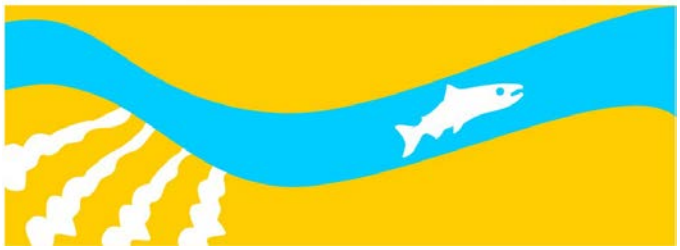
## Study 6

# Trap and Haul of Adult Fall Run Chinook

## Public Draft
## 2013 Monitoring and Analysis Plan

SAN JOAQUIN RIVER
RESTORATION PROGRAM



**September 2012**

**Fisheries Management Work Group**
**STUDY WORKPLAN**
**Draft**

**MAP Study Title: Trap and Haul of Adult Fall Run Chinook**
**Principal Investigator(s): Matt Bigelow, Don Portz, Zac Jackson**
**Contact Info. Of Principal Investigator(s): See Details below**
**Proposed Staff: 6 from CDFG, 2 from USFWS, and 2 from USBR in addition to listed PI's**
**County(ies) affected by Study: Fresno, Madera, Merced**

## I. Study Management

### A. Study Description

1. History or Background
   a. General project background discussion.

The Settlement (NRDC v. Rodgers et al 2006) requires the reintroduction of salmon into the San Joaquin River "no later than December 31, 2012". The Fisheries Management Work Group is working to meet that goal. A number of channel modification projects intended to improve habitat and passage conditions are being developed, requiring fisheries agencies to examine options allowing for reintroduction to commence while channel modification projects are still being planned. One option being explored is to trap and haul salmon around existing barriers and unsuitable habitat while channel modifications are still pending. This study will evaluate the feasibility of using trap and haul to transport adult Chinook salmon around existing barriers in the San Joaquin to suitable holding and spawning habitat upstream.

In 1948 the Department of Fish and Game conducted an emergency trap and haul program on the San Joaquin River by erecting a temporary barrier weir at Hills Ferry with a trapping and loading facility. Tank trucks transported adults to a suitable release site that would bypass the dry section of the river. A watertight collection tank and boom truck hoisted fish out of the trap and into transport trucks. Twenty to thirty fish at a time were hauled 18 miles upstream to where the river still flowed (Warner 1991). Currently the winter-run conservation program (USFWS) transports adult winter-run Chinook salmon to the Livingston Stone Conservation Facility for use in their captive rearing program, with great success. However, attempts to trap and haul Butte Creek adult spring-run Chinook salmon have had little success. The winter-run Chinook salmon trap and haul program utilizes a "fish elevator" to move the fish from below the Keswick dam to the transport truck. This allows fish to remain in water with no handling. Whereas, in Butte Creek fish were moved from the corral nets to the transport truck in dip nets. This required handling the fish, and didn't allow fish to remain in water as they are moved to the transport truck.

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

The SJRRP needs to develop the protocols to achieve successful trap and haul of adult salmon in order to achieve the restoration goal of reintroducing salmon in a timely manner. In addition to trap and haul, spawning, incubation, and rearing methods and protocols need to be developed.

1. How flows may interact with study?
   Interim flows may impact the study by the release of flows over Sack Dam causing an additional attraction flow that is not currently present. This additional attraction would require an additional trap to be set up and monitored in the area above Highway 165 Bridge. Fall pulse flows in the Reach 1 area will have a minimal effect on the study because the duration is short.

c.. Site Description

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

a. Trapping:

Fish will be collected in Reach 5 of the Restoration Area with traps installed annually in the following general areas, upstream of the HFB, at Mud and Salt Sloughs and on the San Joaquin River above the confluence with Salt slough. Moving or expanding trap locations in the future may include placing a trap on Sack Dam or placing a net trap just downstream of Sack Dam.


Figure 1: General location for traps above HFB on the SJR and one location on Mud Slough

Figure 2: General trap location on Salt Slough

b. Release:
Captured fish will be transported to and released in Reach 1 of the Restoration Area upstream of the State Route (SR) 99 Bridge. Some fish may be transported to a location closer to Friant Dam to be utilized for streamside spawning.

