

San Joaquin River Restoration Program



Program Overview

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Water Education Foundation
Central Valley Tour
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BACKGROUND



Pacific Ocean

Sacramento-San Joaquin Delta

San Joaquin

Cosumnes

Mokelumne

Stanislaus

Tuolumne

Merced

Fresno

Fresno Slough

Hanford

Tulare Lakebed

Kern River Flood Channel

Fresno

Kings

Tulare

Delano

Bakersfield

Buena Vista

Visalia

St. Johns

Lake Success

White

Poso Cr.

Kern

South Fork Kern

Lake Isabella

Wishon Reservoir

Mammouth Pool Reservoir

Don Pedro Reservoir

New Melones Lake

Tullock Reservoir

Eastman Lake

Hidden Lake

Millerton Lake

Chowchilla

Mariposa Cr.

Bear Cr.

San Luis Reservoir

East Side Bypass

San Joaquin

Middle Fork

South Fork

Cherry Cr.

Herch Family Reservoir

Claver

Middle Fork Stanislaus

Sutter Cr.

Gamache Lake

Salt Springs Reservoir

Calaveras

Lodi

Stockton

Modesto

Turlock

Merced

San Luis Reservoir

San Joaquin Delta

Pacific Ocean



- Reaches of the San Joaquin River under evaluation include the following:**
- **Reach 1** – Friant Dam to Gravelly Ford
 - **Reach 2** – Gravelly Ford to Mendota Dam
 - **Reach 3** – Mendota Dam to Sack Dam
 - **Reach 4** – Sack Dam to the confluence of Bear Creek and the Eastside Bypass
 - **Reach 5** – Eastside Bypass/Bear Creek confluence to the Merced River confluence





- Construction begins on Friant Dam in 1939.

- Built for water supply to downstream users and secondary uses for flood control and recreation.

- 520,000 acre-feet, 15 miles north of Fresno, CA

• Friant Dam completed in 1942 as part of the Central Valley Project, effectively trapping the full flow of San Joaquin River.

• Historic spawning habitat of largest and southern-most spring-run Chinook salmon eliminated.

• Spring-run extirpated from the river.



Settlement History

Fast forward 46 years...

1988

Lawsuit filed challenging Reclamation's renewal of the long-term contracts with Friant Division contractors

2004

Federal Judge rules Reclamation violated Section 5937 of the California Fish and Game Code:

“The owner of any dam shall allow sufficient water at all times to pass through a fishway, or in the absence of a fishway, allow sufficient water to pass over, around or through the dam, to keep in good condition any fish that may be planted or exist below the dam...”





Settlement History

2005

Settlement negotiations
reinitiated

2006

Settlement reached;
implementation begins

2009

Federal legislation enacted
(Public Law 111-11) to fund the
Program





The “Players”

Settling Parties

- NRDC Coalition
 - 14 organizations
- Friant Water Authority
 - 17 water agencies intervened
- Federal Government
 - Department of the Interior
 - Bureau of Reclamation
 - Fish and Wildlife Service
 - Department of Commerce
 - National Marine Fisheries Service
- State of California
 - Department of Water Resources
 - Department of Fish and Wildlife
- Restoration Administrator
- Third Parties



Implementing Agencies



Settlement Goals

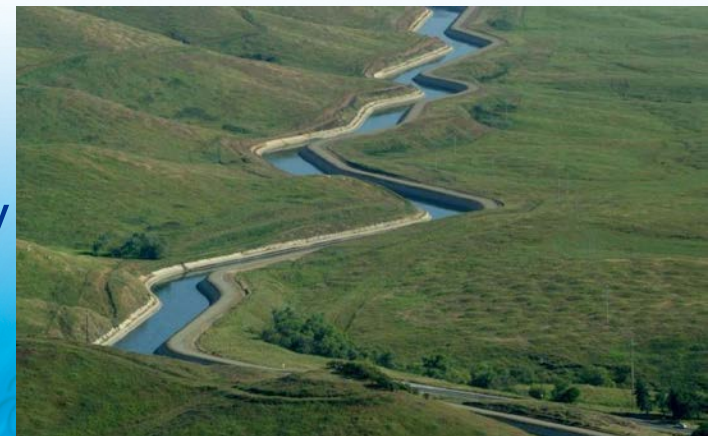
- **Restoration Goal**

- To restore and maintain fish populations in “good condition” in the main stem of the San Joaquin River 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 of the Friant Division long-term contractors that may result from the Interim Flows and Restoration Flows provided for in the Settlement.



Key Restoration Goal Activities

- Increase flows from Friant Dam
- Improve channel and structures to convey flows and improve fisheries habitat
- Reintroduce spring-run and fall-run Chinook salmon



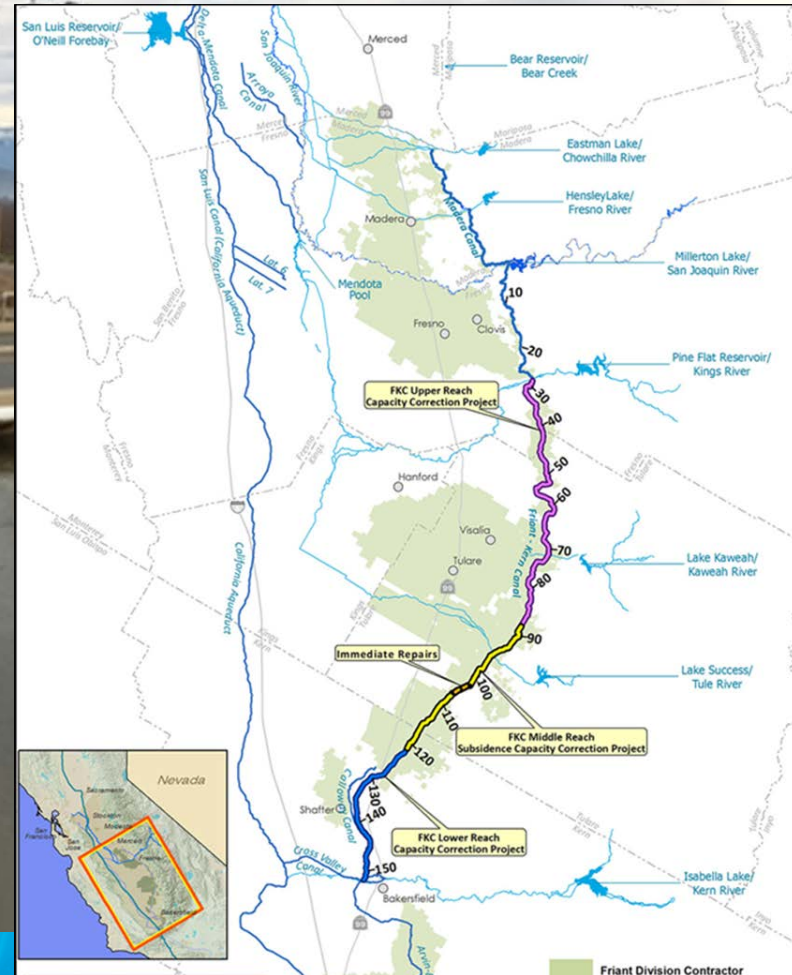


Key Water Management Goal Activities

- Water Accounting and Recovery
 - Restoration Flow Guidelines (Completed 12/2013)
 - Recapture and re-circulate Restoration Flows
- Physical Projects
 - Friant-Kern Canal Capacity Correction
 - Madera Canal Capacity Correction
 - Friant-Kern Canal Reverse Flow
 - Part III Groundwater Projects



Key Water Management Goal Activities



Key Water Management Goal Activities

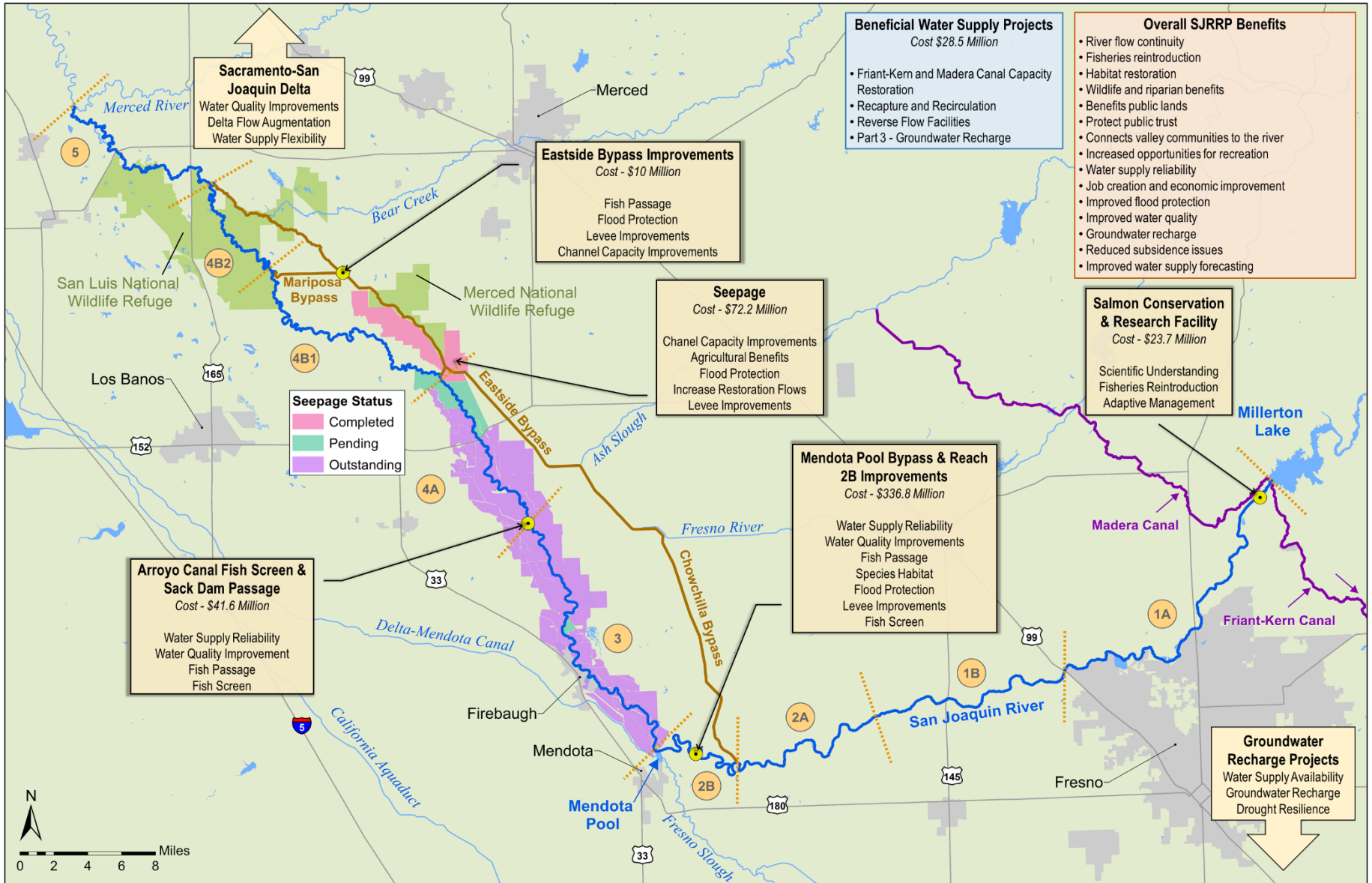


Key Guiding Program Documents

How Restoration and Water Management goals are implemented:

