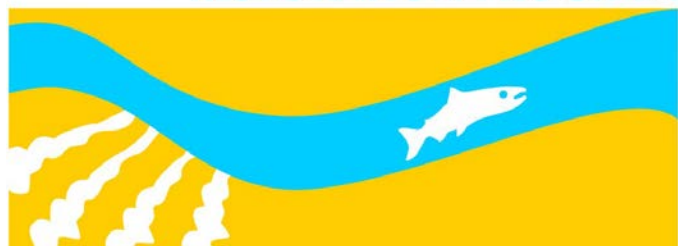


Study 10

Juvenile Survival and Migration

**Final
2014 Monitoring and Analysis Plan**

SAN JOAQUIN RIVER
RESTORATION PROGRAM



Fish Management Work Group

STUDY WORKPLAN

MAP Study Title: Juvenile Survival and Migration (year 4 – telemetry)

Principal Investigator(s): Michelle Workman (FWS); Paul Adelizi (DFW); Matt Bigelow (DFW)

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Proposed Staff: 1 DFG scientific Aid; 2 FWS field crew in addition to PIs

County(ies) affected by Study: Fresno, Madera, Merced

I. Study Management

A. Study Description

1. History or Background

a. General project background discussion.

A number of critical questions regarding habitat suitability, biological impacts, migration patterns and rates can be addressed through the use of acoustic telemetry. Currently a large array of acoustic telemetry receivers is used throughout the Sacramento-San Joaquin River Tributaries, Delta and Estuary to evaluate the movement of Chinook salmon, steelhead, and sturgeon. Recent advancements in this technology have allowed for the successful tagging and tracking of subyearling smolt-sized (about 120 mm fork length) juvenile Chinook salmon. In spring 2013, a newly developed small tag (V-5) should allow studies of smaller juvenile salmon that better match the size of naturally produced smolts. In spring of 2014, a newly developed smaller tag (V3) will allow tagging even smaller size fish.

The long-term objective of this acoustic tagging study is to test the hypothesis that the flow management objectives are adequate to sustain the survival of downstream migrating juvenile salmon and to identify all physical features that impede downstream migration. The current flow management objectives are to meet water temperature targets at various locations in the river during specific time period that are believed to be critical to the survival of juvenile salmon. Physical features that potentially impede downstream migration of juvenile salmon include flow control structures, road crossings, water diversions, inadequate water depth, and in-river mine pits and the predaceous species of fish that are commonly associated with these features.

The first year of study occurred during the 2011 flood control releases which made it possible to study migration and survival through the San Joaquin River including Mendota Pool, and through the Chowchilla and Eastside Bypass system. Results from 2011 showed that fish moved relatively quickly through reach 1 (ave speed 1.53 mph) compared to downstream reaches (e.g., movement in reach 2 was 0.44 mph). These delays could be from slow water habitat within existing empoundments, or confusion around unscreened diversions. Additionally, in 2011, receivers were deployed throughout Mendota Pool (above and below, and at the entrance of Columbia canal and James Bypass). Results here showed signs of obvious predation losses.

“Evidence of predation and/or mortality occurred and was determined using capture histories. Six tag codes within Mendota Pool showed multidirectional movements (not downstream movement typical of a juvenile anadromous salmonid), and were never detected downstream. Four tags were detected over an extended time period (35-45 days) at the James Bypass (2) and Mendota Pool (2) receivers. Likely, these fish were lost to predation, and tags expelled at the receiver location until the battery died. Likewise 3 tags showed upstream movement in Mendota Pool, then were never detected again.” (Workman 2012 ATR).

In 2011, survival from San Mateo Road Crossing releases through Mendota Pool were only 33%. This compares to survival in reach 1 from Friant Dam Releases of 78%. There are obvious survival issues through reach 2 and Mendota pool, and multiple years of data collection will provide baseline data as well as direction for reintroduction releases prior to 2b restoration construction begins.

In 2012 and 2013 studies of survival and migration patterns in the Restoration Area were constrained by the inability to release full Restoration Flows due to seepage impacts. As a result of seepage impacts, releases of spring pulse flows are reduced and typically no flow is released below Sack Dam throughout most of the spring and summer, and flow that gets below Mendota Dam is released through a bottom outlet, which is not conducive for juvenile passage. Continuous flows through the river and/or bypass system will only occur during flood control releases until the seepage impacts have been addressed.

In 2012, the study focused on migration rates related to flow pulses of varying magnitude in the upper reaches, and movement through Reach 5 and through the Delta (in coordination with other ongoing studies outside the SJRRP). Reaches 2-4 as well as the bypass system could not be sampled due to lack of river connectivity. The 2013 study was originally designed to address predation rates in reach 1 mine-pit habitat, but due to fish size constraints the original study plan

had to be revised to accommodate fish availability. Consequently, releases were made weekly beginning April 17th through May 7th. Release groups were of variable sizes (50-200 fish per release group), as fish were tagged as they reached appropriate size for tagging (restrictions on battery life precluded holding all fish for longer periods).

