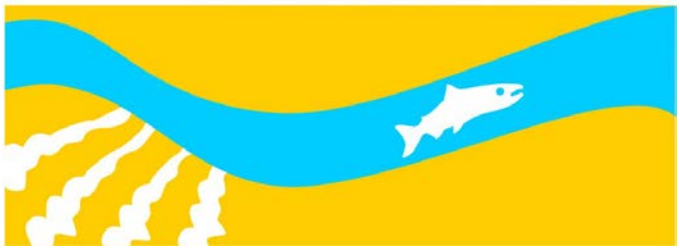
Study 7

Juvenile Salmon Holding

Public Draft
2013 Monitoring and Analysis Plan

SAN JOAQUIN RIVER
RESTORATION PROGRAM



September 2012

Fish Management Work Group
STUDY WORKPLAN

MAP Study Title: Juvenile Salmon Holding
Principal Investigator(s):Zac Jackson (FWS); Paul Adelizi (DFG); Matt Bigelow (DFG)
Contact Info. Of Principal Investigator(s): zachary_jackson@fws.gov; padelizi@dfg.ca.gov; mbigelow@dfg.ca.gov
Proposed Staff: 2 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.

It may be necessary to hold juvenile salmon to support two potential aspects of reintroduction efforts (e.g., out-of-basin spring Chinook salmon, San Joaquin River basin fall Chinook salmon). The San Joaquin River Restoration Program (Program) goal of reintroducing spring Chinook salmon to the San Joaquin River below Friant Dam will require the movement of out-of-basin eggs and/or juvenile salmon into the Restoration Area. Juveniles may be held within in-river cages to stimulate imprinting on San Joaquin River water, thereby increasing the likelihood of them returning as adults to the San Joaquin River. The cages will also allow rearing the fish to a large enough size that will allow the placement of a mark and tag, identifying the fish as Program fish. Similarly, if efforts this fall to transport fall Chinook salmon that escape into the Restoration Area are successful and a portion of those individuals are ripe and successfully spawned, the cages can be used to rear those offspring until they are large enough to tag for release or special studies (e.g., mine-pit predation, reach-specific survival).

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

This study is a critical component of reintroduction efforts. Whether reintroduction in 2012/2013 involves spring or fall Chinook salmon, either are likely to need to be held in the San Joaquin River until they are large enough to be tagged so that they can be

identified as SJRRP stocks for numerous regulatory reasons. Further, juveniles held in this study are likely to be used to support other studies evaluating site- and reach-specific survival and movement rates. It is not anticipated that this study will be affected by normal Friant Dam operations. However, very low releases (e.g., <100 cfs) or flood releases may negatively impact this study.

2. Site Description

a. Location of the study (include maps, geographic data, etc.). The study will occur in Reach 1 of the Restoration Area (Friant Dam to Gravelly Ford).

3. Study purpose

a. Statement of study goals

1. Hold spring Chinook salmon juveniles from the Feather River to encourage imprinting and until they are large enough to tag.
2. Hold progeny of fall Chinook salmon that escaped into the lower reaches of the Restoration Area until large enough to tag and to support survival studies.
3. Operate rotary screw traps (RST) to inform future monitoring activities and support survival studies.

b. List the objectives of the study

1. Determine effectiveness of holding juveniles in cages in terms of growth and survival.
2. Locate suitable long-term RST monitoring location and determine sampling efficiency at range of flows experienced.
3. Provide additional information from RST to inform survival studies.

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

Data collected over the life of the study will be used to determine if holding out-of-basin juvenile salmon can imprint on, and will return as adults to, the San Joaquin River after being held for at least ten days. This will inform future reintroduction strategy decisions. RST operations will also lay the foundation for long-term monitoring necessary to inform future decisions about reintroduction, population management, water operations, and restoration activities.

B. Study Organization and Responsibilities

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

and role.

Zac Jackson
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Responsibilities include budgeting and staffing the study, study design and implementation, and draft and final report preparation.

Paul Adelizi
California Department of Fish and Game
1234 E. Shaw Ave
Fresno, CA 9370
Office # (559)-243-4014 ext. 250
Fax # (559)-243-3004
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Responsibilities include husbandry during holding/tagging, coordination of releases and associated data, and providing equipment and staff.

Matt J. Bigelow
Environmental Scientist
San Joaquin River Restoration
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Region 4
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Fresno, CA. 93710
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Responsibilities include coordinating DFG staff for cage installation and maintenance and transporting and releasing study fish.

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.

Once juveniles are available and at least 35 mm in total length, they will be placed in aluminum cages in the SJR located in Reach 1 below Friant Dam.

Cages will be fitted with clock-driven belt-style fish feeders. Fish will be fed daily approximately 4 to 6 % of total body weight using a standard commercial salmon feed. Feed level will determined using BioGro, an Excel based fish feeding program developed by the University of Washington and used by the Oregon Department of Fish and Wildlife. The program calculates fish growth based on temperature units required to produce an inch of growth for each salmonid species. The Program uses 840 temperature units for Chinook salmon.

Cages will be fitted with floats or pontoons and will be anchored using a combination of anchors, tethers and t-posts. Tethers will be positioned to avoid obstructing boaters. Fish will be held at a low density within the cages at a maximum allowable density of 0.15 lb/ft3/in, based on recommendations proposed by Banks (1994) and Ewing and Ewing (1995) for rearing spring Chinook salmon. Fish will be monitored daily for feeding and cleaning the cages. Success will be based on survival, weight gain and condition factor. Fish will be held in cages for at least ten days for imprinting purposes or until they reach a size large enough for tagging. After which, fish will be released in reach 1 of the SJR in accordance with California Department of Fish and Game policy. If some of the fish held in these cages are identified as needed for other studies (e.g., predation, telemetry), they will be held until they are large enough for the intended purpose.

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.

D. Study Resource Needs

1. **Detailed budget**

USFWS

Equipment - $28,800

CWTs - $6,300
V-Detector - $5,000
Contract with CWT taggers - $15,000
Misc. supplies (plumbing, etc.) - $2,500
Equipment overhead (6%)- $1,728

Staff time - $39,193.60

Bioday rate (this rate includes salary, benefits, administrative costs, use of vehicles, gasoline, office materials, etc; $750 day for technical, $900 day for senior staff)

10 biodays for 1 technical staff to assist with tracking growth and survival of caged fish- $7,500
8 biodays to tag and release fish (2 technical staff, $750 rate)- $6,000
0.10 FTE – Field Study Coordinator – for oversight of all FWS lead MAP studies - $23,693.60

Staff overhead (25.5%[i] for outside CVPIA)- $9,994.37

Travel - $ 2,000 (4 staff for 1 week (tagging)= $2,000

Operations: $39,193.60
Operations Overhead: $9,994.37
Total Operations: $ 49,187.97
Equipment: $28,800
Equipment Overhead: $1,728
Total Equipment: $30,528

Study Total: $79,715.97

[1] The rate for CVPIA is 22.5% and 25.5% for agreements made outside CVPIA

E. Compliance Considerations

1. Route study through Fisheries Reintroduction Regulatory Team for compliance considerations

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?

Hazard Analysis Critical Control Point plans will be 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 of 2013. A draft report to the mid-year ATR will provide information on fish size and condition at placement into cages, tagging, and release as well as release location and timing.

References

Banks, J. L. 1994. Raceway density and water flow as factors affecting spring Chinook salmon during rearing and after release. Aquaculture 119:201-217.

Ewing, R. D., and S. K. Ewing. 1995. Review of the effects of rearing density on survival to adulthood for Pacific salmon. Progressive Fish-Culturist 57:1-25.