- Settlement & Act (legally binding)
- 2015 Revised Framework for Implementation
 - Provides timeline for Program implementation in 5-year increments
- 2017 Fisheries Framework
 - Outlines fish reintroduction strategy
- 2017 Funding Constrained Framework
 - Program priorities into next decade given budgetary constraints (through 2024)

San Joaquin River Restoration Program Cost & Benefits Map



Funding Constrained Framework - Stage 1: FY 2017 to FY 2024

- **Goal: Beginning the reestablishment of spring-run and fall-run Chinook salmon**
- **Construction / completion of the following:**
 - Mendota Pool Bypass, Fish Screen, and Reach 2B Project
 - Seepage and levee stability projects to achieve up to 2,500 cfs capacity in all reaches
 - Arroyo Canal Fish Screen and Sack Dam Fish Passage Project
 - Conservation Facility construction
 - Fish passage and levee improvement actions in the Eastside Bypass
 - Friant-Kern Canal and Madera Canal Capacity Restoration projects



Funding Constrained Framework - Stage 1: FY 2015 to FY 2024

Total Stage 1 Costs	\$643,255,000
Federal Stage 1 Costs	\$540,912,000
Federal Stage 1 Funding Authorized	\$525,745,000
Federal Stage 1 Shortfall	(\$15,166,000)
State Stage 1 Costs	\$102,343,000
State Stage 1 Funding Authorized	\$93,709,000
State Stage 1 Shortfall	(\$8,634,000)



Funding Sources

Source

Amount

Friant Surcharge (average collected)	\$5.6 million/year
Recovered Water Account Receipts (average collected)	\$0.8 million/year
Unreleased Restoration Flows sales	\$23 million (est.)
Sales of Other Water and Property	\$0 to date
Friant Capital Repayment (est. collected)	\$225 million
Non-Federal Contributions	\$0 to date
CVPIA Restoration Fund (maximum)	\$2 million/year
New Federal Appropriations (maximum)	\$300 million
State Funding (stated commitment)	\$200 million

Deposited into the San Joaquin River Restoration Fund

Funding Constrained Framework - Stage 1: FY 2015 to FY 2024

2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
Seepage ~ 500 cfs*									
	Seepage ~ 700 to 900 cfs*								
		Seepage ~1,300 to 1,500 cfs*							
			Seepage - 1,500 cfs to 2,000 cfs*						
				Seepage - 2,000 to 2,250 cfs*					
				Seepage - 2,250 to 2500 cfs*					
	Reach O Levees- 1,070** to 2,500 cfs								
Mendota Pool Bypass and Reach 2B - 1,210 cfs to 2,500 cfs									
	Eastside Bypass Fish Passage Improvements								
			Arroyo Canal/ Sack Dam Project						
						★ Unimpeded Fish Passage			
								Stage 2	

* The magnitude of flow that is addressed by seepage actions are approximate and subject to change.

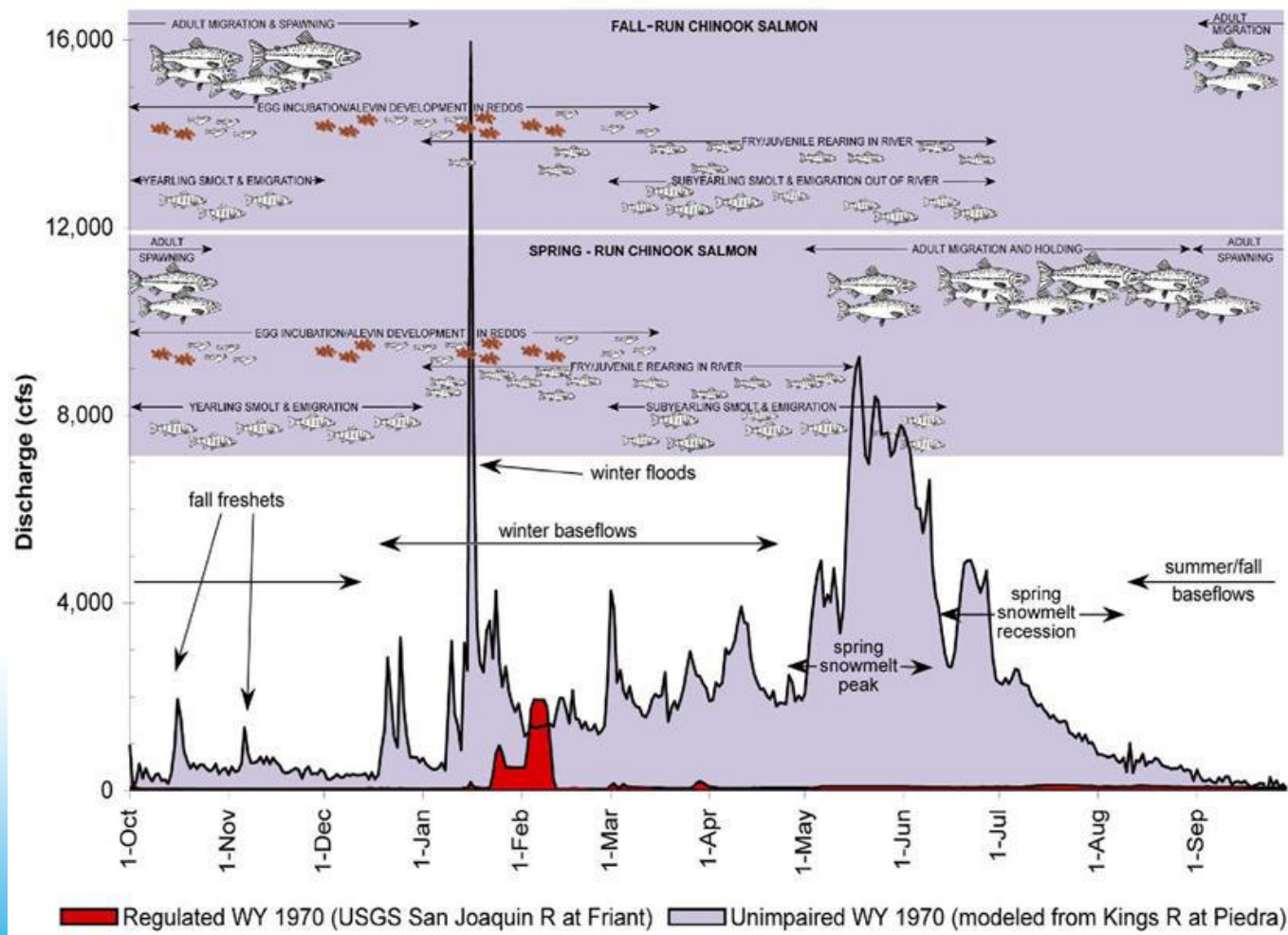
**This channel capacity assumes that the weir boards will be removed from the Merced National Wildlife Refuge weirs. With boards in the weirs, capacity is 580 cfs.