Evaluation of the mine pits for prioritization for restoration is a Paragraph 11(b) item in the Settlement and studies are needed to help quantify predation risk and assess the habitats that pose the greatest risk of predation. Additional high priorities, for near term actions include a more in-depth assessment of movement through and around existing impoundments, including Mendota Pool and Sack Dam to determine if operational actions can improve fish movement around these structures. The 2014 study will also continue annual releases near Friant Dam and in Reach 5 to develop multi-year comparisons of migration rates, routes, and survival estimates. The specific objectives of discrete release groups will remain flexible to answer the highest priority questions possible, given the flow constraints, or opportunities as they arise.

c. Why is the study necessary (context of settlement requirements, reintroduction efforts, interim flow information needs, etc.)?

On a long-term basis, this study will help assess the effectiveness of the Program's flow management, operations management at existing structures, and the site-specific restoration actions. Juvenile survival rate could impact the Program's ability to meet reintroduction targets, so data informing survival rates, and critical areas of concern for juvenile survival are important components in designing and implementing reintroduction actions in the near-term and long-term.

Studies are needed to help quantify predation and entrainment risk, in the habitats that pose the greatest risk of predation and entrainment, including captured mine pit habitat and existing impoundments and unscreened diversions. The 2014 acoustic tagging study will help quantify predation and entrainment potential in these altered habitats and build upon 2011-2013 data collected. This study will provide data on juvenile salmon mortality near passage impediments that can be used to inform reintroduction strategies, such as release number, timing, and location for juvenile salmon. In addition, these data can be used to estimate project-wide smolt survival rates allowing for refinement of fish population models (e.g., ESHE and EDT).

2. Site Description

a. Location of the study (include maps, geographic data, etc.).

The study will occur over the entire Restoration Area (Friant Dam to the confluence with the Merced), with emphasis placed on mine pit habitats and impoundments/diversion such as Mendota Pool and Sack Dam. Data will also be collected surrounding the downstream tributaries of the San

Joaquin and through the Delta through collaborative data sharing with other ongoing acoustic telemetry studies.

3. Study purpose

a. Statement of study goals

Continue the collection of movement and survival information of juvenile salmonids through the restoration area to develop information for a number of water year types and operations scenarios to help inform reintroduction, and habitat restoration/management decisions.

b. List the objectives of the study

1. Determine Reach specific survival rates, migration rates, and route selection of fish released below Friant Dam, and San Mateo Crossing (if there is connectivity). If the river does not have connectivity, releases will be made at the uppermost end of the downstream connected river (e.g., release at the top of reach 5 or below Sack Dam, etc.)
2. Determine survival rates, and migration rates through the mine pit reach of the Restoration Area with specified releases above target mine pit complexes for short-term tracking of fish through a defined area with high predation potential.
3. Compare movement and survival rates of juvenile Chinook salmon through Mendota Pool and Sack Dam under variable operations scenarios to determine if movement rate can be influenced by operational changes, and if those changes translate into increased survival. Targeted releases will be made directly above target locations identified. These data can also be compared with data collected in 2011 from the Mendota Pool area. These data will be critical to inform near-term reintroduction strategies while construction projects are still pending. Prior to reach 2b construction the Service will be required to make management decisions regarding reintroduction numbers, timing, location for both fall-run and spring-run Chinook. Data on survival through these reaches as well as the need for imprinting during downstream migration will need to be analyzed to make the best decisions for Program success.

4. What are the management or policy implications of the study?

Data collected over the life of the study will be used to determine the most appropriate release locations for reintroduced salmonids based on predation risk, survival estimates, travel time, and water quality parameters to optimize survival of reintroduced salmonids. Information gathered here may also be paired with results of the mine-pit predator assessment in determining a prioritized list of restoration actions through the mine pit reach.

Data from these investigations can also lead to changes in flow management decisions regarding temperature, survival, movement rates, etc.; decisions regarding habitat restoration for juvenile lifestages, including the necessity for temporary screens on diversions prior to reach 2b construction or creation of appropriate rearing habitat locations and inundation timing; as well as operational decisions regarding the best operations scenarios at existing structures that is feasible for meeting both the Restoration and Water Management Goals of the Program.

B. Study Organization and Responsibilities

1. Person(s) responsible (names, title, phone numbers, addresses, e-mail) and role.

Michelle Workman: michelle_workman@fws.gov. Responsibilities include budgeting and staffing the study, equipment ordering/preparation, study design and implementation, draft and final report preparation.

Paul Adelizi: paul.adelizi@wildlife.ca.gov. Responsibilities include study stock appropriation, husbandry during holding/tagging, coordination of releases and associated data (providing equipment and staff).

Matt Bigelow: matt.bigelow@wildlife.ca.gov. Responsibilities include coordinating DFW staff for tagging, transporting, and releasing study fish, and coordinating river access locations for both releases and receiver deployment.

