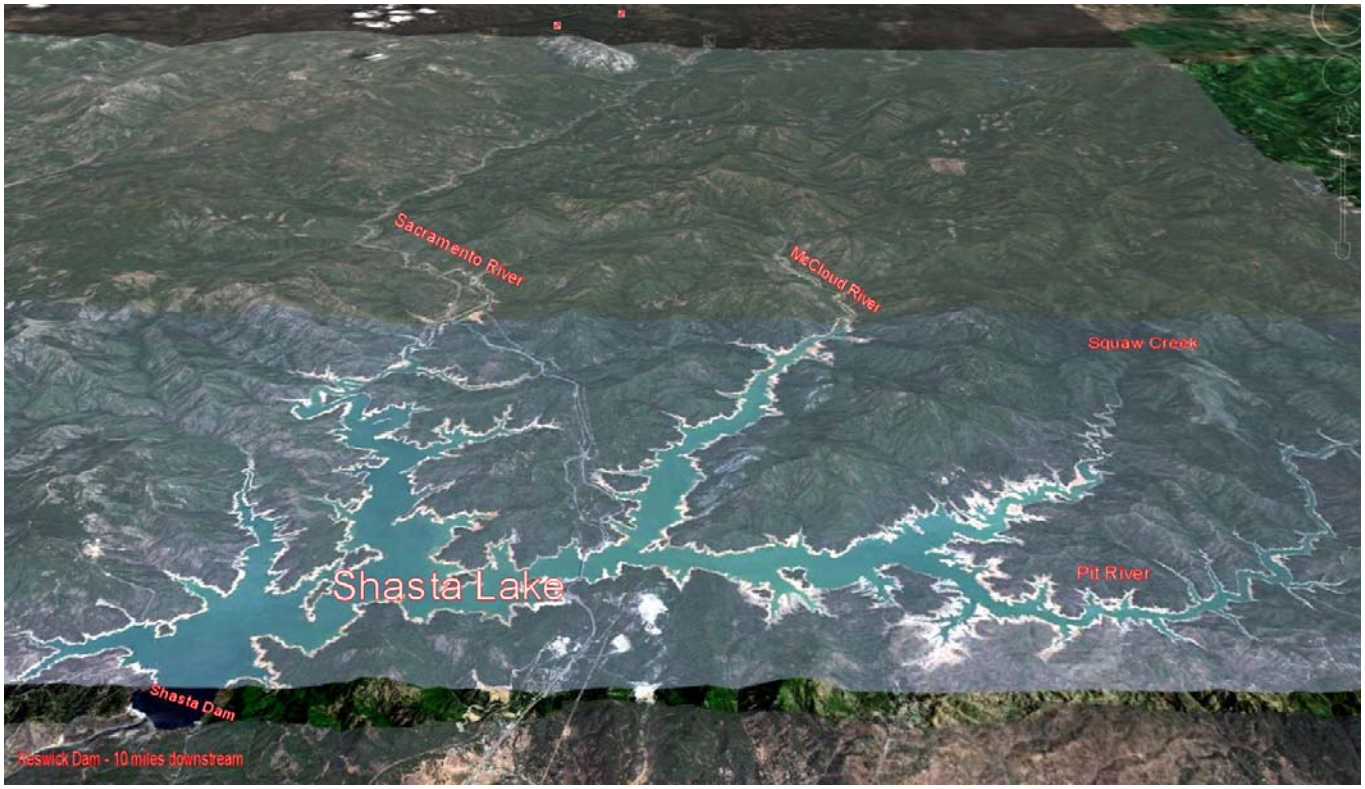
Draft Annual Report of Activities

October 1, 2010, to September 30, 2011



Interagency Fish Passage Steering Committee (IFPSC)

October 2011

Table of Contents

Background

On June 4, 2009, the NMFS issued its Biological Opinion and Conference Opinion on the Long-Term Operations of the Central Valley Project and State Water Project (NMFS BiOp). The NMFS BiOp (Action NF 1, page 661) included the requirement that Reclamation create the Interagency Fish Passage Steering Committee (IFPSC). The IFPSC's role is to provide oversight and technical, management, and policy direction for a Fish Passage Program. The RPA includes development of a Fish Passage Program to evaluate reintroduction of listed species upstream of Shasta, Folsom, and New Melones dams. Because the duration of the consultation covers more than two decades NMFS anticipates that long-term future events, including increased water demand and climate change, will increase the frequency of temperature related mortality. Substantial areas of higher elevation habitat exist above these dams and could provide a refuge for cold water fish in the face of climate change.

