency of the salmon trap and transport efforts occurred in 2020, many planned field activities were deferred by the Program in response to staff and public health concerns posed by COVID-19. These deferred studies are anticipated to resume in full in mid to late 2021.

### TECHNICAL FEEDBACK GROUPS

Technical Feedback Groups (TFG) assist Program staff with soliciting input from technical experts, interested stakeholders and the general public. The meetings provide an open and transparent process for the development of key Program strategies, documents, and implementation activities. There are currently three TFGs: Restoration Goal, Seepage and Conveyance, and Water Management Goal. The conduct of TGF meetings were limited in 2019 and 2020 due, in part, to California Governor Gavin Newsom's March 4, 2020, declaration of a State of Emergency as a result of COVID-19 (Executive Order N-33-22). The Water Management Goal TFG held four Part III workshops in 2019 and 2020. The Seepage and Conveyance TFG met on January 24, 2019. No meetings for the Restoration Management Goal TFG were held.

#### WATER MANAGEMENT GOAL TECHNICAL FEEDBACK MEETINGS

##### PART III WORKSHOP

2019	January 22
	March 29
	May 31
	September 27
2020	January 21

### TOURS

The SJRRP regularly conducts Program informational briefings and tours with elected officials, government agencies, stakeholders, and interested organizations to report on the progress of the Program, discuss Program activities and solicit feedback.



To increase awareness and understanding of restoration activities, the Restoration Program Office partners with organizations such as the Water Education Foundation to conduct educational tours of the Restoration Area.

## 4: PUBLIC INVOLVEMENT AND OUTREACH

Reclamation also partners with the Water Education Foundation, an impartial non-profit organization founded in 1977 that offers educational materials, tours of key watersheds leadership training and other events. In 2019 and 2020, the SJRRP co-sponsored two water tours. The 2019 SJRRP Water Tour, as well as the separate Central Valley Water Tour, included presentations by Program Manager Donald Portz, PhD, and stops at the state’s major water infrastructure such as Friant Dam and San Luis Reservoir. In response to the COVID-19 pandemic, the Foundation held all of its 2020 tours “virtually.” At up to three hours in length, these events featured pre-recorded, on-site interviews with Program staff and key stakeholders.

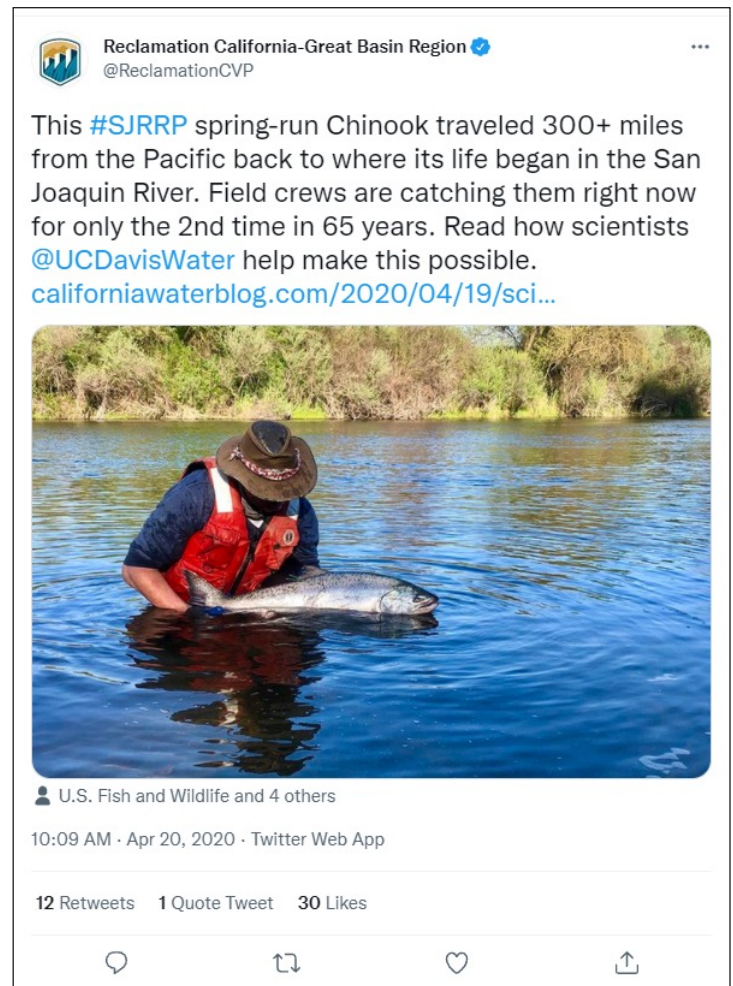
These virtual tour included “stops” at Friant Dam, San Joaquin River hatchery, Scout Island salmon monitoring area, Chowchilla Bifurcation Structure, Mendota Pool, area farmlands, San Luis National Wildlife Refuge, and the San Joaquin River and Merced River confluence at Hills Ferry.

