


# Juvenile Salmonid Survival and Migration in the San Joaquin River Restoration Area During Flood Operations, Spring 2011

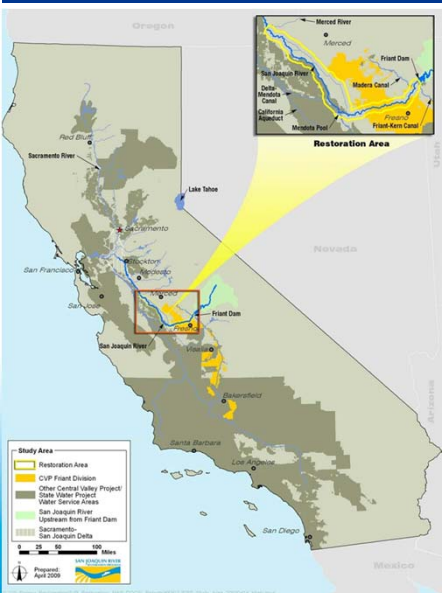
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## Study Area




- San Joaquin River Restoration Area
  - Friant Dam to Merced Confluence
- Interim Flows
  - To Collect data to inform settlement actions, including fish reintroduction
- 2011 Flood Operations
  - Majority of Friant Release routed down the Chowchilla Bypass

**SAN JOAQUIN RIVER RESTORATION PROGRAM**

## Study Goals



- Characterize fish movement rates, route selection, and survival rates through the Restoration Area
- Investigate areas of potential losses due to predation and entrainment for further study
- Provide management direction for reintroduction implementation based on results



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## Methods

- Acoustic Telemetry
  - 29 Vemco® 180 kHz stationary receivers deployed throughout the restoration area at key locations
    - Above and below mine pits, at decision points for fish migration
    - Read Range = 75 m radius
    - Dual receiver stations to determine detection probability and survival by location
  - Feather River Fall Run Chinook salmon
    - 1200 fish (200 acoustic tagged) released at two locations on April 21, 2011
    - All fish coded wire tagged for long-term ID



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## Methods (cont)

- Acoustic Telemetry Release locations
  - Below Friant Dam
  - San Mateo Crossing
    - Below Chowchilla Bypass
- Release Groups
  - ~600 coded wire tagged fish
  - +96 acoustic tagged fish
    - 4 acoustic tagged fish from each location held in the hatchery for tag life study

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## Methods (cont.)

Fish Data Summary			
Release Group	Wt. Avg.	FL. Avg.	Avg. Surgery Time
Friant 1A	17.06	124.42	0:02:20
Friant 1B	19.608	120.72	0:02:56
San Mateo 2A	19.7966	122.52	0:02:36
San Mateo 2B	19.355	121.5	0:02:12

Fish Size needed for Surgery= 13.0g (5% of body weight)  
 Tag Burden = 3.28 – 3.81% by tag group



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### Receiver locations –downstream of Hwy 41 to upstream of Chowchilla Bypass

- One between 2<sup>nd</sup> and 3<sup>rd</sup> set of mine pits (Scout Island)
- Two between 3<sup>rd</sup> and 4<sup>th</sup> set of mine pits (Pashayan)
- Two at Gravelly Ford (upstream of Chowchilla Bypass)


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### Receiver locations –Chowchilla Bypass to Mendota Pool

- 2 below the bifurcation structure in the River
- 1 six miles down the Chowchilla
- 1 above Columbia canal
- 2 in the Mendota Pool
- 2 at the James Bypass
- 1 downstream of Mendota Pool

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## Receiver locations –Sand Slough area



-2 at Sand Slough      -2 in Eastside Bypass at Washington Rd.

This slide features an aerial photograph of a river system with several receiver locations marked in green. The labels are 'SS Up' and 'SS Down' on the left side of the river, and 'ESB1' and 'ESB2' on the right side. The river flows from the top left towards the bottom right. The surrounding area is a mix of agricultural fields and open land.