Flows



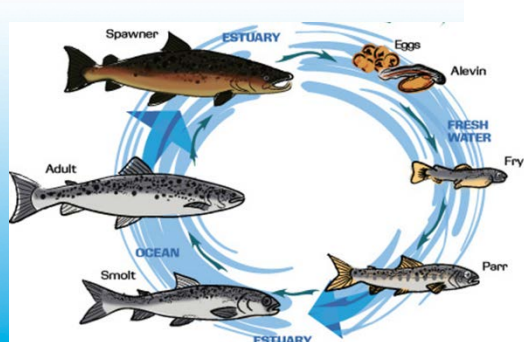
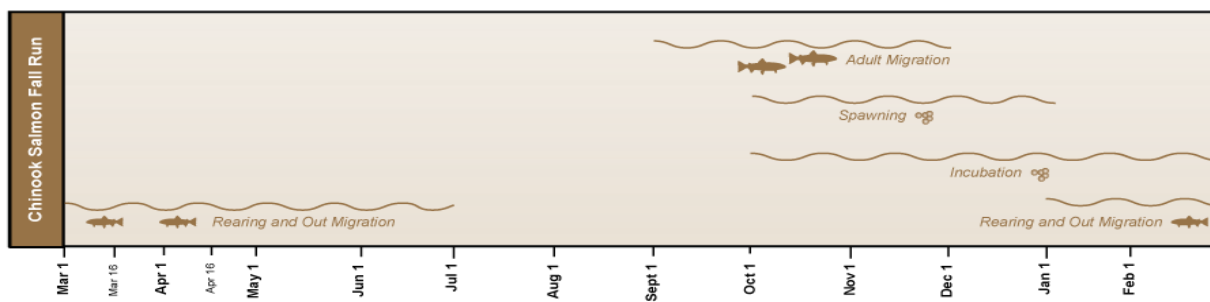
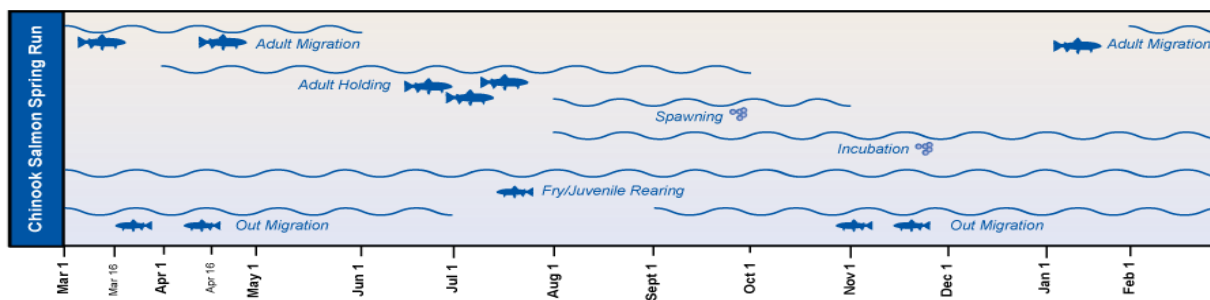
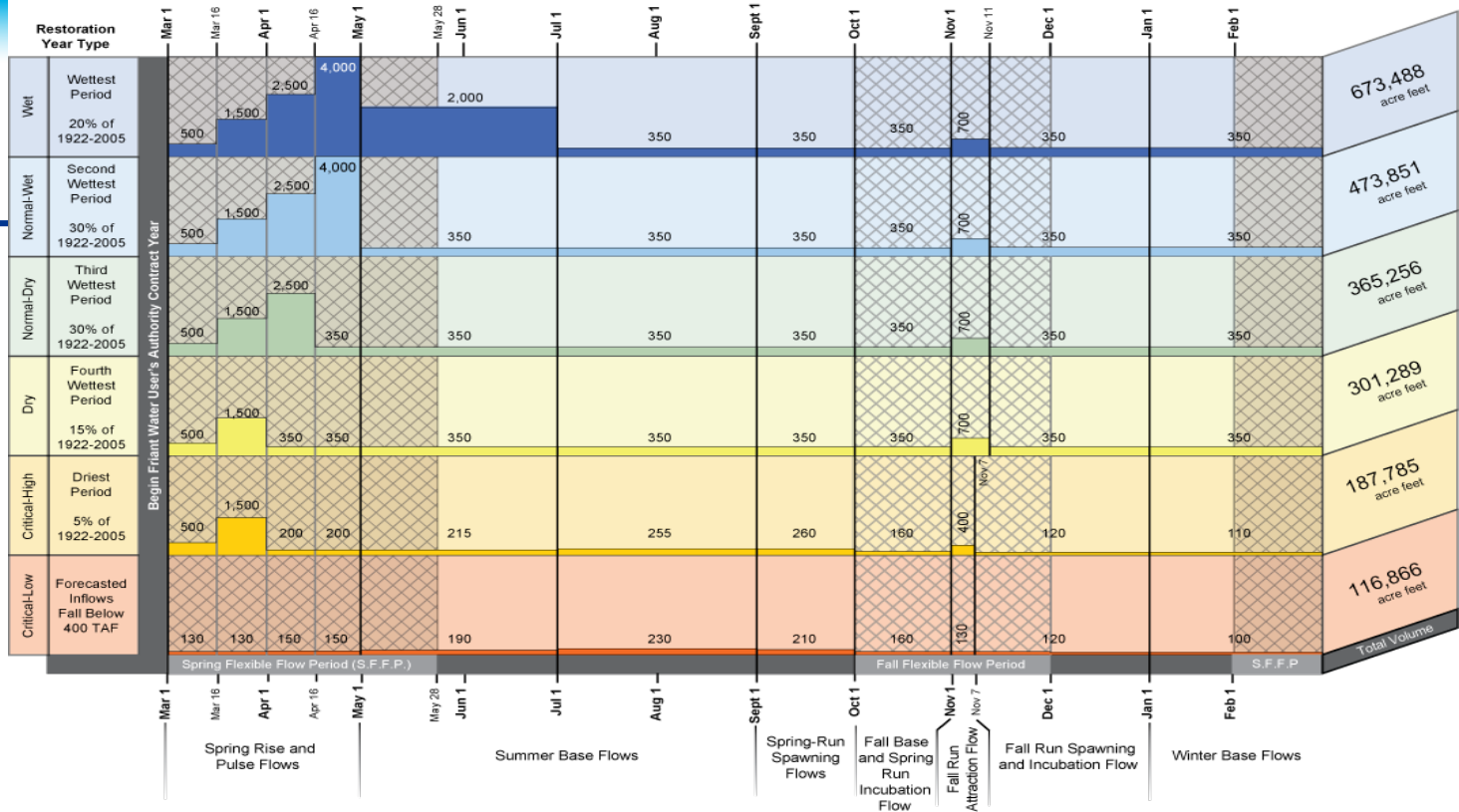
An Altered Hydrograph



Annual Unimpaired Hydrograph of San Joaquin River at Friant (modeled) and Regulated Flows at Friant (measured) for Approximately Average Water Year Conditions

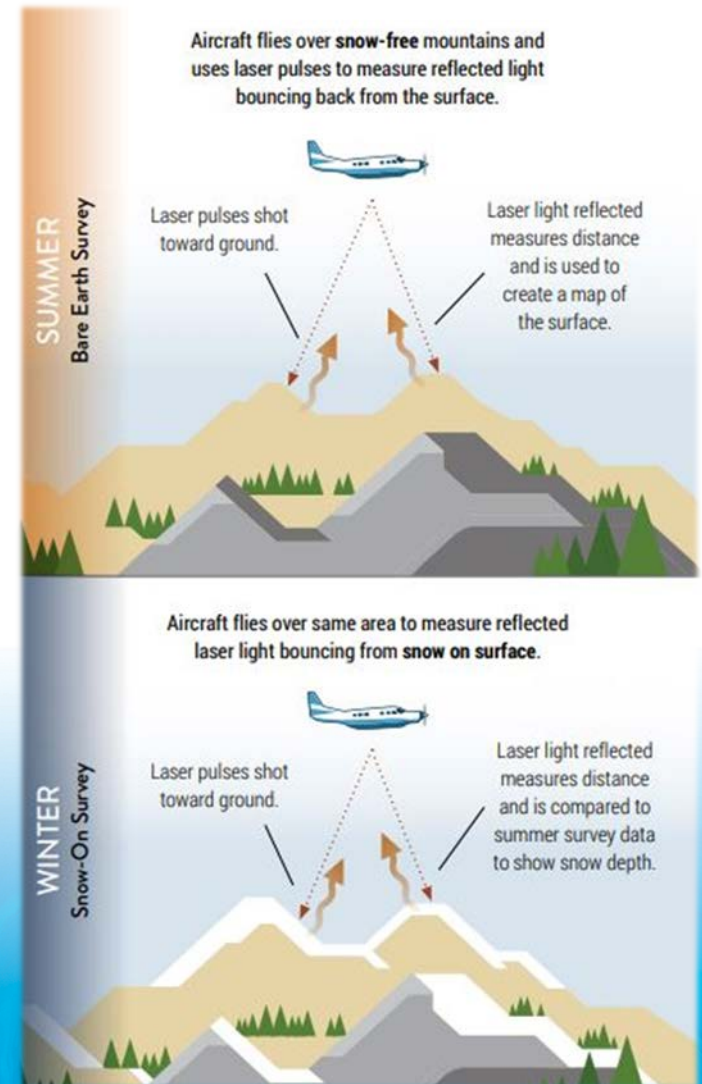
Friant Release Schedule with Fisheries Migration Timing

- Interim Flows began in 2009
- Restoration Flows began in 2014



Runoff Forecasting

- Determining how much water is available for flows is critical
 - Determines water year type
 - Restoration Flows
 - Water User availability
- Use a number of tools including:
 - Blended forecasts from DWR and NWS
 - NASA's Airborne Snow Observatory. Accurate and early warning of runoff addresses multiple challenges across all four realms





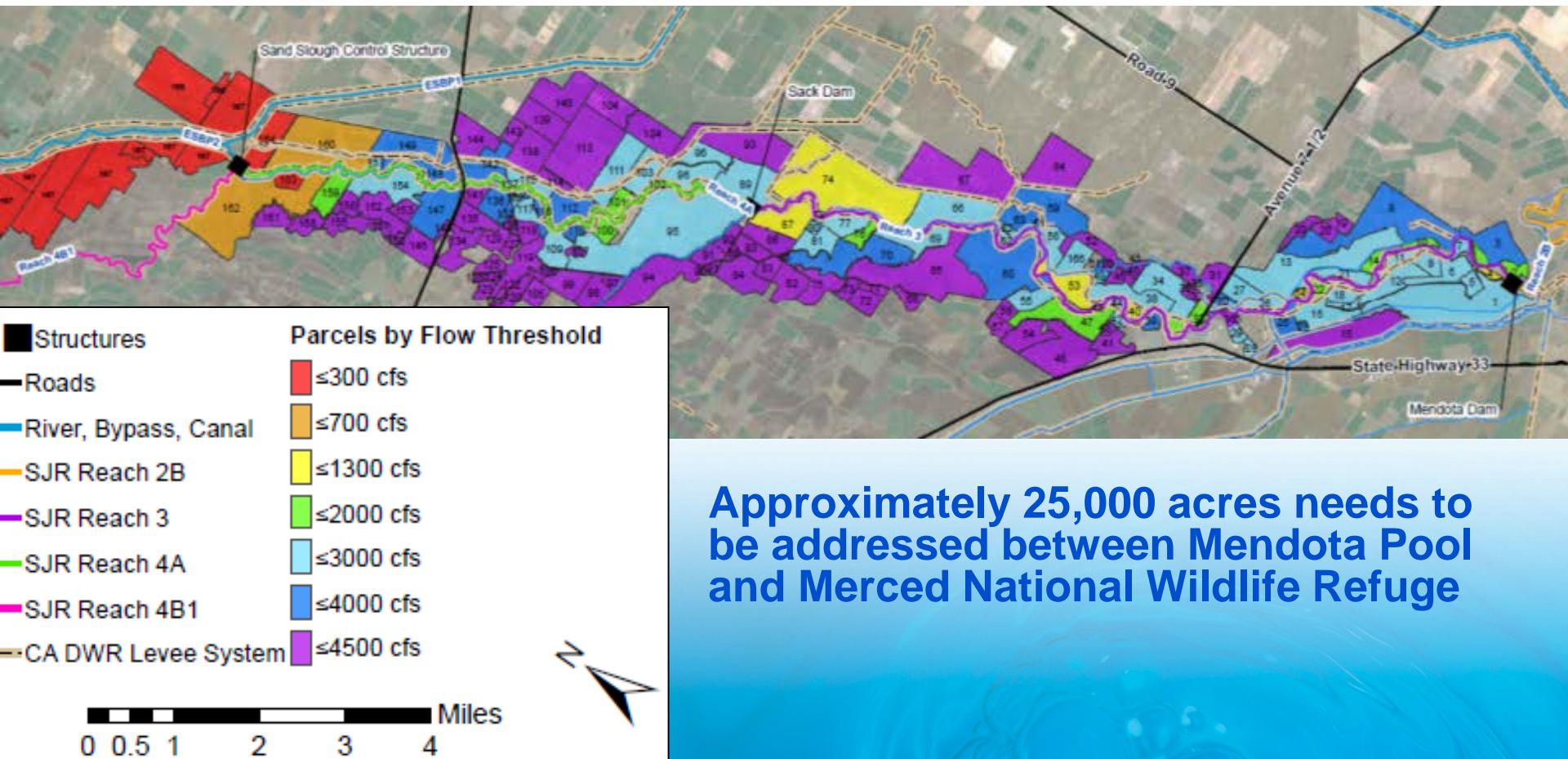
Seepage Management

- Rewetting the San Joaquin River increases shallow groundwater elevations
- Can effect crop productivity (i.e. increased salinity and water logging of crops)