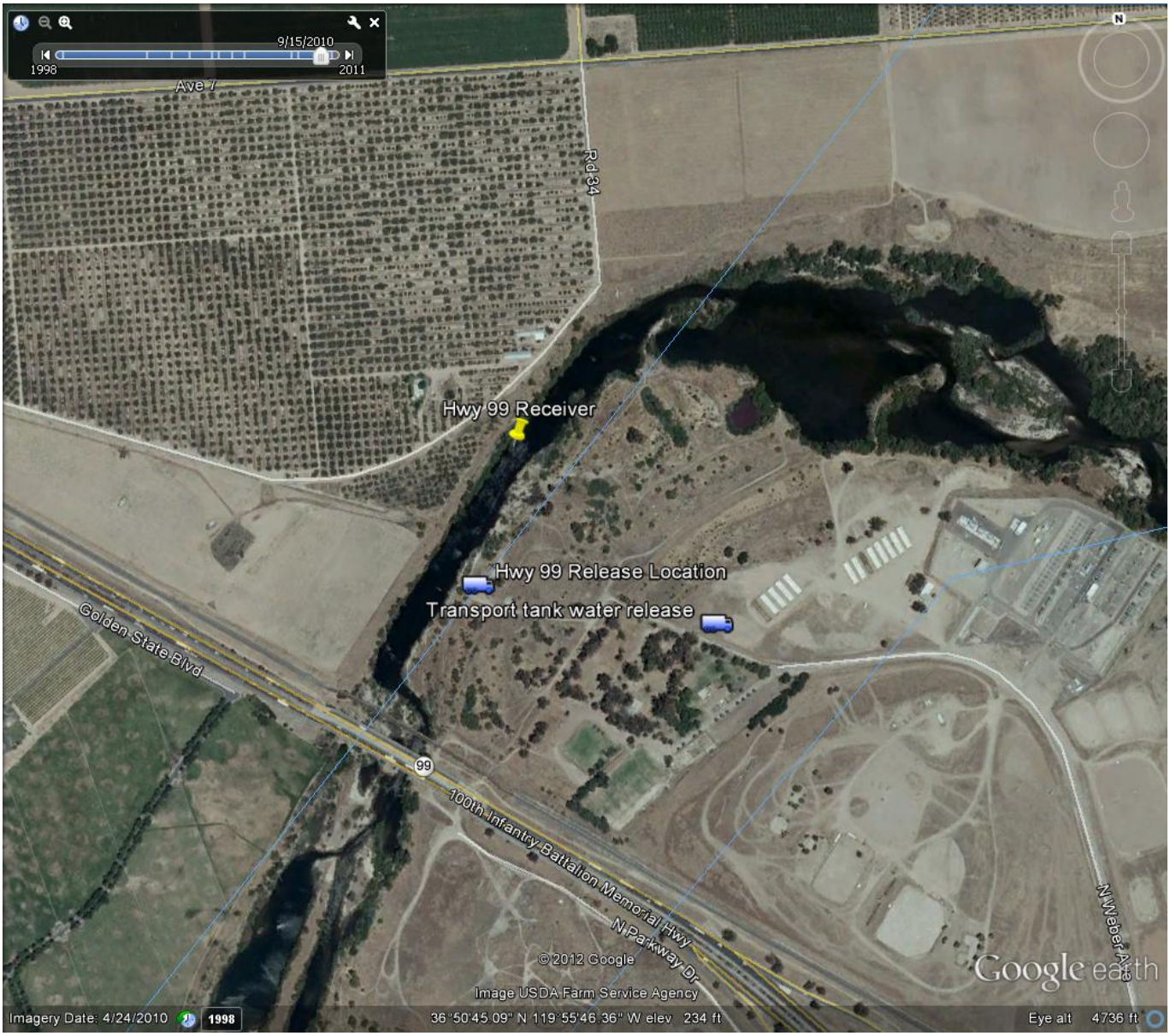


Figure 3: Fish release location also showing transport water clean-out location

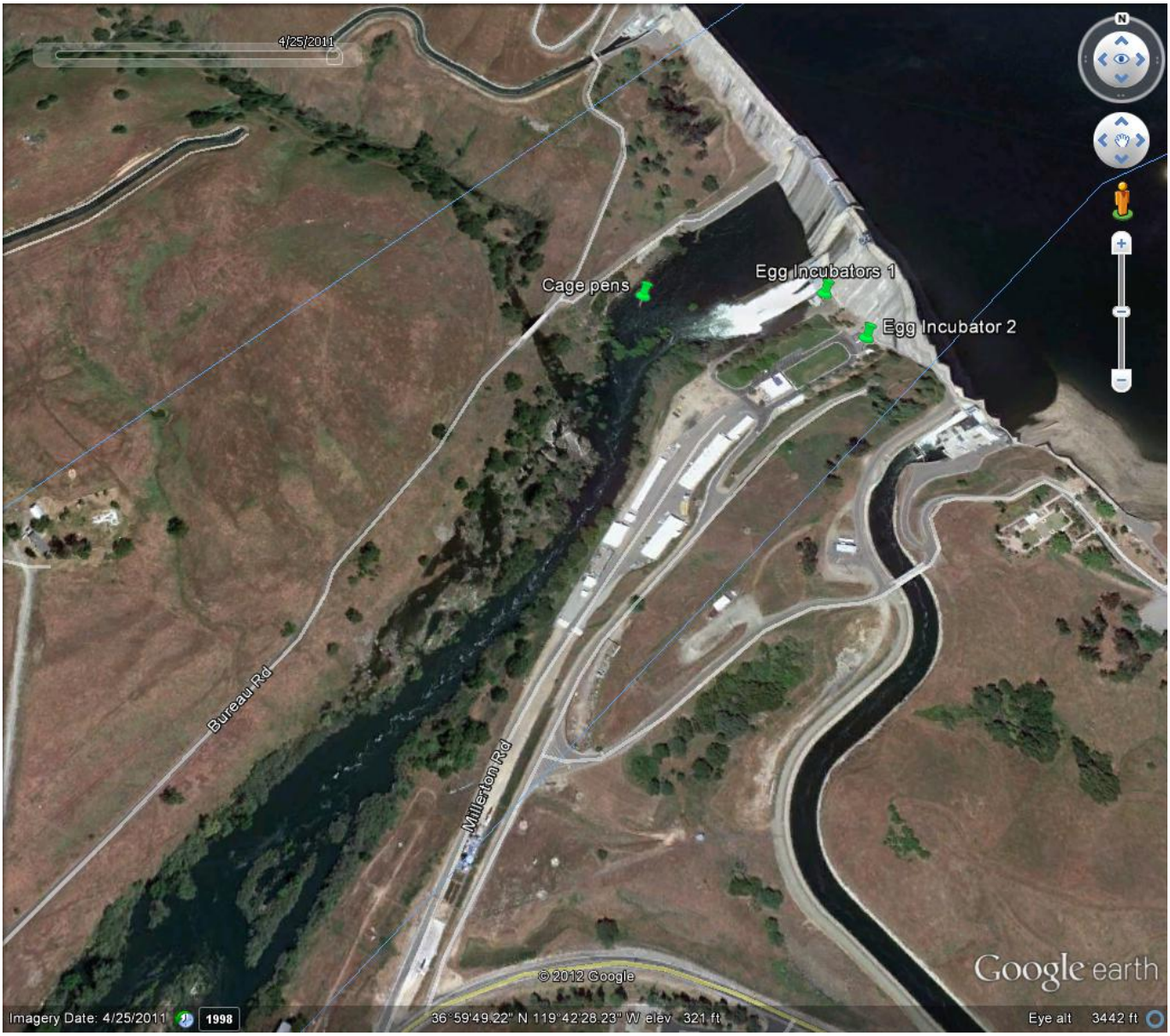


Figure 4. Cage rearing pens and Incubator locations

2. Describe the environmental setting for the study.
   The Program will move fish above fish passage barriers to suitable spawning habitat. Reaches 2, 3, and 4 of the Restoration Area do not contain suitable spawning habitat. Therefore, only Reaches 1 and 5 of the Restoration Area are described below

   Spawning and release Locations:

   ***Reach 1***
   Reach 1 begins at Friant Dam and continues approximately 37 miles downstream to Gravelly Ford. The reach is divided into two subreaches, 1A and 1B. Reach 1A extends from Friant Dam to SR 99. Reach 1B continues from SR 99 to Gravelly Ford. Reach 1 is the principal area identified for salmon spawning, but has been extensively mined for instream gravel. In

addition, in Reach 1, riparian encroachment has occurred, channels have been incised, mobilization of bed material is less frequent, and possible sedimentation of spawning grounds has occurred. Reach 1 presently supports continuous riparian vegetation, except where the channel has been disturbed by instream and floodplain aggregate mining.

Native fish species recently documented in Reach 1 include Sacramento sucker (*Catostomus occidentalis*), sculpin (*Cottus.sp*), rainbow trout (*O.Mykiss*), lamprey (*Lampetra,sp*), threespine stickleback (*Gasterosteus aculeatus*) and Sacramento pikeminnow (*Ptychocheilus grandis*). In addition to native fish, this reach also supports nonnative species such as largemouth bass (*Micropterus salmonides*), spotted bass (*M. punctulatus*), striped bass (*Morone Saxatilis*), goldfish (*Carassius auratus*), bluegill (*Lepromis macrochirus*), green sunfish (*L. cynanellus*), pumpkinseed (*L.gibbosus*), readear sunfish (*L. microlophus*), warmouth, log perch, common carp (*Cyprinus carpio*), catfish (brown-black bullhead, and white) (*Amerius sp*.), Channel catfish (*Ictalurus punctanus*), crappie (*Pomoxis.sp*), golden shiners (*Notemigonus crysoleucas*), brook trout (*Salvelinus fontinalis*) and western mosquitofish (*Gambusia affinis*).