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## Receiver locations –East Side and Mariposa bypasses


-1 in the Mariposa Bypass    2 in the ESB below the Mariposa



This slide features an aerial photograph of a river system with several receiver locations marked in green. The labels are 'Mariposa Bypass' at the bottom left, 'ESB below Mariposa 1' and 'ESB below Mariposa 2' in the center. The river flows from the top right towards the bottom left. The surrounding area is a mix of agricultural fields and open land.

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## Receiver Locations – end of Restoration Area

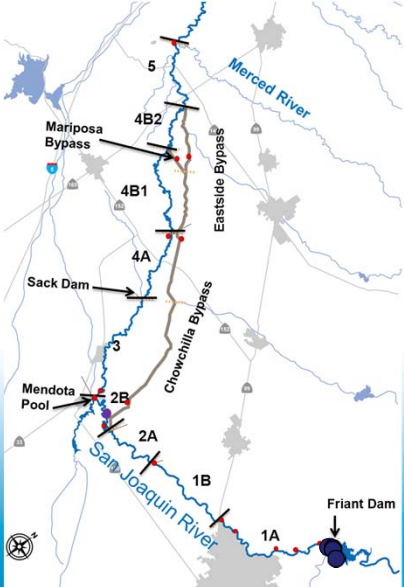


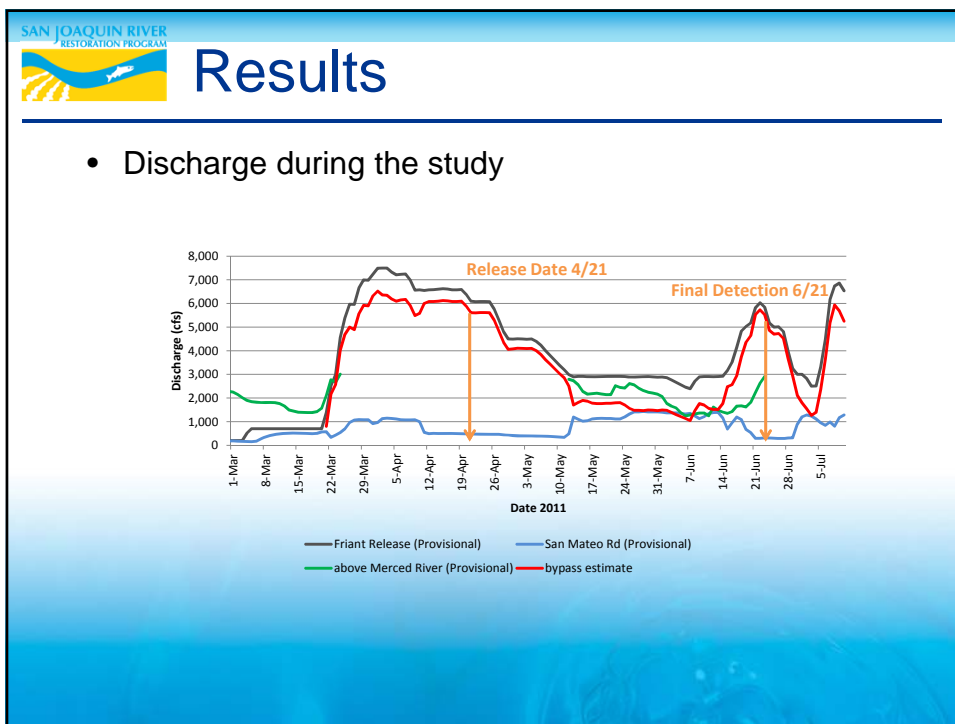
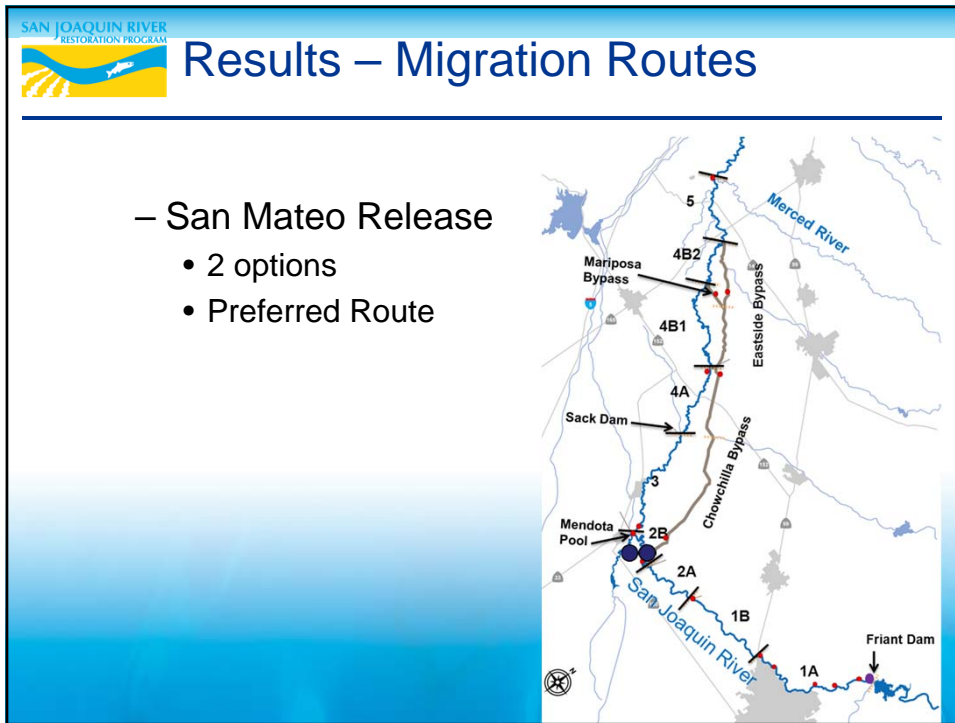
- 2 at the Confluence of the Merced and the San Joaquin