Seepage Management

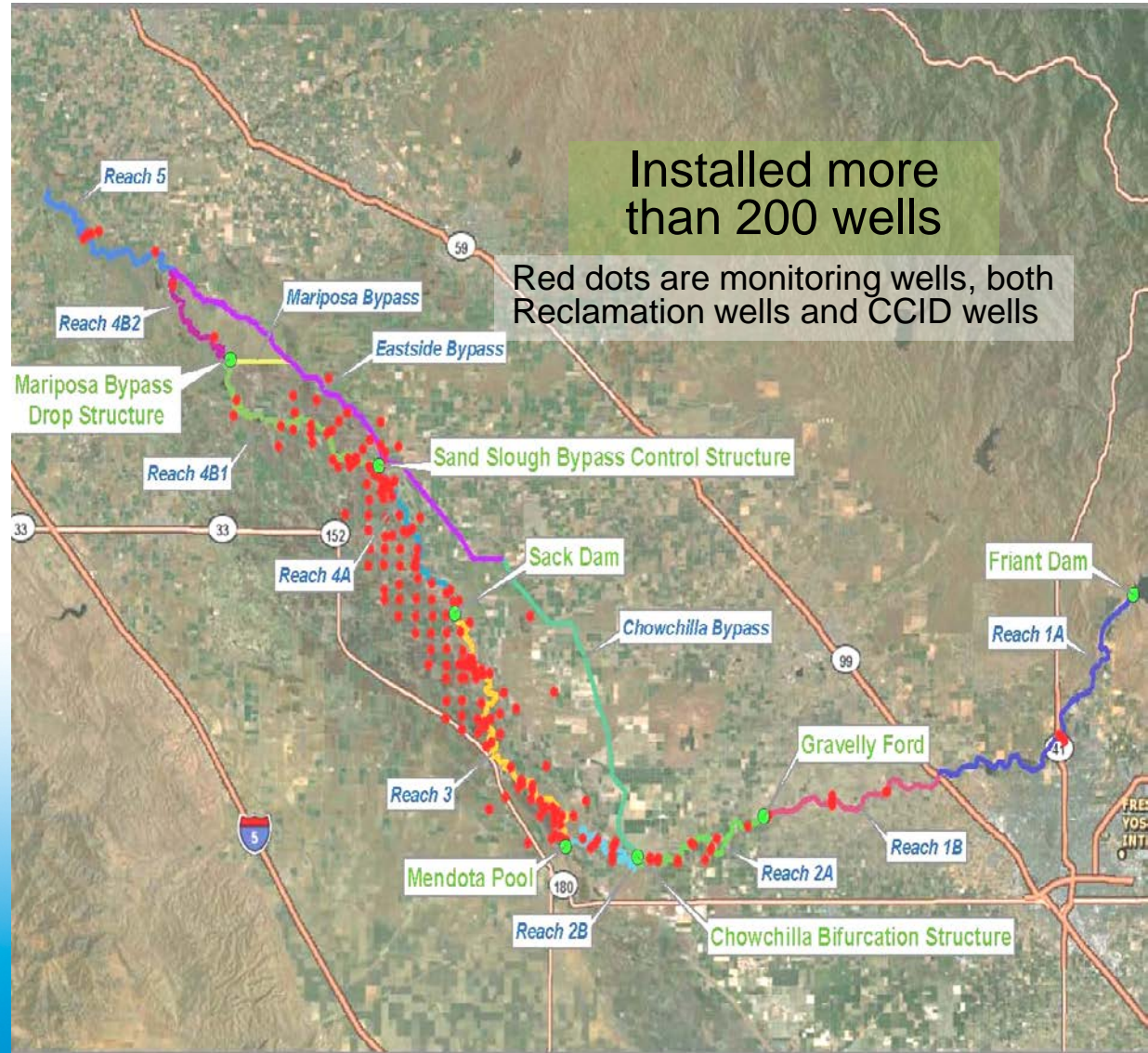


Approximately 25,000 acres needs to be addressed between Mendota Pool and Merced National Wildlife Refuge

SJRRP Monitoring Well Network

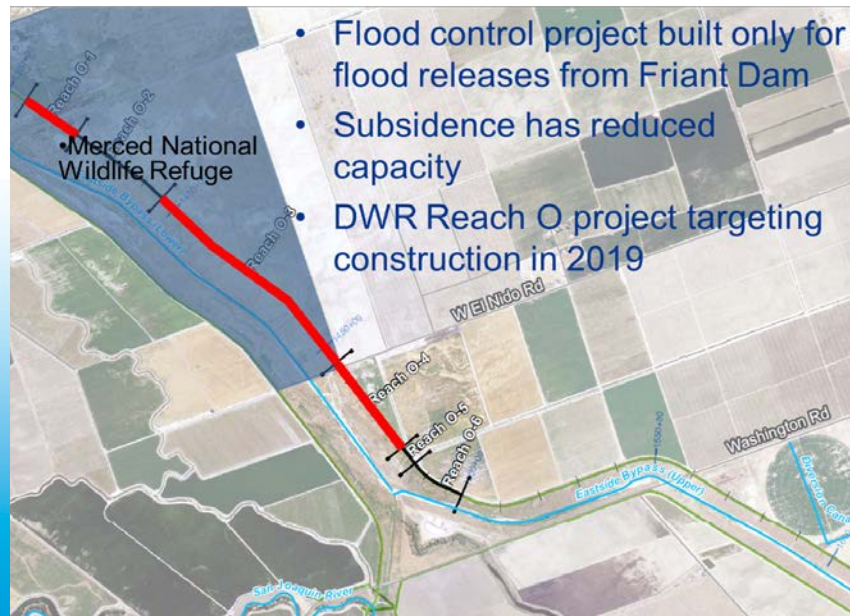
Data Reporting

- Real-time wells online
- Weekly measurements for key wells
- Monthly or quarterly for all other wells depending on site conditions
- Pressure transducers gathering hourly data
- Well Atlas provides well locations, groundwater elevations, topography and similar items and is updated about quarterly



Levee Stability & Channel Capacity

- Flood control project designed and built assuming only flood releases from Friant Dam
- Levee improvements needed to address long-term flows
- Channel capacity limits flow levels that meet USACE Safety Factors for Levee Slope Stability and Underseepage



Reach	Flood Design Flows (cfs)	2017 Then-Existing Channel Capacity (cfs)	How Capacity is Determined
2A	8,000	6,000*	Geotechnical
2B	2,500	1,120	In-channel
3	4,500	2,860*	In-channel
4A	4,500	2,840*	Geotechnical/ In-channel
4B2	10,000	930	In-channel
5	26,000	2,350	In-channel
Middle Eastside Bypass	16,500	580 (0)	Geotechnical
Lower Eastside Bypass	18,500	2,890	In-channel
Mariposa Bypass	8,500	350	In-channel

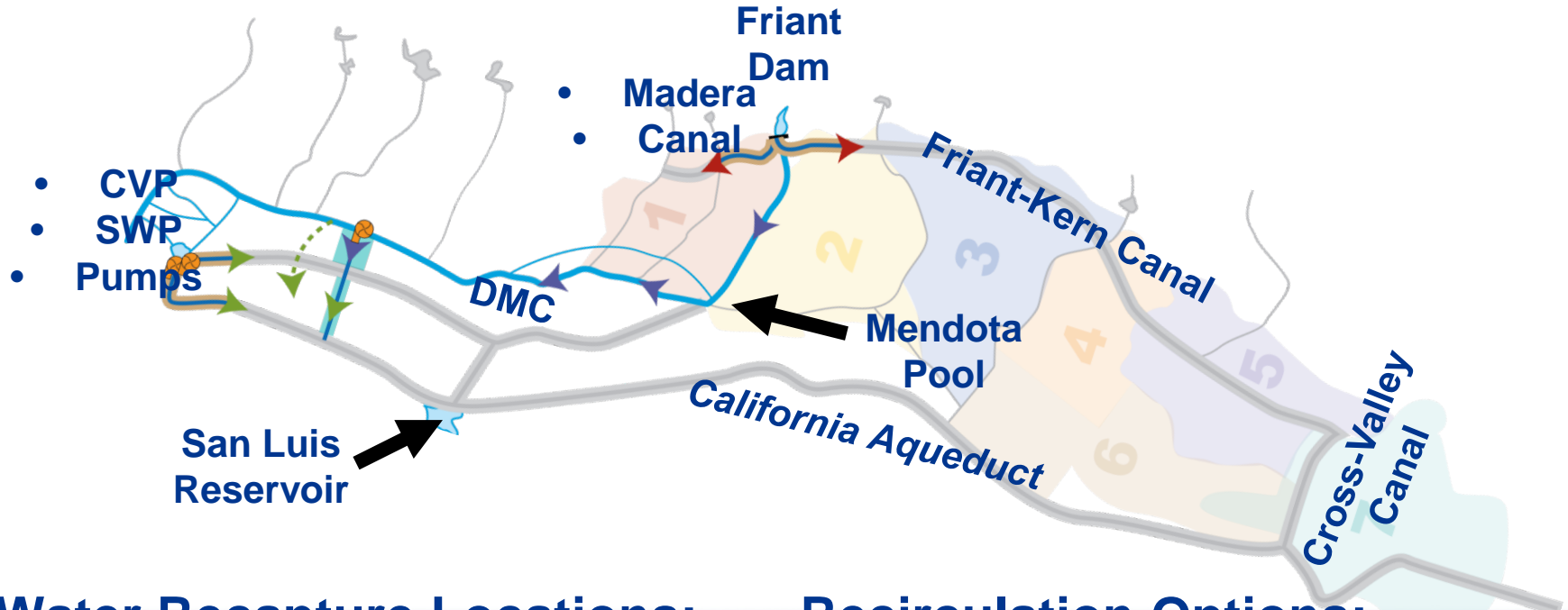


Unreleased Restoration Flows

- After January 1 2014, Restoration Flows not able to be released into the river are banked, stored, sold, or exchanged with first priority to Friant Contractors
- Sales price varies from \$20/AF to about \$647/AF based on water year type and follows market prices
- Proceeds deposited into the San Joaquin River Restoration Fund

Contract Year	URF Water Sold	\$/AF Range	Total Proceeds
2016	151,966 AF	\$20-\$150	\$9,790,790
2017	367,967 AF	\$20-\$150	\$6,934,380
2018	124,791 AF	\$20-\$150	\$6,618,362

Recapture and Recirculation



Water Recapture Locations:

- Mendota Pool (temporary)
- In Delta
- Along San Joaquin River at existing pumping plants
- New pumping plant along the river (considered in PEIS/R)

