

Appendix B Spring Pulse Information

Collection of environmental and fish variables are implemented annually regardless of a pulse flow action. Data collected in non-pulse action years (e.g., dry years with no action, average years with natural pulse events, wet years with flood flows and no pulses) will inform baseline conditions for comparison with years with a pulse flow and be used to determine if certain conditions/results are due to pulse actions or other environmental conditions.

Monitoring relevant to the spring pulse flow includes environmental acoustic telemetry, rotary screw traps, environmental parameters. Acoustic tagging projects were conducted in WY 2022 tagging multiple salmonid species and runs throughout the season and the Delta/watersheds (Table 1).

Minimum survival to Tower Bridge, minimum survival to Benicia Bridge (east span), and minimum survival through-Delta (Sacramento to Benicia) varied widely by study. Environmental Parameters are shown in Tables 2 and 3.

This has been described in the Spring Pulse Flow Study Plan.

Table 1. Project details for WY 2022 acoustically tagged salmonids and preliminary survival results. . Individual studies denoted by rows with bold lines. Data recorded from the CalFishTrack Central Valley Enhanced Acoustic Tagging Project website on 4/11/2022. Preliminary survival (Φ) results for acoustically tagged salmonids (Chinook and steelhead). Individual studies denoted by rows with bold lines.

Project	Group (n)	Release Date(s)	Release Location	Min. Φ to Tower Bridge	Min. Φ to Benicia Bridge (East Span)	Min. through-Delta Φ (Sac to Benicia)	Notes
Hatchery-origin Chinook salmon: Seasonal Survival Study	Week 1 (200)	12/15/2021 – 12/16/2021	RBDD	75.5% (SE = 3.0)	17.1% (SE = 2.6)	22.7% (SE = 3.4)	Fish detected at Old River and Benicia receivers
Hatchery-origin Chinook salmon: Seasonal Survival Study	Week 2 (200)	2/2/2022 – 2/3/2022	RBDD	5.5% (SE = 1.6)	0.5% (SE = 0.1)	9.1% (SE = 8.7)	Fish detected at Tower Bridge, below Georgiana, and Benicia receivers
Hatchery-origin Chinook salmon: Seasonal Survival Study	Week 3 (200)	2/23/2022 – 2/24/2022	RBDD	3.0% (SE = 1.2)	1.0% (SE = 0.7)	33.3% (SE = 19.2)	Fish detected at Tower Bridge and Georgiana receivers
Hatchery-origin Chinook salmon: Seasonal Survival Study	Week 4 (200)	3/17/2022 – 3/18/2022	RBDD	3.5% (SE = 1.3)	0.5% (SE = 0.5)	14.3% (SE = 13.2)	Fish detected at I-80 (3.5%) and Benicia (0.5%) receivers
Hatchery-origin Chinook salmon: Seasonal Survival Study	Week 5 (367)	4/7/2022 – 4/8/2022	RBDD	0%	0%	0%	Fish detected at Butte Bridge receiver (0.5%)
Hatchery-origin winter-run Chinook salmon	Week 1 (139)	2/9/2022	Caldwell Park, Redding	15.8% (SE = 3.1)	6.5% (SE = 2.1)	40.9% (SE = 10.5)	Fish detected at Tower Bridge, I80 Bridge (15.8%), and Benicia (6.5%) receivers