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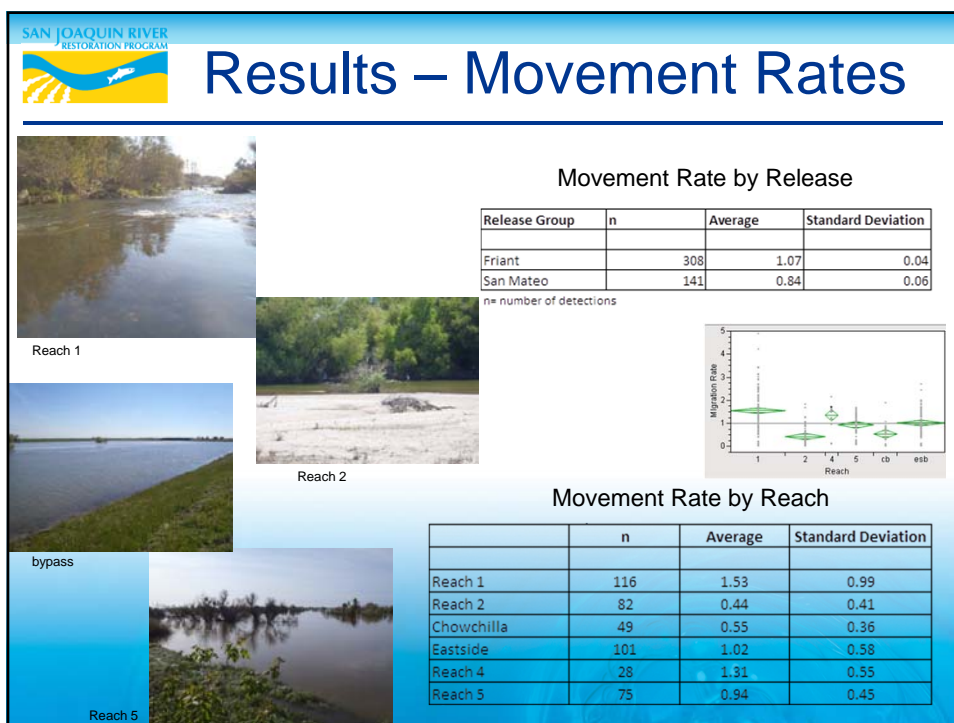
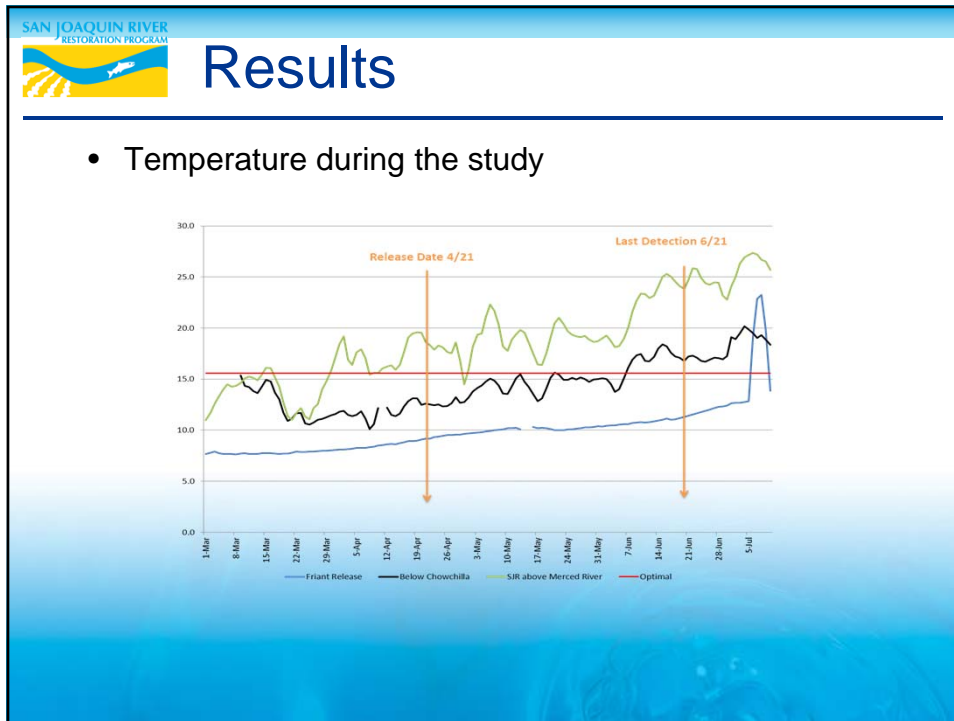
## Results – Migration Routes