Recirculation Options:

- Exchanges
- Direct Deliveries (AEWSD/SWID)
- Transfers

**Total Contract Year 2010 to 2017:
350,000 acre-feet or 33% of releases**

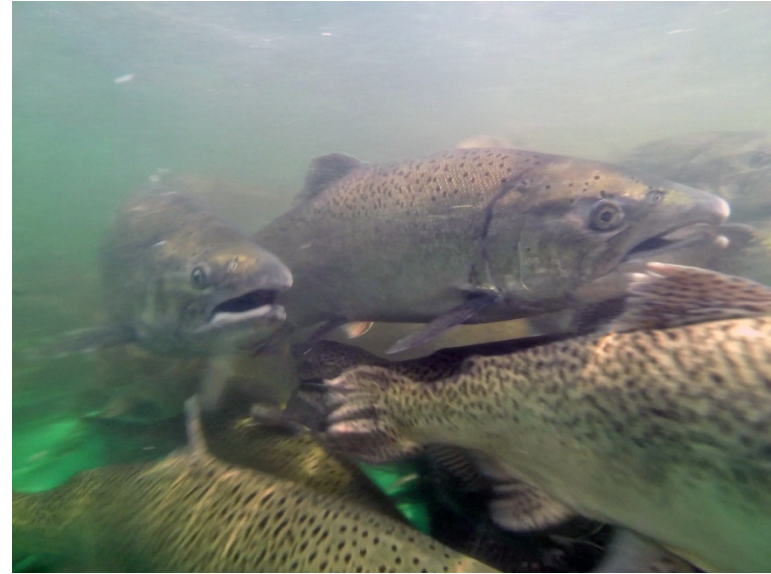


Passage and Habitat



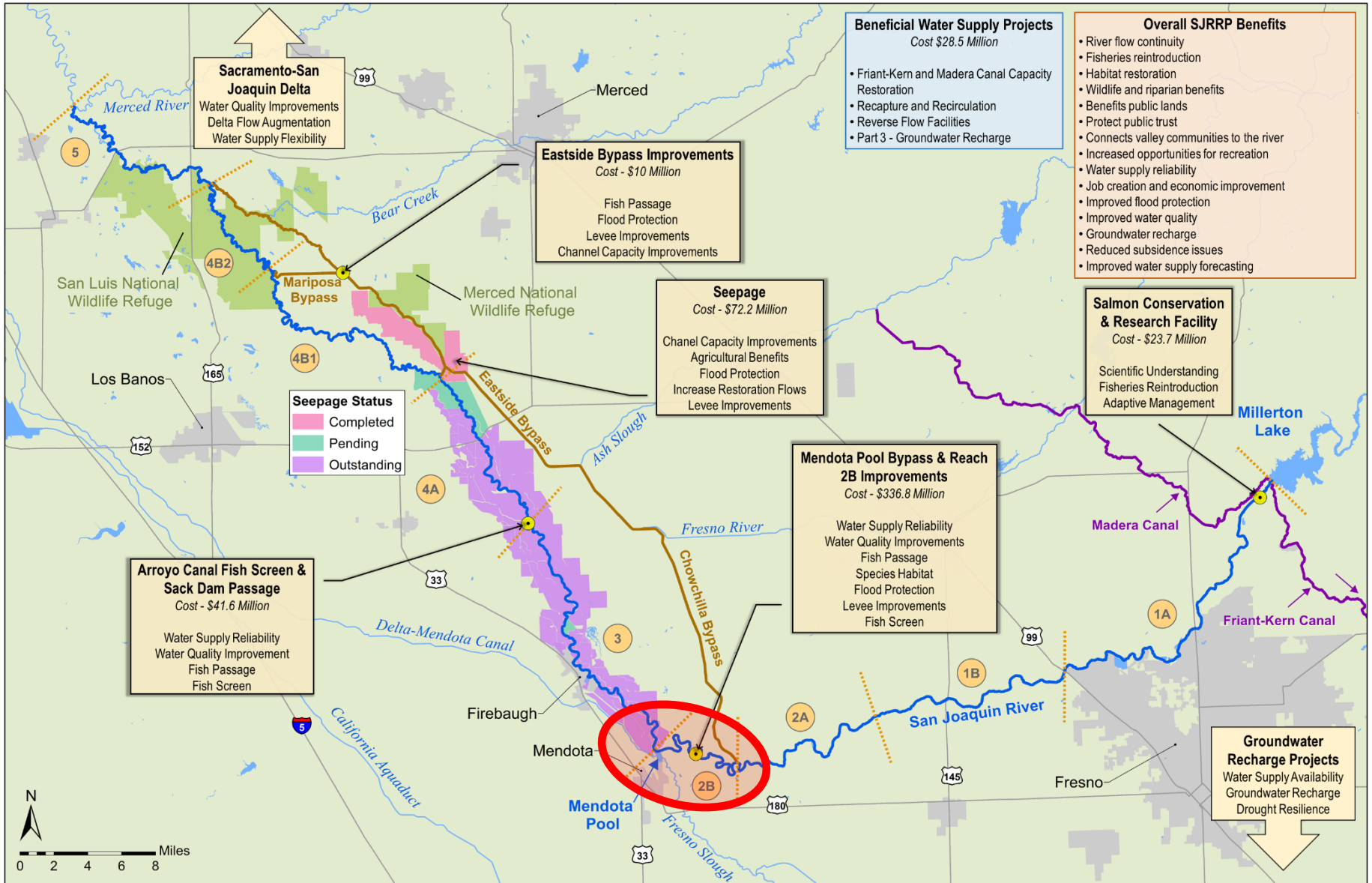
Key actions for fish survival

- Volitional movement up and down the river through life stages
- Eliminate stranding and entrainment potential
- Create habitat needed for life stages



Reach 2B

San Joaquin River Restoration Program Cost & Benefits Map



Reach 2B and Mendota Pool Bypass Project

- Area between Chowchilla Bypass and Mendota Pool
 - Most is not part of Flood Control Project
 - Original design capacity was 2,500 cfs
 - Current capacity is ~1,300 cfs
 - Levees built by landowners of native soil and will need to be rebuilt





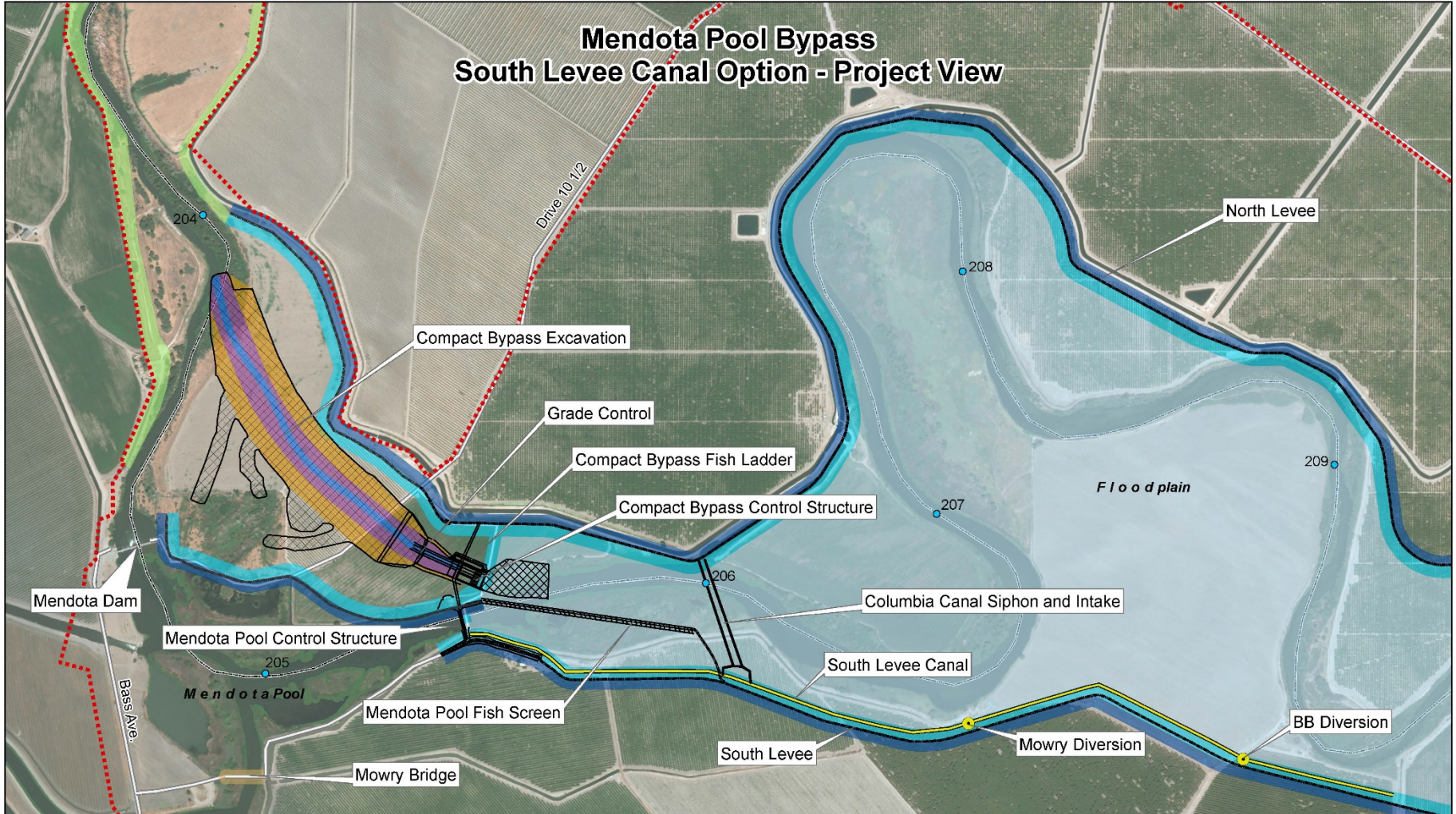
Mendota Pool Bypass and Reach 2B Channel Improvements Project

RECLAMATION
Managing Water in the West

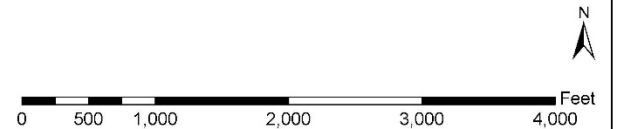


- Create bypass channel around the Mendota Pool (about 3/4 mile of new river channel)
- Expand Reach 2B capacity to convey at least 4,500 cfs (11 miles of new levee and flood plain habitat)
- *Current Schedule:* ROD – October 2016
- Land acquisition 2017/2018
Construction start date – 2019
- *Cost:* \$336 million