Membership

The IFPSC consists of the following representatives from Reclamation, NMFS, FWS, CDFG, DWR, Forest Service, and an academic member.

John Hannon, Reclamation

Jeff McLain, Alice Berg and Garwin Yip, NMFS

Jim Smith and Donnie Ratcliff, FWS

Leslie Pierce and Randy Beckwith, DWR

Tom Schroyer and George Heise, DFG

Mike Chapel, USFS

Lisa Thompson, UC Davis

Fish Passage Actions Summarized from the RPA

Near-Term Fish Passage Actions

NF1. Formation of the Interagency Fish Passage Steering Committee

- NF2. Evaluation of Habitat Above Dams
- NF3. Development of Fish Passage Pilot Plan
- NF4. Implementation of Pilot Reintroduction Program
    - NF4.1. Adult Fish Collection and Handling Facilities
    - NF4.2. Adult Fish Release Sites above Dams and Juvenile Fish Sites Below Dams
    - NF 4.3. Capture, Trapping, and Relocation of Adults
    - NF4.4. Interim Downstream fish Passage through Reservoirs and Dams
    - NF4.5. Juvenile Fish collection Prototype

    - NF4.6. Pilot Program Effectiveness Monitoring and Evaluation
    - NF4.7. Stanislaus River Fish Passage Assessment
- NF5. Comprehensive Fish Passage Report

Long-Term Fish Passage Actions

- LF1. Long-term Funding and Support for the Interagency Fish Passage Steering Committee.
- Long-term fish passage program
    - LF2.1. Construction and Maintenance of Adult and Juvenile Fish Passage Facilities
    - LF2.2. Development of Supplementation and Management Plan
    - LF2.3. Construction and Maintenance of Long-term Adult and Juvenile Release Locations and Facilities
    - LF2.4. Development of Fish Passage Monitoring and Evaluation Plan
    - LF2.3. Construction and Maintenance of Long-term Adult and Juvenile Release Locations and Facilities
    - LF2.4. Development of Fish Passage Monitoring and Evaluation Plan

Activities since last year

- A Fish Passage plan subgroup was assembled and identified initial options for a pilot plan. Members were assigned specific tasks and Reclamation assembled information into a draft passage plan, still in progress, but being presented at this review.
- Reclamation and NMFS held meetings to discuss the schedule in the RPA and need for up front compliance activities. No RPA adjustments were made.
- Existing data compilation continued
- Land ownership information obtained for Sacramento and American River watersheds
- Water temperature loggers installed in areas without existing data (Upper Sacramento River and North Fork American River)
- Stanislaus River plan for collecting information to evaluate passage was submitted to meet Action NF7 deadline (see attachment)
- Engineering technology group being formed to focus on downstream passage options

- Temperature analysis/modeling beginning to evaluate water temperatures upstream and downstream of the reservoirs across year types
- Funding likely available for more focused work in 2012

Questions for the panel

The primary product available for review by the panel at this time is the draft fish passage plan attached below. The following questions have arisen in development of the draft plan. Input regarding these questions would be appreciated.

1) Are you aware of other pilot fish passage projects related to salmon? Do you recommend a particular planning approach?

2) Since no anadromous fish are currently present in the upstream habitats the pilot plan proposes to do pilot testing by introducing test fish prior to investing in construction of facilities. Is this a suitable course of action?

3) The current draft pilot plan recommends using non-listed test fish to estimate productivity of the habitat, juvenile collection options, and survival through the lake. This gets around ESA permitting issues and limited fish availability for testing phase but the test fish will have different life history characteristics, such as run timing (fall/late-fall run Chinook vs. the target winter and spring-run). Is this an acceptable method (use of surrogates) for evaluating passage options?

4) Do you have any recommendations regarding level of detail for upstream habitat assessments? We are currently working to verify that sufficient potential spawning habitat exists to support a minimum population size and to determine water temperature suitability (see habitat assessment outline).

5) What are your thoughts regarding lake rearing and through-lake survival potential for Chinook? Should we invest time and resources to determine whether juvenile collection/downstream passage could occur near the dams?

6) Do you have recommendations regarding modeling fish behavior for developing passage options versus introducing test fish to study behavior?