Trapping:

***Reach 5***

Reach 5 of the San Joaquin River extends approximately 18 miles from the confluence of the Eastside Bypass downstream to the Merced River confluence. This reach receives flows from Mud and Salt sloughs, channels that run through both agricultural and wildlife managements areas, and flows are dominated by agricultural return water. Reach 5 and the sloughs are typically composed of sandy substrate, steep banks with little to no vegetation, but occasionally have gradual sloping banks with only sparse grass cover. Woody riparian vegetation along the channel is sparse, but dominated by willow species.

Habitat conditions for fish in Reach 5 have been substantially modified by levee/dike construction, agricultural encroachment, and water diversions. These changes have reduced the quality of floodplain habitat, as well as reducing the main channel habitat complexity and the quantity and quality of off-channel habitat.

Native species recently documented in Reach 5 and adjacent sloughs included Sacramento sucker, prickly sculpin (*Cottus aspur*), hitch (*Lavinia exilicauda*), Sacramento blackfish (*Othorodon microlepodotus)*, Sacramento pikeminnow, Sacramento splittail (*Pogonichthys macrolepidotus*), hardhead (*Mylopharodon conocephalus*), and Tule perch (*Hysterocarpus traskii*). However, this reach is dominated by nonnative species such as largemouth bass (*Micropterus salmonides*), spotted bass (*M. punctulatus*), striped bass (*Morone Saxatilis*), goldfish (*Carassius auratus*), bluegill (*Lepromis macrochirus*), green sunfish (*L. cynanellus*), pumpkinseed (*L.gibbosus*),

readear sunfish (*L. microlophus*), warmouth, log perch, common carp (*Cyprinus carpio*), catfish (brown-black bullhead, and white) (*Amerius sp*.), Channel catfish (*Ictalurus punctanus*), crappie (*Pomoxis.sp*), American shad (*Alosa sapidissima*), threadfin shad (*Dorosoma petenense*), inland silverside (Menidia beryllina), and other minnows and shiners.