Mendota Pool Bypass

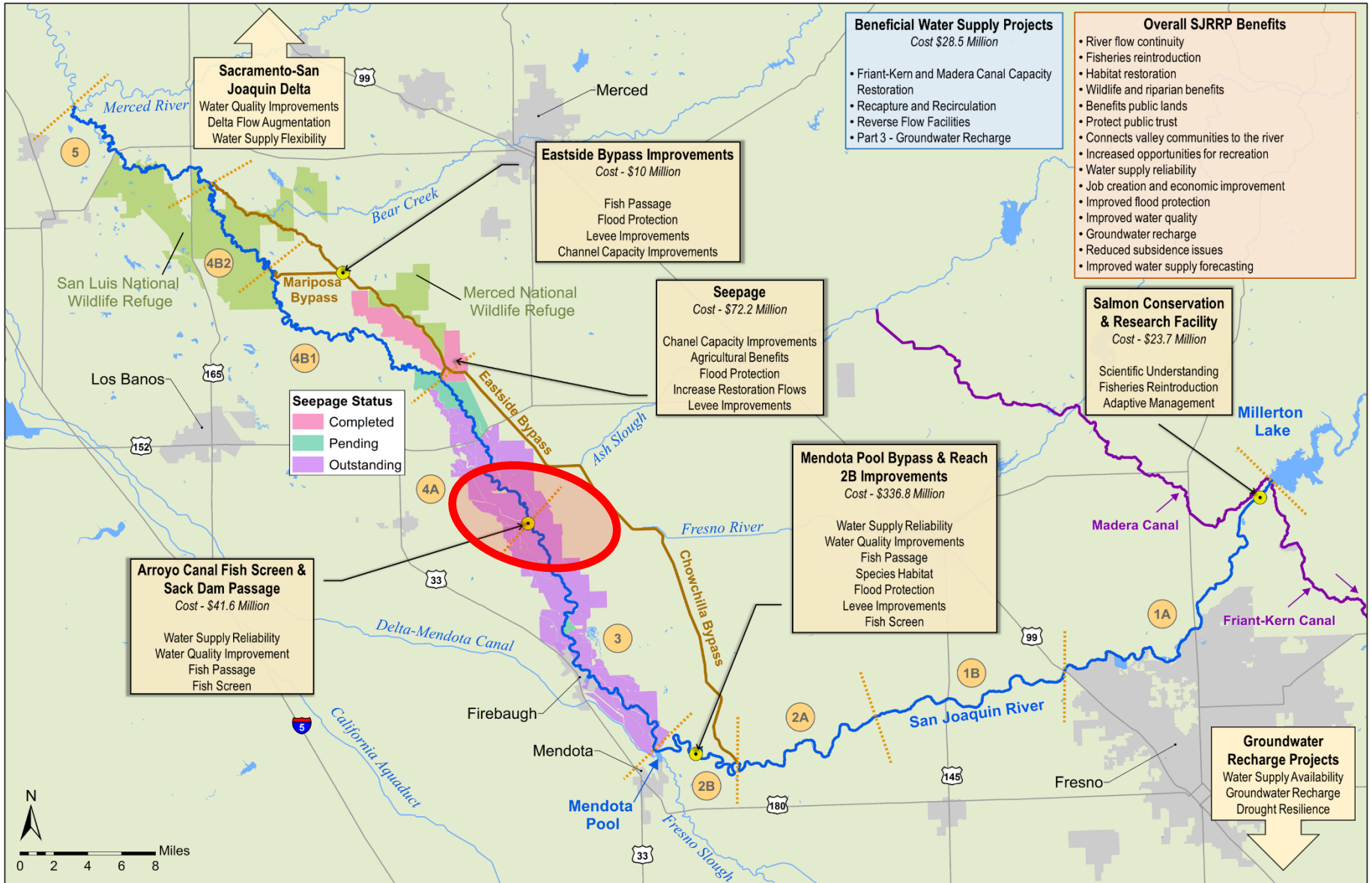


- Project Boundary
- County Boundary
- Construction Access Route
- River Mile Post
- Compact Bypass Channel**
- Low Flow
- Floodplain
- Levee
- Bankfull
- Top of Floodplain
- Mowry Bridge Replacement
- Levee - 100ft Buffer
- Reach 3 Levee Improvement



Arroyo Canal Fish Screen and Sack Dam Fish Passage Project

San Joaquin River Restoration Program Cost & Benefits Map



Arroyo Canal Fish Screen and Sack Dam Fish Passage Project



Sack Dam – Modify for fish passage

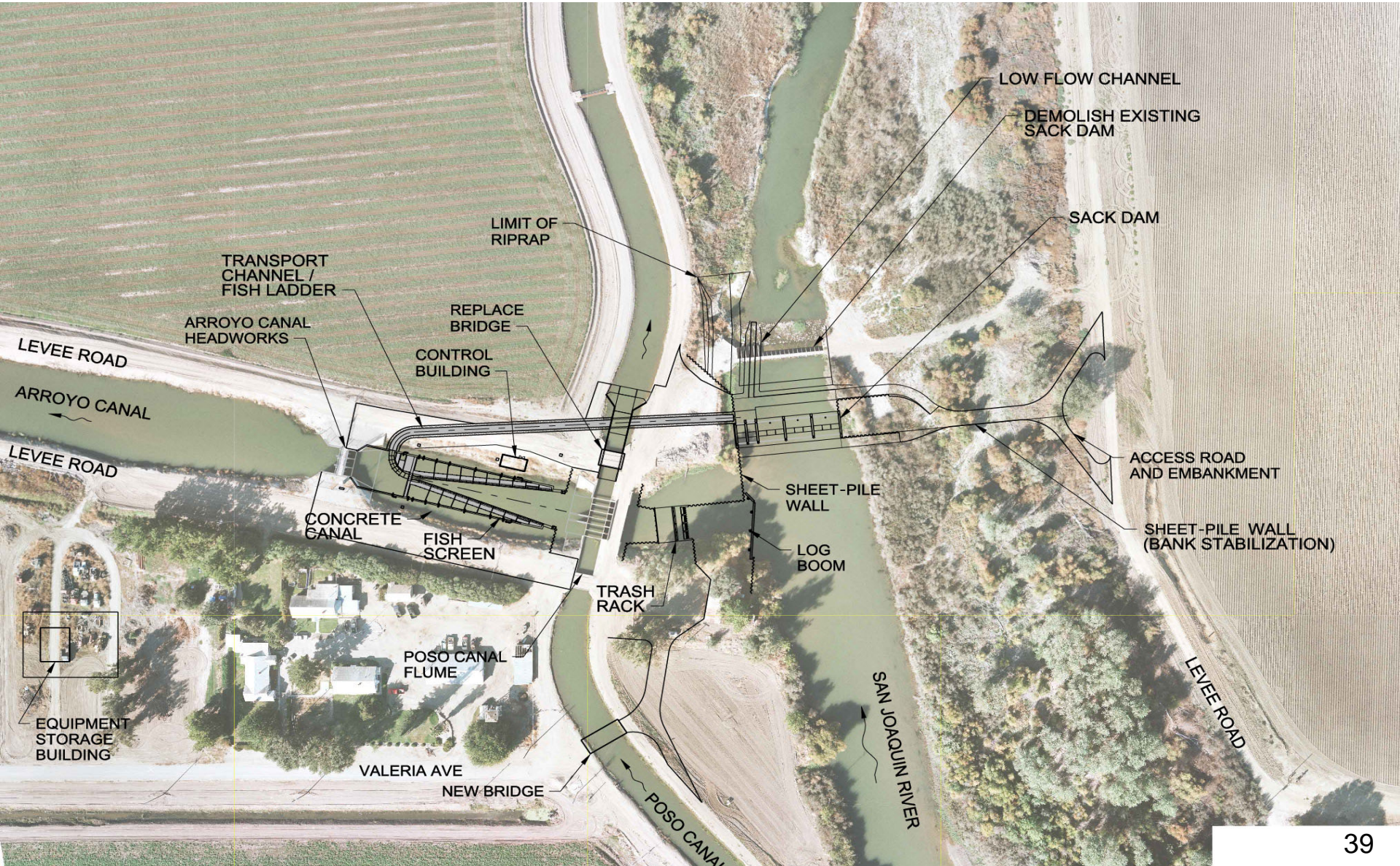
Arroyo Canal – Screen to prevent fish entrainment

NEPA and CEQA completed

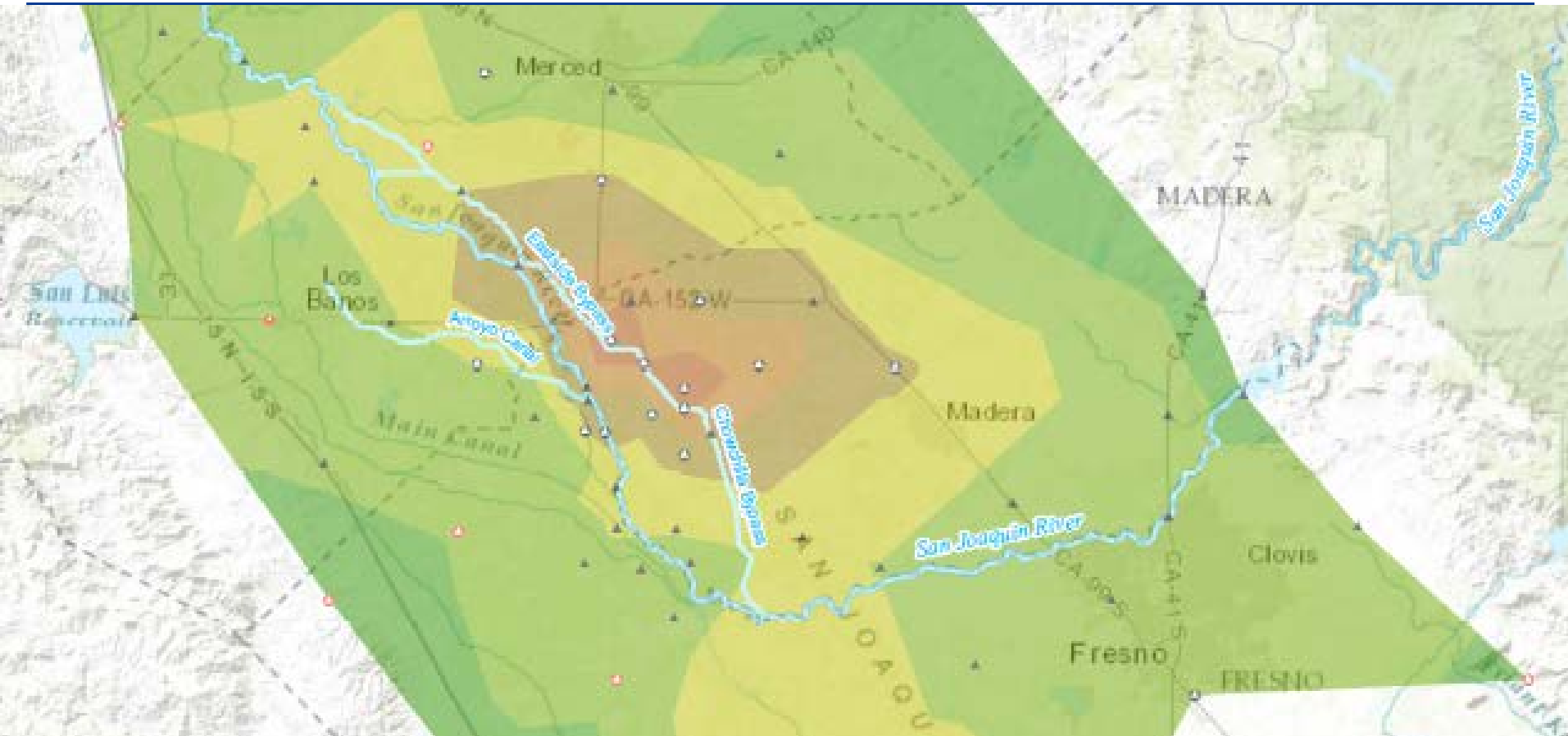
Construction – Redesign for project underway to address subsidence.