Project	Group (n)	Release Date(s)	Release Location	Min. Φ to Tower Bridge	Min. Φ to Benicia Bridge (East Span)	Min. through-Delta Φ (Sac to Benicia)	Notes
Hatchery-origin winter-run Chinook salmon	Week 2 (430)	3/2/2022	Caldwell Park, Redding	12.6% (SE = 1.6)	5.6% (SE = 1.1)	44.4% (SE = 6.8)	Fish detected at Tower Bridge, below Georgiana (4.9%), and Benicia (5.6%) receivers
Hatchery-origin Battle Creek winter-run Chinook salmon	Release 1 (312)	3/16/2022	North Fork Battle Creek, below ECD	1.	(SE = 0.6)	0%	0%
Hatchery-origin Battle Creek winter-run Chinook salmon	Release 2 (600)	3/16/2022	North Fork Battle Creek, below ECD	0.7% (SE = 0.3)	0.2% (SE = 0.2)	25% (SE = 21.7)	Fish detected at Tower Bridge (0.7%) and I-80 (0.7%) receivers
Hatchery-origin Battle Creek winter-run Chinook salmon	Release 3 (288)	3/16/2022	North Fork Battle Creek, below ECD	1.0% (SE = 0.6)	0%	0%	Fish detected at Tower Bridge (1%) and I-80 (1%) receivers
6-year study San Joaquin River steelhead – March releases	Head of Old River (144)	3/15/2022	Head of Old River	Not Enough Detections Yet	6.3% (SE = 2.0)	NA	Fish detected at Clifton Court Radial Gates, CVP trash rack, and Benicia receivers
6-year study San Joaquin River steelhead – March releases	Durham Ferry (248)	3/15/2022	Durham Ferry	Not Enough Detections Yet	4.0% (SE = 1.2)	NA	Fish detected at Clifton Court Intake Canal, CVP trash rack, and Benicia receivers
6-year study San Joaquin River steelhead – March releases	Stockton (100)	3/15/2022	Stockton	Not Enough Detections Yet	12.1% (SE = 3.3)	NA	Fish detected at Old River Quimby Island and Benicia (6%) receivers
Hatchery-origin San Joaquin spring-run Chinook salmon	Fremont Ford (694)	3/30/2022	Freemont Ford	Not Enough Detections Yet	Not Enough Detections Yet	Not Enough Detections Yet	Not Enough Detections Yet

Project	Group (n)	Release Date(s)	Release Location	Min. Φ to Tower Bridge	Min. Φ to Benicia Bridge (East Span)	Min. through-Delta Φ (Sac to Benicia)	Notes
Hatchery-origin rice field reared fall-run Chinook salmon	Release 1 (315)	3/7/2022	Sutter Bypass	9.2% (SE = 1.6)	1% (SE = 0.5)	10.3% (SE = 5.7)	Fish detected at Below Georgiana and Benicia (1%) receivers
Hatchery-origin fall-run Chinook salmon paired release	Upstream (300)	4/5/2022	Battle Creek	Not Enough Detections Yet	Not Enough Detections Yet	Not Enough Detections Yet	Fish detected at Butte Bridge receiver (42%)
Hatchery-origin fall-run Chinook salmon paired release	Downstream (300)	4/7/2022	Sac River, Butte City	Not Enough Detections Yet	Not Enough Detections Yet	Not Enough Detections Yet	Fish detected at Butte Bridge receiver (1%)

Table updated 4/11/2022. Additional information for all projects can be found online at [CalFishTrack Central Valley Enhanced Acoustic Tagging Project](#)

Table 2. Collected environmental parameters measured at specific locations relevant to a spring pulse flow.

Monitoring Location	Flow	Velocity	Turbidity	Dissolved Oxygen	Water Temperature
Keswick	X	NA	X	X	X
Sacramento River upstream of Hwy 44	NA	NA	NA	NA	X
Sacramento River above Clear Creek	NA	NA	X	X	X
Sacramento River at Balls Ferry Bridge	NA	NA	X	X	X
Sacramento River at Jellys Ferry	NA	NA	X	X	X
Sacramento River at Bend Bridge	X	NA	X	X	X
Sacramento River at Red Bluff Diversion Dam	NA	NA	X	X	X
GCID (side channel, near RST)	NA	NA	X	NA	X
Sacramento River below Wilkins Slough	X	NA	NA	NA	X
Sacramento River at Knights Landing	NA	NA	NA	NA	NA
Sacramento River at Verona	X	NA	X	NA	X
I80 / I50 Bridge	NA	NA	NA	NA	NA
Sacramento Trawls	NA	NA	NA	NA	NA
Chipps Island	NA	NA	NA	NA	NA

Table 3. Collected fish parameters measured at specific locations relevant to a spring pulse flow.

Monitoring Location	Fish Passage Counts (RST)	Fish Presence Fish Survival (telemetry receivers)
Red Bluff Diversion Dam	X	X
Mill/Deer Creek	X (partial)	NA
GCID	X	X
Wilkins Slough	NA	NA
Knights Landing	X	X
Verona	NA	X
I80 / I50 Bridge	NA	X
Sacramento Trawls	X	X
Chipps Island	X	X