### PROGRAM INFORMATION MATERIALS AND MEDIA RELATIONS

The SJRRP manages a website to house Program information including key Program documents and to highlight major Program accomplishments and milestones. The website is a key conduit of information for stakeholders, including the general public. The Program works to generate original content for the website, including media-ready stories on Program focal-points. Topics in 2019 and 2020 included overviews of the 2019 and 2020 fish returns, coverage of the science meeting, water contractor benefits provided through the Water Management Goal, and Reach O levee improvements. Additional web pages included the 2020 SJRRP Science Meeting and the Reach O Levee Project.

The Program also continues to increase its presence on social media platforms, working closely to highlight Program success using the California Great Basin Region public affairs office and the social media sites it oversees. Tweets about the fish returns were particularly popular.

In addition, the Program works with various media outlets to promote Program activities, answer questions from the press and to encourage coverage of key Program developments. Media relations activities conducted by Program staff have increased awareness of Program achievements with local and regional media outlets including The Fresno Bee as well as other outlets including podcasts, blogs and other news sources.



# SECTION 5: PROGRAM COSTS AND FUNDING

Section 5 details the budget and funding for 2019-2020 for the San Joaquin River Restoration Program.

## COST CONSIDERATIONS

From the federal perspective, a majority of costs to implement the SJRRP come from federal appropriations and the San Joaquin River Restoration (SJRR) Fund.

These funds are used to continue implementation of significant actions in the Settlement.

While currently \$88 million is available for expenditure from the SJRR Fund, after October 1, 2019, additional funds will become available without Congressional action. Federal appropriations in the amount of \$35 million are available for the Mendota Pool Bypass and Reach 2B Channel Improvements Project, Arroyo Canal Fish Screen and Sack Dam Fish Passage Project, and Seepage Projects.

Annual federal appropriations have ranged from \$28.2 million to \$38.3 million, not including \$2 million in funds from the Central Valley Project (CVP) Restoration Fund.

Overall, the SJRRP will be funding constrained, and activities will be subject to the amount of appropriated funds.

## AUTHORIZATION AND FUNDING

Federal participation in the SJRRP is authorized under the Central Valley Project Improvement Act and the Settlement Act, part of the Omnibus Public Land Management Act of 2009, Public Law 111-11. The Central Valley Project Improvement Act, signed in 1992, included provisions for the potential restoration of the San Joaquin River and authorized planning and environmental compliance for such activities. The Settlement Act, signed in March 2009, authorizes and directs the Secretary to implement the Settlement. Federal funding obligated for the SJRRP was \$35 million in fiscal year 2019 and \$38.8 million in fiscal year 2020.

The State has committed its support to the Settlement by entering into a Memorandum of Understanding (MOU) with the Settling Parties that outlines its collaborative role in the planning, design, funding, and implementation of the actions set forth in the Settlement. The State has committed to contributing approximately \$200 million for projects that directly contribute to the restoration efforts. California Propositions 84 and 1E, passed by the voters in 2006, provide a portion of these funds.



Reclamation initiated biannual subsidence surveys in the Restoration Area after a 2009 LiDAR evaluation by DWR identified widespread land subsidence caused by groundwater overdraft. This land subsidence has been a significant contributor to design delays, and increased project costs, to build fish passage structure at Sack Dam.

## SJRRP ANNUAL REPORT: ANNUAL BUDGET TABLE FOR 2019-2020

FEDERAL FUNDS	FISCAL YEAR 2019	FISCAL YEAR 2020
<b>Reclamation<sup>1</sup></b>		
San Joaquin River Restoration Fund	\$9,789,417	\$10,686,228
Central Valley Project Restoration Fund	\$2,000,000	\$2,000,000
Federal Appropriations	\$35,000,000	\$38,275,040
<b>FEDERAL SUB-TOTAL</b>	<b>\$46,789,417</b>	<b>\$50,961,268</b>
<b>STATE OF CALIFORNIA FUNDS</b>		
<b>Department of Fish and Wildlife</b>		
Proposition 84	\$2,075,848	\$1,826,137
<b>Department of Water Resources</b>		
Proposition 84	\$2,010,578	\$1,669,998
Proposition 1E	\$563,720	\$189,322
Proposition 1	\$567,745	\$7,497,544
<b>STATE SUBTOTAL</b>	<b>\$5,217,891</b>	<b>\$11,183,001</b>
<b>TOTAL</b>	<b>\$52,007,308</b>	<b>\$62,144,269</b>

NOTES: 1. Includes funding for USFWS and NMFS participation.