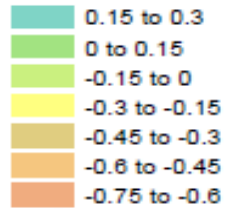
Arroyo Canal Fish Screen and Sack Dam Fish Passage Project



Subsidence, Control Point Survey Results

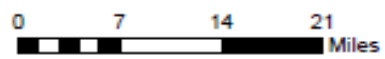


Subsidence Rates (feet/year)
July 2012 to July 2016



GPS Coordinates

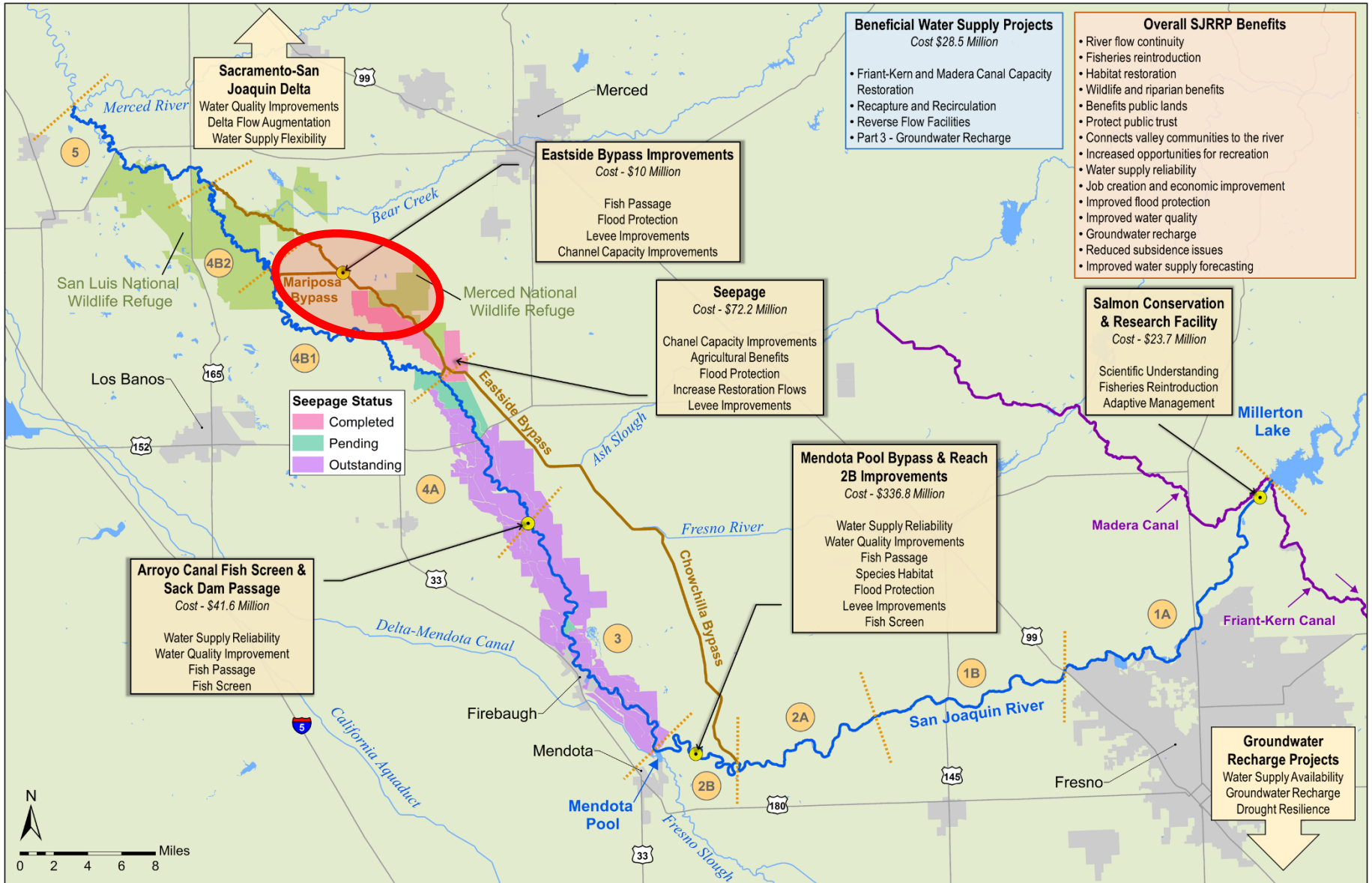
- ▲ GPS Point-December 2011
- GPS Point-added July 2012
- ◻ GPS Point-added December 2013