2. Study purpose

a. Statement of study goals.

To capture and successfully relocate salmon to Reach 1 of the Restoration Area that are lost upstream of Hills Ferry Barrier. In addition to the primary goal, evaluate the feasibility of using trap and haul to transport adult Chinook salmon around existing barriers in the San Joaquin to suitable holding and spawning habitat and develop protocols to successfully trap and haul adult salmon in order to achieve the restoration goal of reintroducing salmon in a timely manner.

b. Objectives.

Objective 1 assess the viability of trapping and hauling adult salmon

Objective 2 assess spawning site selection of adults transported to Reach 1

Objective 3 establish a long term plan for use of trap and haul activities

Objective 4 assess success of streamside spawning and incubation

Objective 5 produce offspring from trapped adults for use as study fish

c. Study milestones. Identify products and timelines.

1) Begin trapping starting in 2012

2) Release fall-run Chinook salmon in Reach 1 starting in 2012

3) Spawn fall-run Chinook salmon in Reach 1 starting in 2012

4) Produce annual reports on finding and activities starting in 2013 and ending in 2021

5) Develop a long term strategy for the use of trap and haul. Completion date: October 2014

6) Trapping/spawning releases will occur within the time period the Hills Ferry Barrier is in place (i.e. begin in September of each year and end in December). This study is expected to continue through 2020. Year one (2012) activities will begin in October.

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

1) The initial years of the study may have long term effects on the management of the species with in the entire San Joaquin River system.

2) This project may complicate the reintroduction of spring-run Chinook salmon.

**B. Study Organization and Responsibilities**

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

1. Principle Investigators:

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2. Chain of command (if appropriate).

3. Collaborators (agencies, NGOs, academia, etc.) and contact persons: Is an MOU and/or contract already established with the collaborator(s)? CDFG, USFWS, USBR

4. Describe specific roles and responsibilities of all PIs on the project

Matt Bigelow will be responsible for Fyke net placement, transportation equipment, mobile tracking equipment, and spawning activities/equipment. Matt will be the lead

for transportation and mobile tracking but will assist with all aspects of the study and will also be responsible for draft and final reports and presentation of findings.

Don Portz will be responsible for supplying the fyke nets and traps, tags and tagging devices, mobile tracking equipment, a 150 gallon transport tank and will be assisting with all aspects of the study but will be the lead for the trapping efforts of the study. Don will also be responsible for trapping and tracking sections in the draft and final reports and presentation of findings.

Zac Jackson will be responsible spawning activities/equipment. Zac will be the lead for spawning activities and will also be responsible for the spawning sections in the draft and final reports and presentation of findings.

## C. Study Design

**Collection and Transportation:** This multi year study will assess survival (measured as days alive after trapping), egg viability (of female transportation mortalities, and of streamside spawned females), and spawning success of released fish. Information gathered during this study, will better inform future reintroduction activities, and improve trap and haul techniques that may eventually be necessary for reintroducing spring-run Chinook salmon.

Activities for this Study will commence fall of 2012 (after October 1) and is anticipated to end in spring of 2017. Fish will be trapped and transported annually between October and January of each year until conditions allow for them to migrate upstream without assistance. This Study will utilize adult fall-run Chinook salmon collected above the Hills Ferry Barrier. Hills Ferry Barrier (HFB) is a temporary barrier that is operated every year from mid-September to mid-December in the San Joaquin River near the Merced River confluence used to exclude salmonids from the San Joaquin River mainstem in favor of the Merced River where suitable spawning habitat can be reached. A percentage of fish get past the barrier annually and are unable to access suitable spawning habitat due to poor habitat conditions (i.e. dry river conditions) and fish barriers. Fish are also entrained in Mud and Salt Sloughs which typically have greater flow than the main stem SJR. These fish do not contribute to the fall-run Chinook salmon escapement numbers, and may be considered “lost” to the tributary populations. This provides an opportunity for the Program to utilize these fish for restoration activities and if successful may provide small numbers of fish that could return as adults to the tributary populations.

### Fyke Nets

Fish will be trapped using fyke nets installed in up to six locations including upstream of the HFB, Mud Slough, Salt Slough, below Sack Dam and on the San Joaquin River above the confluence with Salt Slough (for approximate locations see maps below). Fyke nets will be placed in the river as close to improved roads as practical to allow for the transport tank to be in close proximity. Fyke nets used in the main stem river will be constructed of two 150 ft long, 6-ft tall, 1.5 inch #15 treated nylon wing walls funneled to a 6ft x 6ft collection box that leads to five, five-foot diameter fiberglass

hoops with a 10-inch diameter funnel throats. Fyke nets set in the sloughs will be similar in design except they will be 4-feet tall with 1-inch square #21 treated nylon netting and 3.5-foot fiberglass hoops. These nets will be installed in October of each year and will be removed by the end of December or earlier depending on flow.