- Friant Release
- 4 Options
- Preferred Route









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## Results - Survival

$m_1$  = number detected at site 1  
 $m_2$  = number detected at site 2  
 $r_1$  = number detected at both sites

$$\hat{S}_1 = \frac{m_1}{R} \frac{1}{\hat{p}_1} = \frac{m_1 m_2}{R r_1}$$

$$\hat{p}_1 = \frac{r_1}{m_2}$$

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## Results - Survival

Survival Estimates and standard error for acoustic tagged juvenile Chinook salmon in the San Joaquin River Restoration Area, Spring 2011.

Release Group	Survival Location	Estimate of Survival	Standard Error
Friant (RM 265)	Hwy 99 (RM 234)	0.78	0.02
Friant (RM 265)	Hills Ferry Barrier (RM 118)	0.55	0.04
San Mateo (RM 212)	Mendota Pool (RM 205)	0.46	0.05
San Mateo (RM 212)	Below Mendota Pool (RM 204)	0.31	0.06
San Mateo (RM 212)	Hills Ferry Barrier (RM 118)	0.27	0.08



## 2012 Proposal

- Releasing BY 2010 Merced Fall Run
  - First Group on a pulse of ~300~500 cfs (Late March)
  - Second Group on a pulse from ~500 - ~1,000 cfs (Early April)
  - All fish will be CWT, PIT tagged, and 100 acoustic tagged
- Releasing YOY Feather River fall-run
  - ~100 below Friant
  - ~ 100 at downstream “connected River” (probably reach 5)
- Receivers expanded to San Joaquin Mainstem upstream to the Stanislaus – connect to USBR 6-year steelhead acoustic study.
- Coordinate with USBR PIT tag feasibility study and planned flow pulses