2. Coordinated Studies:

This study will be intricately coordinated with PIT tag assessments conducted by USBR, to address similar objectives. PI for PIT tag assessments is Don Portz: dportz@usbr.gov

C. Study Design

1. Describe the sampling design and measurement variables.

- a. Describe the experimental design and projected sample sizes. For manipulative experiments, describe the table of treatments and number of replicates, and how experimental units will be grouped or blocked if appropriate.**

Tagging Juvenile Fall Run Chinook Salmon- Replicate core group releases (100 in Reach 1 as 2 replicates of 50 fish each; 100 tagged lower connected reaches, released as 2 replicates of 50 fish each). Additional releases directly above mine pit complexes (2 release groups of 100 fish (2 fifty fish replicates each) above Sycamore Island mine pit complex (RM 244), 2 replicate releases in Mendota Pool, 2 replicate releases above Sack Dam (total of 200 fish). . Likely source fish will be the progeny of the fall-run transport study, and progeny of the BY10 fall run captive broodstock on station at the iSCARF. A minimum of 500 pilot fish will be released with each tagged fish

release group. The mine pit/Mendota Pool releases will represent the year 4 ‘special study’ releases in addition to annual releases below Friant and in the lower connected reaches. Tagging will be conducted in the interim conservation facility or the mobile processing trailer on loan to the SJRRP from the Anadromous Fish Restoration Program (AFRP). All fish will be coded wire tagged (CWT) and a subsample will have acoustic tags implanted. CWTs will be injected in the snout of the fish using a Mark IV Tag injector (Northwest Marine Technology). Acoustic tag placement will involve surgical techniques requiring an approximate ½ inch incision closed by suturing with standard absorbable suture material by staff experienced in the procedure. Fish will be recovered for no less than 24 hours to ensure no latent mortality from surgical implanting of tags effects tag results.

Receiver Placement – As in past years, receivers will be placed throughout the Restoration Area, and through the downstream tributary reaches through the Stanislaus River.

Release Fall Run Chinook Salmon –Releases in mine-pit complexes will be coordinated with mine-pit predation assessment scheduling to validate predation losses through diet analysis. Specific release locations, mentioned above, will be confirmed through DFG access agreements.

Receiver Download and Data Processing/Analysis - Receivers will be interrogated on a standard schedule, and additional mobile tracking with a handheld tag detector will be conducted within the mine pits/Mendota Pool area to assess predation/entrainment.

2. Describe the contingency plans to assure the question is resolved and uncertainties are addressed:

Contingency planning will occur based on 1) changes in planned operations schedule, 2) issues with access, purchasing, equipment, staffing, etc., 3) fish size issues as they may arise.

D. Study Resource Needs

1. Detailed budget

Equipment – tags (800) \$280,000

Equipment overhead (6%) – \$16,800

Staff time -\$(salary + travel)= \$

Bioday rate (this rate includes salary, benefits, administrative costs, use of vehicles, gasoline, office materials, small equipment, etc; \$750 day for technical)

25 biadays for 1 technical staff to deploy and download receivers + mobile tracking- \$18,750; DFG technicians will assist with downloading receivers in Reach 1 (no cost)

20 biadays (\$750) to tag and release fish and conduct mobile tracking(\$15,000 rate; 2 DFG staff will assist with setting up receivers (no cost)

0.20 FTE – Field Study Coordinator – for oversight of all FWS lead MAP studies - \$47,387

Travel: 10 nights at \$147/night per diem for Fresno = \$14,700

Report preparation and Biologist time is covered under the USFWS Staffing Agreement with BOR.

Travel -

Operations: \$80,837

Equipment: \$280,000.00

Equipment Overhead: \$16800.00

Total Equipment: \$296,800

Study Total: \$377,637

E. Compliance Considerations

1. Route study through FRRT for compliance considerations

This study is permitted for a 5 year period beginning in 2011. We currently have valid: NOE (CEQA), CatEx (NEPA), Nationwide 5 (ACOE), NLAA and Internal Section 7 FWS (ESA compliance), and a concurrence that it does not affect any Indian Trust Assets (ITA) under the programmatic document. Need to resubmit a Special Use Permit (SUP) for receiver placement in the San Luis Refuge Complex three weeks prior to proposed access, if river connectivity necessitates.

F. Invasive Species: What measures will be taken to ensure field staff does not spread invasive plants or animals to new sites during the study?

HACCP plans are developed for this activity.

G. Due Dates and Products

1. Describe the timeline for the study, with due dates for deliverables, including drafts (this should relate to section I.A.2.c).

This study will be implemented in the spring/early summer of 2013. A draft report to the mid-year ATR will provide information on fish size and condition at tagging, receiver deployment locations, release location and timing. Receivers will be downloaded up to 3 times during the study based on release timing, and spacing between release groups. An annual summary of results will be prepared for the December ATR which will include survival estimates by release group and reach, migration rates and route selection information for various release groups.