Existing vegetation or t-posts will be used to anchor the nets in the stream. Wing walls will extend to one or both stream banks depending on location and presence boater traffic. T-posts will also be used to stake off the terminal end of the trap with additional t-posts being placed along the wing walls for support as needed (approximately 5-15 t-posts per trap). T-posts will be pounded in to a depth of 1-2 feet using hand tools and will be reset on an as needed basis (a visual representation is given below in figure 5). All fyke nets will allow for the passage of boat traffic if present. If boater traffic is present then nets will be placed to allow boater traffic to pass on the deepest side of the channel, while only utilizing up to ¾ of the river channel leaving room for boats to pass uninhibited and will be outfitted with flashing lights. It is anticipated that only the fyke net set above HFB will need to accommodate boater traffic. Fyke nets placed in the sloughs and on the San Joaquin above the confluence with Salt Slough will be located where boats cannot navigate.

All fyke nets will be checked every 24 hours, including weekends, and may increase in frequency depending on conditions, such as peak migration, high flows, or excessive debris. Fall-run Chinook salmon will be processed first and all other fish will be released downstream of the fyke nets to decrease likelihood of multiple catches and in random locations to decrease predation. Fish will be handled with care and within water to the maximum extent possible. The water levels are typically low creating shallow conditions this allows for portions of the hoop system to be out of the water to accommodate species that require air. Previous experience with these nets in this area during similar timeframe has shown no adverse effect on this type of species.

Figure 5: Image of Fyke net (Image courtesy fipec, Inc)

**Processing and Transportation**

Data collected from all trapped salmon include fork length, sex, condition score (i.e. good, poor etc…), and adipose fin present/absent. In addition, tissue samples will be collected, fish will be tagged with a visible tag, and some may be acoustic tagged with coded transmitters. Environmental data (air temp, water temp, conductivity, salinity, dissolved oxygen, will be collected with a multimeter (i.e. hydrolab,ysi)) or at the gauging station closest to the activity.

Tagged fish will be loaded streamside into a transport tank, 150 gallon, 450 gallon or 500 gallon, using either dip nets or water filled vessels to carry them to the tank. Water filled vessels will be the preferred method for loading. If dip nets are used fish will be kept in water until they are ready to be loaded into the tank. The transport tank will be filled with water at ambient river temperature with 6-10% NaCl to minimize stress. Transport water will be obtained from the trapping location and will either be baled into the tank using 5 gallon buckets or pumped into the tank using a screened portable pump. Dissolved oxygen in the transport tank will be maintained at 8mg/L or more.

Based on the condition of the fish, captured salmon will be sorted for either release in Reach 1 or streamside spawning. Only ripe fish, as evidenced by production of milt or eggs after palpation of the abdomen, will be utilized for streamside spawning. In addition, both a male and female must be present in the traps that day and both must be ripe to be utilized for streamside spawning; otherwise they will be released in Reach 1.

If both poor and good condition fish are present, to the extent possible, efforts will be made to separate these fish while being transported. The 150 gallon tank has two compartments which can hold two adults per side and if necessary either the 450, or 500 gallon tank will be used in conjunction with the 150 gallon tank to separate fish or to accommodate up to 12-14 captured adults.

**Direct Releases**

Fish will be removed from the livewells with a large dip net and placed in small net pens to allow fish to fully acclimate to the release water. Net pens will be small structures, such as a closable collapsible laundry bin, that will be tethered to existing vegetation while fish are being acclimated. Fish will be given at least 30 minutes to acclimate and then will be allowed to leave the net pen under their own volition. Net pens will only be in the water during acclimation and will otherwise be stored in the transport vehicle. After fish have been released, the water from the transport tank will be transported back to the DFG North Grasslands Unit and used for irrigation of those lands. Mendota pool dam will serve as a downstream barrier and fish will be tracked and monitored to determine movements, survival, disease, observe behavior, and spawning success. Fish used for streamside spawning will be checked for fecundity. If fish expire prior to release they will be checked for fecundity. Fish that expire in transport will be frozen prior to disposal in one of the following ways placed in municipal garbage, sent to a rendering plant, buried at the Departments willow ecological reserve OR chopped into quarters and disposed in river.

**Receivers**

A maximum of 20 single channel receivers (receivers) capable of identifying coded transmitter tags will be strategically placed to monitor fish movements throughout the San Joaquin River from downstream of Friant Dam, and various locations at spawning or passage points in the area down to the SR 99 Bridge. The receivers will be moored using stainless steel cable anchored to the bank and weighted to the bottom using flat weights, or cement blocks (see figure 6). Nearby structures or trees will be used to anchor receivers. Receivers will be suspended using a boat buoy to keep the receiver vertical in the water column. All work will be done using hand tools; receivers will be installed in September and will be retrieved in January if conditions allow.

