Study 15

San Joaquin River PIT Tag Monitoring and Site-specific Technology Development

Public Draft
2013 Monitoring and Analysis Plan

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San Joaquin River Restoration Program

2013 Monitoring and Analysis Plan

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Proposed Staff: 3 Reclamation staff with FWS assistance for tagging and fish release
County(ies) affected by Study: Fresno, Madera, Merced

I. Study Management

A. Study Description

1. History or Background

a. General project background discussion.

In order to monitor the success of reintroduction, passive integrated transponder (PIT) tag arrays would be beneficial to study the downstream emigration, instream movement, and entrainment of hatchery-reared juvenile Chinook salmon. As well as the basin-wide escapement, entrainment, or straying of returning adults, which is important in determining survival estimates. The use of remote PIT tag detection will help monitor fish passively (i.e., dam passage, habitat use, entrainment, age, individual movements, behavior, life history parameters, and escapement) and PIT tag capture information can provide fish growth and abundance data. Advancements in RFID technology have allowed for smaller (i.e., 12mm) and superior tags for field detections. In 2012 PIT Tag arrays were constructed, in collaboration with an acoustic tracking study, to determine the migration rates related to flow pulses of varying magnitude in Reaches 1 and 2 of the Restoration Area. While 2012 was successful for monitoring instream juvenile Chinook migration, more technology development and emphasis is necessary for flat plate PIT tag array designs and detection at in-river structures (i.e., dam and bypass passage). Continued efforts are needed to assess migration and survival over a variety of operations scenarios that include changing the migratory path of emigrating juvenile salmon by the use of bypasses or confining them to the river channel. PIT tags allow researchers to tag and monitor more and smaller fish because of their minimal cost and small size compared to other tracking methods.

c. Why is the study necessary (context of settlement requirements, reintroduction efforts, interim flow information needs, etc.)? The San Joaquin River is highly regulated and water flow decisions may impact juvenile Chinook salmon downstream migration patterns. Data

recorded from PIT tagged fish can be used to determine areas that contribute to mortality, migration rate, and emigration routes through the Restoration Area under a variety of flow conditions. This information will be used to better inform management while making decisions regarding reintroduction timing and flows, and pathways through the system which provide the greatest chance for survival. These data will also be used to estimate reach specific and Restoration Area-wide juvenile Chinook survival rates providing more accurate information for the Emigrating Salmonid Habitat Estimation model to predict the number of juvenile production needed to meet the program population goals. This data can be used to gain a better understanding of the survival and migration paths of juvenile Chinook while adaptively managing future decisions toward reaching the Restoration Goal.

2. Site Description

a. Location of the study (include maps, geographic data, etc.). The study will occur in all reaches of the Restoration Area with more emphasis on Reaches 1-3, Chowchilla Bifurcation structure, Sack Dam, and other major structures.

3. Study purpose

a. Statement of study goals To provide mortality, migration rate, and emigration route choices through the Restoration Area under a variety of flow conditions and water year types. This information will be used to better inform management while making decisions regarding reintroduction timing and flows, and pathways through the system which provide the greatest chance for survival. In addition, better PIT tag array designs can further the detection technology and widen its use.

b. List the objectives of the study

1. Design effective flat plate PIT tag arrays and low profile antennae that can be used at structures and within the river where recreationist and debris can freely float over them without incidence.
2. Determine migration scenarios with the greatest survival for a variety of flow conditions and water year types.
3. Identify locations with high predation and fish losses.

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

PIT tag data and other telemetry data will be used to adaptively manage future Restoration efforts and actions regarding the routing of water through the Restoration Reaches.

B. Study Organization and Responsibilities

1. **Person(s) responsible.**

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Office (303) 445-2220, cellphone (303) 859-9505, dportz@usbr.gov
Reclamation project lead and coordinator. Responsibilities include: budgeting and staffing, equipment ordering/preparation, study design and implementation, PIT tag array construction, fish tagging, draft and final report preparation.

Michelle Workman: Project collaborator and coordinator of FWS staff. Tagging and release of juvenile Chinook salmon.

C. Study Design

1. **Describe the sampling design and measurement variables.**

We will be exploiting the latest in PIT tag technology for the site feasibility evaluation and development of improved detection methods and equipment. Historically PIT tag technology has focused on the use of full-duplex tags due to their relatively small size (12 mm). Half-duplex tag technology allows for a greater detection range by sacrificing tag size (23 mm), however, half-duplex tags are now available in a 12 mm size and still maintain a larger detection range. Half-duplex detection arrays allow the use of larger antennas with smaller power requirement. The construction of antennas is much easier than that of full-duplex technology in that half-duplex arrays a less susceptible radio frequency interference which gives researchers the ability to construct site-specific antennas with ease and at a much cheaper cost than full-duplex arrays.

Monitoring at different river locations where PIT tag detection arrays (i.e., diversions, dams, and fish passage structures, and bifurcation structures) will allow an assessment of post-stocking survival and information on the fate of tracked specimens on spatial and temporal scale. Water flows and alternate pathways through the system may greatly affect survival. Movements can be correlated with temperature, flow, and other abiotic factors. Five instream locations are proposed for Reach 1 and 2 similar to spring 2012 PIT Array deployment and two additional structure arrays (e.g., Chowchilla Bifurcation Structure and an additional location) may be designed and constructed to track downstream passage and movement.

Replicate group releases: Two replicates of 1000 fish in Reach 1 with 50 acoustically tagged in each and two replicates of 400 fish each released upstream of the Chowchilla bifurcation structure (or other structure if water is not being diverted). Hatchery sources for these fish

have not been identified and will be determined through the California Department of Fish and Game. Tagging will be conducted in the Interim Conservation Facility. All fish will be HDX PIT tagged with a syringe and a subsample will have acoustic tags implanted. Once juvenile Chinook salmon are released, the PIT tag arrays will be maintained for 6-8 weeks. As PIT tagged fish migrate through the river they will pass antennae arrays where the code, date and time of passage is detected by a receiver, recorded, and stored.

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

Contingency planning will occur if changes arise regarding water availability and flow schedule alterations.

D. Study Resource Needs

Detailed budget

	Estimated Costs
Reclamation	
Field testing:	
3 Reclamation fisheries biologists ($736/day/biologist)	
Installation of up to 8 field sites	$ 66,240
Fish tagging	$ 4,416
Monitoring / downloading data	$ 22, 080
Field Equipment:	
12mm and 23mm HDX PIT Tag (1,500 @ $2.80)	$ 4,200
Antennae wire	$ 3,000
Bulk Twinax Cable for Antennas (1000 ft.)	$ 1,625
2 weeks data entry	$ 7,360
Report writing (2 biologists, 3 weeks)	$ 22,080
Travel (airfare, lodging, per diem, truck, fuel, parking, etc.)	$ 42,456
Grand Total	$ 173,457

E. Compliance Considerations

1. Compliance considerations

A NOE (CEQA), CatEx (NEPA), Nationwide 5 (ACOE), NLAA, and Internal Section 7 FWS (ESA compliance), CA collection permits, and other relevant permits will be obtained before starting this study. A Special Use Permit (SUP) for access to the San Luis Refuge Complex will be requested three weeks prior to proposed access if access is needed.

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?

Permanent equipment is not shared among sites and hand tools are thoroughly dried between site installation.

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).**

A Final Report will be submitted to the Annual Technical Report and project information will be shared on the Program's website.

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