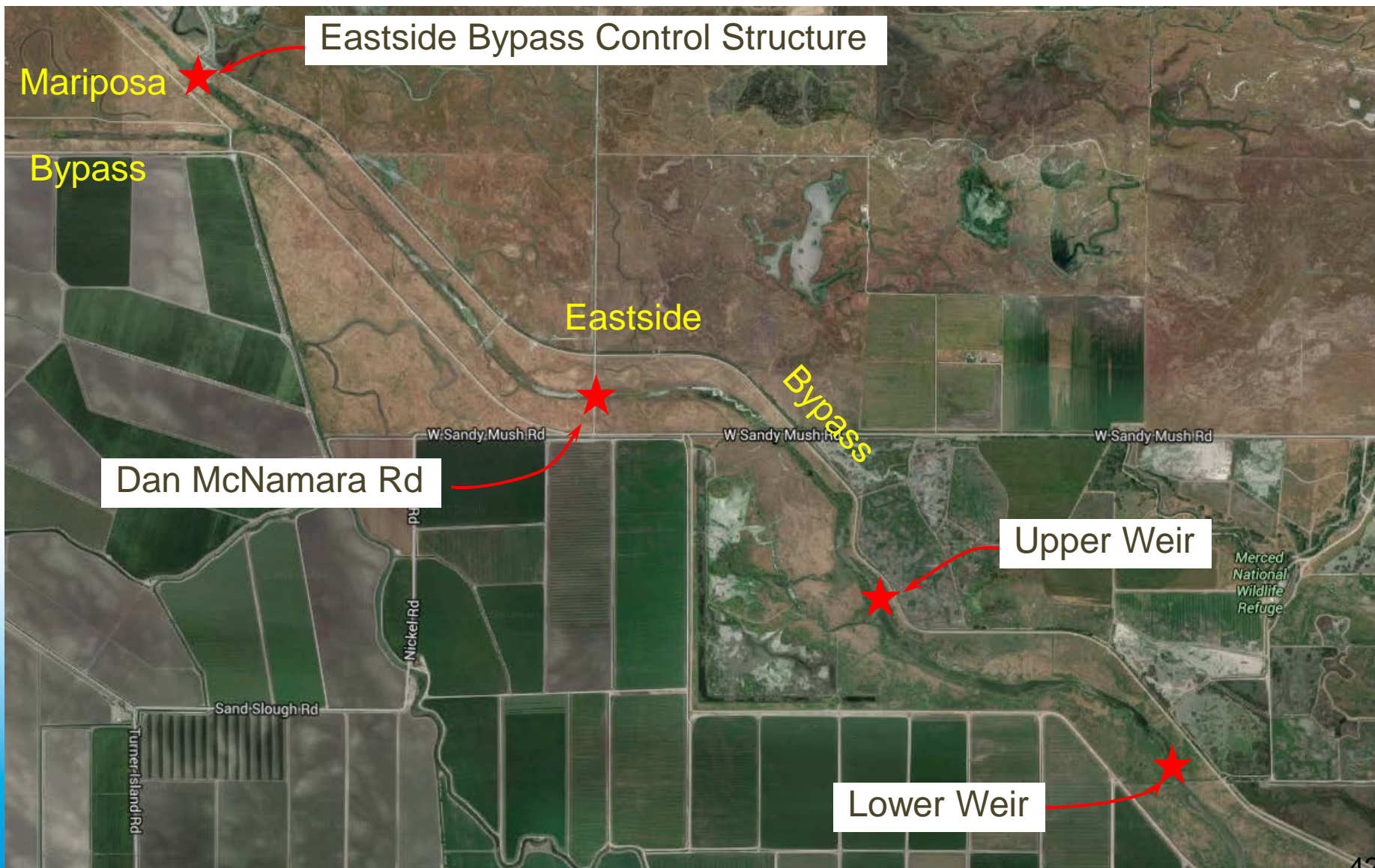


Arroyo Canal Fish Screen and Sack Dam Fish Passage Project

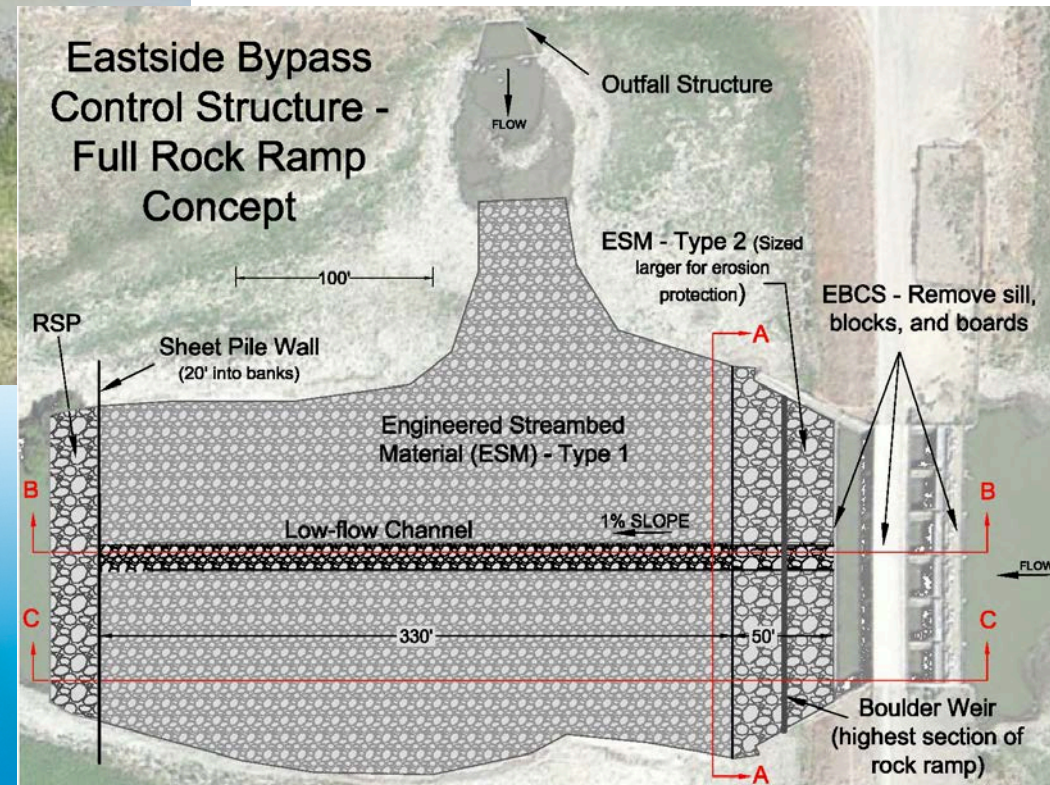
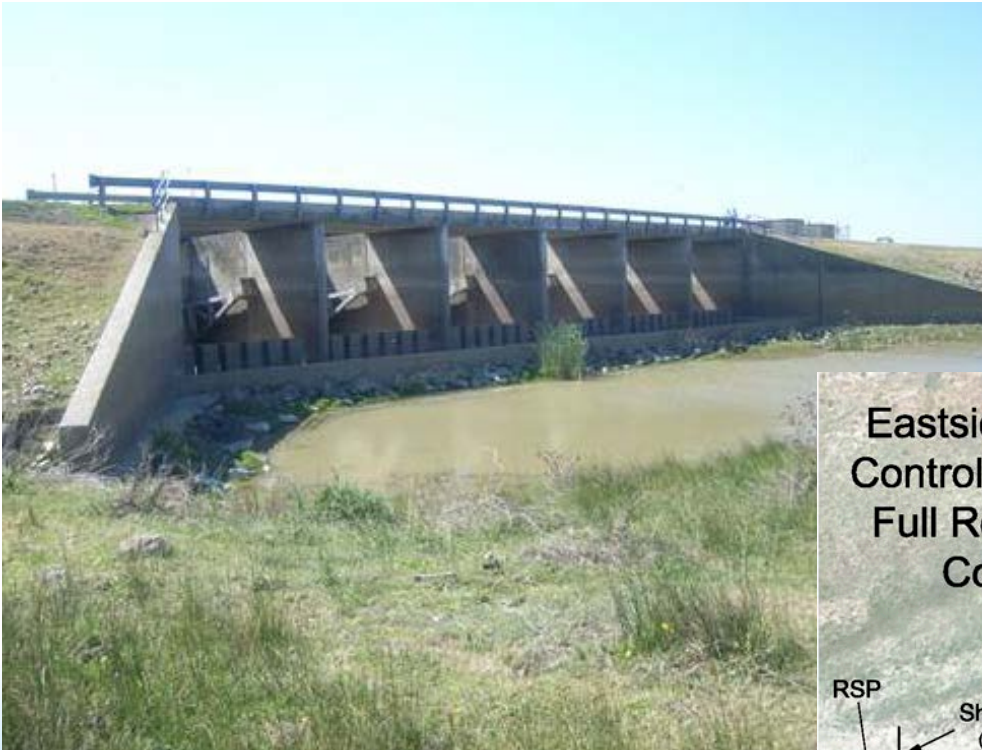
San Joaquin River Restoration Program Cost & Benefits Map



Eastside Bypass Fish Passage Projects



ESBP Control Structure Rock Ramp



National Wildlife Refuge

Weirs



•Upper Weir



•Lower Weir



Salmon Reintroduction



Salmon Reintroduction

- Settlement requires reintroduction of spring-run and fall-run Chinook salmon
- Spring-run broodstock efforts began in 2012 at the Interim Salmon Conservation and Research Facility
- April 2014: First direct release of juvenile spring-run into the river for study purposes; continued annually since then.



SJRRP Biologists release juvenile spring-run Chinook salmon to river



Juvenile Chinook Salmon

Salmon Reintroduction

- 2012 – 2016: Adult fall-run Chinook salmon trapped and transported from Reach 5 to spawning habitat in Reach 1
- 2016 – 2018: Adult spring-run Chinook salmon released to holding areas below Friant Dam to begin to assess holding and spawning habitat



Fall-run Chinook salmon released to Reach 1

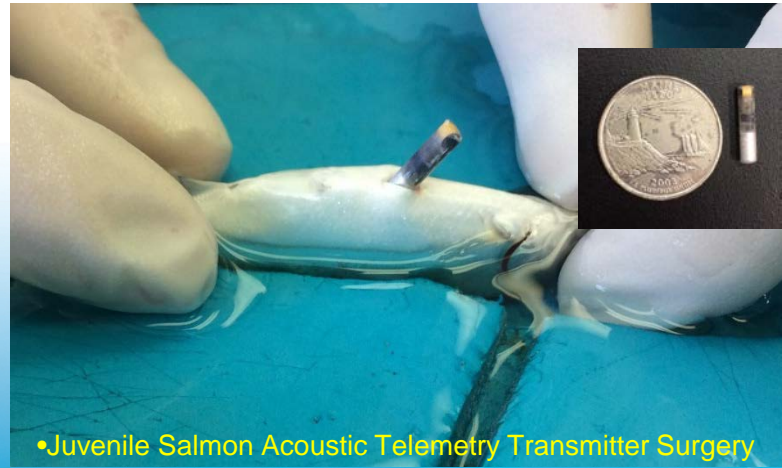


Spring-run Chinook salmon equipped with acoustic telemetry transmitters before release

Juvenile Salmon Monitoring

Juvenile Releases

- 2014: 60,114 (FRFH)
- 2015: 54,924 (FRFH)
- 2016: 57,320 (FRFH) and 47,560 (SCARF)
- 2017: 38,106 (FRFH) and 51,044 (SCARF)
- 2018: 207,848 (SCARF)
- 2019: 206,295 (SCARF)



Juvenile Salmon Monitoring



Smolt index used to categorize life stage of captured Chinook Salmon:

Smolt Index	Life Stage	Criteria
1	Yolk-sac Fry	<ul style="list-style-type: none"> • Newly emerged with visible yolk sac
2	Fry	<ul style="list-style-type: none"> • Recently emerged with sac absorbed (button up fry) • Seam along mid-ventral line visible • Pigmentation undeveloped
3	Parr	<ul style="list-style-type: none"> • Seam along mid-ventral line not visible • Scales firmly set • Darkly pigmented with distinct to slightly faded parr marks • No (to slight) silvery coloration
4	Smolt	<ul style="list-style-type: none"> • Parr marks highly faded or absent • Bright silver or nearly white coloration • Scales easily shed (deciduous) • Black trailing edge on caudal fin • More slender body



Chinook Salmon Emergence Study



- Quantify the spawning success of translocated females and determine the spatial and temporal distribution of spawning.
- Estimate the number of translocated adult salmon that spawned.
- Determine the number of fry produced among observed redds.
- Relate fry production within observed redds to environmental
- Emergence traps set on 10 redds November through January
- Fry captured in 6 out of 10 traps



Chinook Salmon Emergence Study



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Juvenile Salmon Monitoring

2017 – 2018: First Confirmed Successful Spawning of spring-run Chinook salmon on the San Joaquin River in over 60 years

VOLUME 128, NUMBER 17
 MONDAY, FEBRUARY 20, 2018
 \$1.50
 A.M. NEWS SERVICE

The Fresno Bee

Trump clears way for release of GOP memo
 BY STEPHAN LEE
 President Donald Trump cleared the way Thursday for the release of a memo written by Republican congressmen and staff to accuse federal law enforcement officials of abusing their authority.

The president's decision to release the memo, which was written by House members and staff, is a significant step in the ongoing investigation into the actions of the Justice Department and the FBI by congressmen.

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Chinook salmon reach milestones in San Joaquin
 Tens of thousands of spring-run chinook salmon were in a tank at the Salmon Inhabitation and Rearing Facility near Plant Dam on Jan. 26. The fish are being monitored for signs of disease and other health issues.

The fish are being monitored for signs of disease and other health issues.

LOCAL
VALLEY UNDER AIR ALERT
 The Valley Air District wants residents to avoid strenuous outdoor activity as a high pressure weather system brings pollution in the area.

STATE
DROUGHT DEEPENS DRAMATICALLY
 Conditions to support pheasant back have dimmed, with severe conditions now evident in Santa Barbara, Ventura and Los Angeles counties.

BUSINESS
UNITED'S NEW RULES FOR SUPPORT ANIMALS
 United Airlines announced Thursday that it is joining Delta Air Lines in tightening rules for passengers flying with emotional support animals.

ENTERTAINMENT
DISNEY ON ICE IS BACK IN FRESNO
 "Follow Your Heart" is a revamped live tour with new Disney and Pixar characters, and is set to play eight shows at the McCLatchie Arena through Monday.

SEE MEMO, 10A
 SEE SALMON, 2A

ReclamationCVP
 @ReclamationCVP

Follow

Confirmed for first time in 60+ years, spring-run Chinook salmon have successfully spawned in the San Joaquin River
[restoresjr.net/seasonal-fish- ...](https://restoresjr.net/seasonal-fish-...) #SJRRP

11:27 AM - 18 Dec 2017
 131 Retweets 281 Likes

Salmon Conservation and Research Facility (SCARF)

- Broke ground in April 2017 with anticipated completion in 2020
- Construction Cost = \$23.7 million (state \$)
- Develop captive broodstock
- Create experimental population (Feather River stock)
- 1M juvenile salmon annually



Not just Chinook Salmon...



Over 12,000 Pacific lamprey were detected in the Restoration Area in 2018.

White sturgeon captured in fyke net near Merced River confluence in March 2019





Questions?