Fish Passage Pilot Plan draft – Action NF3

Purpose

This plan is submitted in partial fulfillment of the US Bureau of Reclamation's (Reclamation) responsibilities to minimize effects of water operations on winter-run Chinook salmon, spring-run Chinook salmon and Central Valley steelhead by testing the feasibility of providing access to spawning and rearing habitats upstream of dams on the Sacramento and American rivers per Action NF3 of the 2009 NMFS Biological Opinion on Long-term Operations of the Central Valley Project and State Water Project. Action NF3 specifies inclusion of a schedule for implementing a 3-year pilot passage program on the American River and Sacramento River and provides specific information needs to be included in the plan.

Background

In 2000, NMFS (McElhany et al.) determined a method for assessing the viability of listed salmonids called the Viable Salmonid Population (VSP) concept. The VSP framework continues to be the cornerstone of viability assessments and is used by NMFS to measure the status of listed populations and in addition is used to evaluate effects of actions through the Section 7 consultation process. The OCAP consultation analyzed the effects of the CVP and SWP on listed fish over an extended time frame and as a result, highlighted the difficulty in managing cold water aquatic species below impassable barriers. Such management is often dependant on fluctuating and inadequate coldwater pools. The effects analysis in the OCAP opinion found that even after all discretionary actions are taken to operate Shasta and Folsom reservoirs to reduce adverse effects of water operations on listed anadromous fish, the risk of temperature-induced mortality of fish and eggs persists, particularly during dry water years. Modeling by NOAA's Southwest Fisheries Science Center (Lindley et al. 2006; 2007) also highlighted the effects of future impacts of climate change on coldwater pool and changed hydrology on the viability of listed salmonids and documented that presently, impassable dams block access to 80% of historically available habitat. The OCAP analysis concluded that providing passage for listed species will be needed to maintain viability of these species.

Fish Passage Action Schedule

The deadlines in the RPA form a timeline that necessitates multiple activities occurring simultaneously. The schedule specifies that upstream habitat evaluations occur during 2010-2011. The due date for selecting juvenile collection prototype locations and designs was the end of 2010, prior to the completion of habitat evaluations, with construction to be completed in 2013. The steering committee cannot select a top priority tributary for reintroduction and juvenile collection until habitat evaluation information is sufficient to inform a decision on where to focus feasibility testing. Existing biological information on the target species based on

information collected below the dams may be insufficient for design of facilities upstream of dams. Therefore, we recommend that biological testing with the target species, or surrogates, proceed following habitat evaluations and inform design options for downstream juvenile passage.

Reintroductions of listed species require a myriad of policy and decision support tools addressing such elements as the roles of Primary Cooperators, ESA regulatory approaches and stakeholder and public outreach. Fish reintroductions are highly complex projects that involve multiple agencies and stakeholders, some of which have shared responsibilities that need to be clearly defined early in the planning process. The design, construction and operations of fish passage facilities will require a collaborative resource stewardship team comprised of fisheries and facilities co-managers, land management agencies and watershed stakeholders. Adaptive fish management and stewardship of upper basin habitats will be keys to success. The success of future upper basin runs of anadromous fish will reflect the collective efforts of many individuals and groups, both public and private, whose actions will affect fish and their habitat.

The RPA specifies that volitional passage options be considered first, but also specifies that the first task to be implemented is a prototype head of reservoir collector, which is typically not associated with volitional passage. Volitional passage over the long term would be more sustainable and require less outside intervention, and is NMFS' preferred approach. The pilot plan schedule will be conducive to evaluating desirable volitional passage options before embarking on construction of a head of reservoir juvenile collector or other facilities associated with non-volitional passage. This is a deviation from the schedule for a pilot head of reservoir juvenile collection prototype outlined in the RPA. Fish passage programs in the Pacific Northwest with constructed juvenile collectors have had timelines of from 8.5 to 13 years from conceptual design through start-up and evaluation (Willamette Fish Passage Design Requirements Report). The OCAP RPA schedule is more compressed. The pilot plan will attempt to set out a realistic schedule given the practical requirements of planning, designing facilities, and permitting a reintroduction project.