State Fiscal Year is from July 1 to June 30; Federal Fiscal Year is from October 1 to September 30.

# SECTION 6: LOOKING FORWARD

**Section 6 outlines the San Joaquin River Restoration Program's path and progress to meeting the Settlement and Settlement Act.**

## MAINTAINING MOMENTUM

Given the Funding Constrained Framework, the major focus will be initiation of construction for Stage 1 fish passage projects and assisting Friant Division contractors of the Central Valley Project. As these milestones are achieved, the Program will focus on implementation of Settlement activities as new funding becomes available. This includes the Reach 4B flow routing decisions and increased in-channel capacities.

### Stage 1 Restoration Goal Activities

Looking forward to 2021 and 2022, the Program aims to complete updated designs for fish bypasses, control structures and fish screens at Mendota and Sack Dams. A key decision from the Implementing Agencies and Settling Parties was a policy-level agreement that Stage 1 projects — where feasible and practicable — would be designed and operated independent of other water management structures that are owned and operated by third-parties. Such measures reduce design complexity by avoiding structures that mingle fish passage and water distribution requirements; reduces long-term operation and maintenance costs for the Program; and avoids impacts to existing or future water management facilities.



A majority of juvenile spring-run Chinook salmon reared at the interim Salmon Conservation and Research Facility in Friant, California will continue to be released to the lower reaches of the San Joaquin River until key Stage 1 Restoration Goal projects are complete.

The Program, in partnership with DWR, additionally anticipates it will initiate modifications to the Eastside Bypass Control Structure for fish passage in 2021 or 2022. Referred to as the Rock Ramp Project, the efforts at the Eastside Bypass Control Structure will include removal of stop logs, water dissipation structures, notching of the weir's spillway, and construction of a rock "ramp" that mimics a natural river channel. Work will be done in close coordination with the Lower San Joaquin Levee District, the California Department of Fish and Wildlife, and the U.S. Fish and Wildlife Service.

As described in the Mendota Pool Bypass and Reach 2B Improvements Project Draft Environmental Impact Statement/ Report (Sept. 2019), the Project is anticipated to create \$16.1 million in labor income annually over the construction period. This income stems from an estimated 100 construction jobs near Mendota and the indirect support of more than 140 jobs during construction. In addition, operations expenditures would support about \$600,000 in labor income annually and 12 jobs over the long-term. The overall project will benefit multiple stakeholders, including farmers, cities, recreationalists, and the environment.

Additional focus projects for 2021 include, but are not limited to:

- Purchase of additional seepage easements to increase channel capacity and protect landowners.
- Purchase of remaining parcels in Reach 2B required for construction of floodplain habitat and river levees as called for in the Mendota Pool Bypass and Reach 2B Improvements Project.
- Removal of the Upper Weir on the Eastside Bypass, in coordination with Merced National Wildlife Refuge.



# SECTION 6: LOOKING FORWARD



## Stage 1 Water Management Goal Activities

As California braces for another potential drought year in 2021, Reclamation and FWA continue to focus on restoring capacity deficiencies in the Friant-Kern Canal as a component of the Water Management Goal. In early 2022, Reclamation and FWA anticipate issuing construction contracts to build a new, parallel canal to the existing Friant-Kern Canal under the Friant-Kern Canal Middle Reach Capacity Correction Project provided funding is determined. This construction will occur after Reclamation and FWA complete acquisition of additional Right-of-Way from private landowners, CVP Friant Division contractors and the City of Porterville in 2021.

In addition to the milestone actions described above, the Program will continue its ongoing actions which include coordinating flow, fish, and seepage monitoring efforts; establishing channel capacity recommendations via the Channel Capacity Report; managing Restoration Flows in coordination with the Restoration Administrator; and overseeing general administration of the Program. The integration of ongoing activities and upcoming milestone achievements will continue to move the Program closer to accomplishing the Stage 1 goals from the Funding Constrained Framework.



Balancing water supplies to meet the Restoration and Water Management Goals helps ensure successful spawning which ends this spring-run Chinook salmon's 300+ mile journey to Reach 1 of the Restoration Area.

**SAN JOAQUIN RIVER**  
RESTORATION PROGRAM



**FOR MORE INFORMATION**

Josh Newcom  
Public Affairs Specialist  
(916) 978-5109

Craig Moyle  
Landowner Coordination  
(916) 418-8248

2800 Cottage Way, Room W-1727  
Sacramento, CA 95825

[www.restoresjr.net](http://www.restoresjr.net)  
 @sanjoaquinresto