**Figure 6: Vemco receiver with flat weights and buoy**

**Manual Tracking**

Tagged fish will be manually tracked using a portable receiver from a boat and from shore to determine the locations between receivers or specific locations within sections of the river. Visual surveys will be conducted by boat to observe adults and redd locations, which will be recorded utilizing GPS for future monitoring. Manual tracking and visual observations will be conducted by a crew of two individuals floating the river two days per week. Day one from Friant to Hwy 41 Bridge and day two from Hwy 41 bridge to SR 99 Bridge. Adult carcasses will be checked for retained eggs/milt and heads will be retained for Coded Wire Tag (CWT) evaluation. Chinook salmon spawning and behavioral data at these sites will provide information regarding microhabitat utilization, spawning habitat selection and, ultimately, the success of our ability to trap and haul adult Chinook salmon within the Restoration Area

**Streamside Spawning**

Streamside spawning will occur at the trapping location or at the incubation location in a darkened or covered area. The preferred method would be to transport fish and then spawn them to the where incubation will occur. If transportation appears to be

causing egg mortality then fish will be spawned near the river where trapped. If spawned at the trapping location eggs will be stripped from the female and wrapped in wetted cheesecloth then placed in a chilled cooler. While, milt from males will be collected into small plastic bags and placed in a chilled cooler. If spawned at the incubation location coolers, cheesecloth and plastic bags will not be necessary; eggs will be stripped and milt collected as described below.

Eggs will be stripped from the female and prior to fertilization, the eggs will be enumerated and assessed for abnormalities then good eggs will be placed into a mixing bowl or crate. Milt will be extracted form males and may be tested for motility prior to mixing with eggs. Fish will be spawned on a 1:1 male to female ratio. Fertilized eggs will be disinfected with a 10 minute bath treatment containing 100 parts per million of free iodine. After disinfection eggs will be incubated in stream-side incubators. In the future a holding component (i.e. holding non-ripe adults until they are ripe) to this activity may be implemented to allow for greater genetic diversity. Holding pens will be similar to those described for acclimation during release of transported adults and will be attached to the cod end of the fyke system.

**Stream-side incubators**

Eggs used in stream-side incubators will be placed in lockable incubators or vertical incubation trays that will either be housed on BOR property near Friant Dam or in a locked trailer. Water for the incubators will be obtained through existing plumbing from the BOR facility with water being discharged directly to the river. The eggs themselves do not generate any waste, but may need application of iodine up to three times through incubation phase at a rate of 100 parts per million. Treated water will not enter the water way but, will be utilized to irrigate DFG lands. After eggs hatch and are in the swim-up stage they will be moved to in-stream holding pens to rear to an appropriate size.

**Holding Pens**

Once the eggs have reached the swim up stage they will be removed from the streamside incubators and placed into holding pens. The holding pens 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 be 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. Feed will be monitored to ensure that minimal amounts are left uneaten. The Program uses 840 temperature units for Chinook.

Pens will be fitted with floats or pontoons and will be anchored using a combination of anchors, tethers and t-posts. Pens will be placed in the area below Friant Dam on the Madera County side of the river where boater traffic is prohibited. Fish will be held up to a maximum density of 0.15 lb/ft3/in, based on literature and study results from earlier experiments with these pens. Daily, fish will be monitored, fed and pens will be cleaned. 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 Restoration Area of the SJR. If some of the fish held in these cages are identified as needed for other studies (e.g., predator evaluation, telemetry), they will be held until they are large enough for the intended purpose most likely ending in May.

**b. Methods:**

**Trapping and Tagging**
**Setting Trap**

1) Inspect stream for a long straight section with shallow water and existing streamside vegetation or structure sufficient to use as anchors for wing wall of fyke net.
2) Place t-post in the center of the channel and attach the terminal line of the hoop net (be sure the end is tied closed) to the t-post and allow the current to unfurl the wing walls as they float downstream. This should give an indication of where to attach downstream and allow the net to be pulled taught.
3) Attach wing walls to streamside anchor or in-channel anchor if boater traffic will be present
4) Place t-post along wing walls to give additional support as necessary.
5) Make sure floats are at the water surface and that the lead line is on the streambed and that all connections are secure.

**Checking and Re-Setting Trap**

1) Move slowly up to the hoop net portion of the trap and examine for presence of fish.
2) If fish are present, untie the terminal end attached to the upstream t-post.
3) Untie the terminal end cinch to allow for retrieval of fish.
4) If steelhead are present remove them first, then salmon, and finally all other species.
5) Work up salmon and steelhead first. Take weight, length, sex, condition (Poor, Good, Excellent), and degree of ripeness on salmon/steelhead.
    a. Place external tag on all fish and make note of tag number and color.
    b. Place internal acoustic tag in fish to be released in Reach 1 and make note of tag number and frequency code.
    c. Tissue samples will be collected from individual fish. Each sample will be stored separately in individual containers. The collection of tissue samples may cause adverse effects to fish including stress and injury.
    d. For other fish take length on first ten of each species then enumerate the rest and release upstream of the trap.
6) Place salmon in holding tank and wait for transport crew to arrive.

**Transportation**

Transportation will take place in a 150 gallon tank capable of holding up to 4 adults a 450 gallon tank capable of holding up to 12 adults or in a 500 gallon tank capable of holding up to 14 adults. Crews will begin each day by checking the

downstream trap first and work their way upstream checking all the traps. It is approximately 30 min drive time between traps and just over an hour to the release site form the upstream most trap location neat Wolfsen rd in Los Banos. If there are more fish in the trap than can be hauled with the tank they will make a direct trip to the release location and then continue the order of checking traps and if needed, call to have the larger haul tank brought out.

**Streamside Spawning**

This method consists of capturing adults in the wild, removal of all eggs from each female adult taken, and using all the eggs for incubation. An unknown number of adults will need to be taken but, will most likely be spawned using a 50:50 sex ratio. Generally, remote site egg take involves capturing pre-spawn adults in the river and holding them in a pen until ripe and ready to spawn. If adults are ripe upon capture they can be spawned immediately. However, the water temperatures during the fall-run Chinook salmon spawning period, which approach $16^{o}$ C, probably preclude holding wild adults in the river for any amount of time because significant holding mortality is likely to occur. In addition, the capture process will stress the non-captured fish holding in the same area.

The remote egg take operation method consists of the following:

- Fish will be immediately removed from the net as they are captured. As fish are captured the sex will be determined as well as degree of ripeness then they will be placed in a transport tank.

- If adults are ripe (they likely will not all be ripe at the same time) they would be either transported to the incubation site and spawned or spawned on-site. Once they are to the spawning location, eggs will be mixed with milt, water hardened for two hours, and immediately placed in the incubation devices or transferred to the San Joaquin River destination, either in-river, egg tubes, egg plates or similar type devices. A small portion of fertilized eggs may be transferred to a Department quarantine facility to later be transferred to the interim facility for use in the captive broodstock study.

1 - Adult salmon (coho in this case) ready for gamete removal.

2 - Stripping eggs from female salmon at a remote site.

3 - Green eggs transported in plastic bags. ***may want to fertilize onsite due to travel time to Fresno****

4 - Bags of eggs transported in a cooler.

5 - Milt placed into plastic bags for transport.

6 - Eggs emptied into plastic buckets for fertilization at the incubation location

**Figure 7.**
**Photos of similar streamside spawning activity**

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

**CONTINGENCIES/BACKUPS**

A gas powered AC/DC generator will be available to operate aerators in the event of failure to the vehicle's electrical system.

In the event that the vehicle becomes immobilized, a towing company will be used to tow the vehicle to the release location, or if the tank is used on the 14-ft trailer, a backup vehicle will be used to complete the delivery.

If hauling the adults and spawning proves to be unsuccessful then adults may be spawned at the trapping location and then the eggs and milt transported to Reach1 and utilized.

In the event that during the course of the day when traps are being checked it is discovered that there are more fish present in the trap than there is ability to haul using the 150 gal tank a call will be made to have the larger 500 gallon transport tank brought out to transport fish. If this does not remedy the problem then fish will be released downstream of the trap.

## D. Study Resource Needs

1. Detailed budget (in progress)

**Reclamation TSC Trap and Haul Budget:**

| | *Estimated Costs* |
|---|---|
| October 2012 | |
| 2 Biologists (24 days) | $ 35,328 |
| Travel | $ 11,548 |
| November 2012 | |
| 2 Biologists (14 days) | $ 20,608 |
| Travel | $ 6,528 |
| December 2012 | |
| 2 Biologists (12 days) | $17,664 |
| Travel | $ 5,808 |
| Field equipment: | |
| • Four-wheel drive pickup ($600/month) | $ 1,800 |
| • Didson Acoustic camera (3 months) | $ 4,000 |
| • John boat & 10hp outboard motor (3 months) | $ 2,000 |
| • Vemco VR2W receivers ($1,533 x 25) | no cost |
| • Vemco VR 100 manual directional hydrophone receiver | no cost |
| • Vemco V13 acoustic tags ($357 x 20) | $ 7,140 |
| • Fyke trap | no cost |
| • Boat fuel and fisheries supplies | $ 4,000 |
| • Fish haul tank | no cost |
| Acquisitions (for Vemco V13 tags) | $ 1,500 |

Data Analyses and Report Writing
4 weeks (2 biologist) $ 29,440

Presentation $ 2,000

**SubTotal** **$ 149,364**

CDFG Trap and Haul Budget

*Estimated Costs*

October 2012
2 Biologists 4 Temp employees (31 days) no cost
Travel no cost

November 2012
2 Biologists 4 Temp employees (30 days) no cost
Travel

December 2012
2 Biologists 4 Temp employees (31 days) no cost
Travel no cost

USFWS Trap and Haul Budget

*Estimated Costs*

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)

75 biodays for 2 technical staff to assist with transportation and spawning of transported fish and report generation- $56,250

0.10 FTE – Field Study Coordinator – for oversight of all FWS lead MAP studies - $23,693.60

Field equipment:

- Four-wheel drive pickup ($600/month) $ 1,800
- Boat fuel and fisheries supplies $ 4,000
- Fish haul tank no cost

Presentation $ 2,000

**SubTotal** **$ 87,743.60**
**Total** **$ 237,107.60**

2. Personnel needs
   a. Field activities

Approximately 1-4 fyke net traps will be set and fished on a 24 hour basis, the traps will be checked 1-4 times daily. This will require a two man crew to check the trap, work up fish, hold Chinook for transport, clean and reset the trap. Approximately 1-3 hrs per net/trap (includes drive time) will be needed.

Transportation will take approximately 1.5 -2 hours one way and 3-6 hours round trip but may not be necessary everyday and will depend on number of fish caught in traps. This will be most difficult to gauge for field needs but is vital to the success of the study. This should be done with a crew of two persons loading, unloading and handling fish at each location. Turn around time may be delayed if this crew is needed by the trapping/spawning crews to help facilitate those operations. Additionally, there may be a need for multiple crews of transporters due to small sized transport tanks owned by the Reclamation and USFWS or if a vehicle is unavailable to pull the DFG tank.

Carcass/Spawning surveys: some fish will be released to evaluate natural spawning. In order to capture the data of when, where or if they spawn, a carcass survey will need to be done. This will require a two man crew to float from Friant Bridge to HWY 41 Bridge one day and from Hwy 41 Bridge to SR 99 Bridge on a second day in a drift boat once a week. The crew members will record locations of salmon, spawning status of females (spawn versus unspawned), redds, and locations of expired salmon utilizing GPS.

Streamside spawning: This activity will comprise a crew of 4-6 individuals that will spawn the salmon streamside and either place fertilized egg in the river or in streamside incubators. Set-up of the streamside incubators may require a large portion of time and, as this will be the first year, logistical issues may arise.

b. Laboratory and office activities

Tissue samples will be taken from all trapped fish and sent to the DFG Tissue Archive facility for processing. (See Tissue Sampling Protocols)
Approximately two months of office time will be needed for data reduction, report generation and compliance/permitting annually.

c. Travel (in-state and out-of-state)

DFG – All travel will be in-state. There may be a need for overnight stays but, this is not anticipated. A truck will be sent daily to retrieve potential fish caught in traps and then return to reach 1 to release any captured fish. This will be approximately 200 miles round trip. A second vehicle will be used to make short trips to the streamside spawning station. Two additional vehicles will used twice a week to transport the boat and crew for the carcass survey.
USBR– Reclamation staff will be present for 2-3 weeks of each month from October to December. Reclamation Denver Technical Center Staff travel to these locations and stay nearby in hotels and work every day during their field season. Reclamation will provide a ¾ ton pickup and necessary boats.
USFWS

d. Temporary help (estimated number of hours)

An estimated 4-6 DFG Temporary employees using Approximately 174 hrs per month from September through March will be needed. This results in a maximum of 6,264 hours total hrs and a minimum of 4,100 hours.
It is also anticipated the 2 seasonal employees fro the USFWS will be needed accruing approximately 174 hrs per month from September- March and will result in a total of 2,100 hours.

3. Equipment needs

a. All equipment listed will be needed for the duration of the study.

Trucks and transport tanks
Holding pens at both trapping and receiving locations (May not be used the first year)
Plastic bags for milt and eggs
Plastic tubs or buckets for eggs
Boats for receiver deployment and mobile tracking (drift boat, john and two kayaks)
Receivers and anchors
Mobile tracking equipment
Waders and wading shoes
Warm clothes and rain gear (when necessary)
Personal Floatation Devices or float coats during high flows
Data boxes or dataloggers in armored boxes w/data sheets, pencils and extra stylus
Dip nets
Floy tags, tagging guns, extra needles, and sharpener
Pocket knife or scissors for scale samples
Rite-in-the-rain Tissue Sample Envelopes
Satellite/cell Phone in dry bag
First Aid Kit (one per vehicle)
Tagging Schedule
Trap Journal
Transport Journal
Spawning Journal
Phone # list to supervisors, office and crew members
Phone # list to wardens
Gaffs for Large Woody Debris and Small Woody Debris removal
Tagging Cradle
Transport Cradle/crate/tube (to keep fish in water at all times)
Gate keys or combinations
Flashlights
Extra nets, t-posts, post pounder, rope and shovel
Tool Box for repairs

b. major equipment (>$1000)
Borrow or purchase a 1 ton truck capable of pulling a gooseneck trailer. A truck will be needed from October to December each year of the study.
Pontoons for floating the cages

4. Coordination needs
USBR will be participating in the study by supplying the fyke traps and the equipment to erect the traps they will also provide the equipment for acoustic tagging and tracking the Fish.
USFWS will provide staff and equipment for streamside spawning.
DFG will provide the transportation equipment and will provide the boat for carcass/spawning surveys and will provide staff to assist with all aspects of the study.
5. Access

Access to release and streamside spawning locations will be on CDFG owned lands and access has been arranged. Gate codes will be given to the staff at the beginning of the study. The trapping location will be on the river and should have drive up access as many of the locations will be on DFG owned lands with the exceptions of the traps above HFB and the one above Salt slough which will require access agreements which have already been established.

**E. Compliance Considerations**

1. Route study through FRRT for compliance considerations

**F. Invasive Species:**

The Department procedures to prevent the spread of Aquatic Invasice Species (AIS) will be used.

**G. Due Dates and Products**

The study will take place between October and December for the trap and transport portion every year. The eggs from this study will be monitored through emergence and juveniles will be reared up to 140mm size for tagging which, should be in April-May annually with a report expected in August.

A summary of the first two years data will be used to formulate a long term plan for the use of trap and haul activities on the program and will be due October, 2014.

H. References

U.S. District Court, Sacramento Division. 2006. Stipulation of Settlement in *NRDC, et al., v. Kirk Rodgers, et al.* Available at: www.restoresjr.net.

Warner, G. 1991. Remember the San Joaquin Chapter 5. IN: Lufkin, Alan, editor. California's Salmon and Steelhead: The Struggle to Restore an Imperiled Resource. Berkeley: University of California Press, c1991

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