Population Viability Considerations

The goal of the fish passage program is to progress towards achieving recovery of the target species in a measurable way. The RPA identifies the target species as winter-run and spring-run Chinook in the Sacramento River and steelhead in the American River. The program needs to address the four viable salmonid population parameters of population size, population growth rate, spatial structure, and diversity. In the case of winter-run Chinook the draft recovery plan considers three populations to be needed to provide the spatial structure for recovery. This would necessitate creating a successful winter-run population upstream of Shasta reservoir. This pilot plan is being crafted to work towards evaluation of a project that would be suitable to support winter-run Chinook salmon above Shasta as a primary goal. Because winter Chinook

have the most stringent temperature requirements during the warm season we expect that the habitat will support the other runs and steelhead if it is suitable for winter Chinook.

The ultimate success of fish transported upstream compared to the success of fish downstream of Keswick Dam or Nimbus Dam will be a critical information need in assessing the efficacy of removing listed fish from the downstream population and introducing them into the habitat upstream of the dam. If fish transported upstream of dams produce fewer recruits per spawner than needed to maintain a 1.0 or greater cohort replacement rate in a majority of years then the program would not be effective in maintaining or increasing populations of listed species and could be removing productive individuals from the population. Ideally the program should be able to at least match the spawner replacement ratio that is achieved in the habitat downstream of the dam. In this case fish could be safely removed from the downstream population knowing that the program will not reduce production and will increase spatial structure of the population. Possible scenario outcomes under current and future climate conditions are illustrated in Figure 1. If spawning and upstream rearing habitats (below the dams) are not at capacity then the middle scenario (lower survival/production from transported fish than from fish remaining below the dam) may be likely under current climate. Under future climate scenarios the option on the right may occur – greater temperature survival impacts leading to lower survival below dams than above dams. The pilot program needs to assess whether this will be possible. Table 1 and Figure 2 show the effect of varying lifestage specific survival rates on the cohort replacement rate and the effect of a constant cohort replacement rate on population trajectory. In reality the cohort replacement rate will vary, but the goal is to have a positive rate over the long term until recovery is reached.

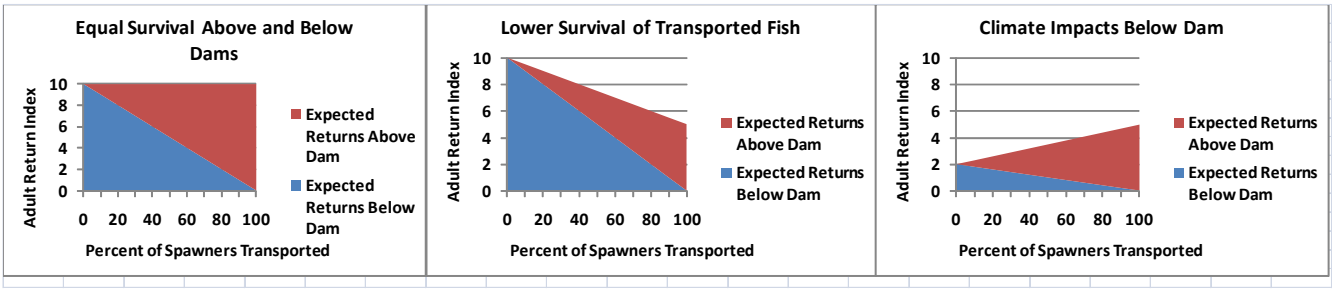


Figure 1. Three potential outcomes of the effects of the fish passage program on the target species under current and future climate scenarios.

Table 1. The effect of varying lifestage survival rates on cohort replacement rate. Survival rate assumptions are shaded in green and the varied rate in each row is shaded in red. The varied rates are the ones affected by intervention via the fish passage program.

Adults transported	Adult survival to spawn	Spawners	Eggs/female	Eggs in gravel	Egg to fry survival	Emergent Fry	Survival to Collector	Collected juveniles	Collection survival (to below dam)	Emigrants	Survival to ocean	Ocean juveniles	Smolt to adult survival	Adult Production	Harvest Mortality	Returning adults	Cohort replacement rate
120	0.7	84	5000	210,000	0.35	73,500	0.5	36,750	0.9	33,075	0.2	6,615	0.05	331	0.5	165	1.38
120	0.8	96	5000	240,000	0.35	84,000	0.5	42,000	0.9	37,800	0.2	7,560	0.05	378	0.5	189	1.58
120	0.9	108	5000	270,000	0.35	94,500	0.5	47,250	0.9	42,525	0.2	8,505	0.05	425	0.5	213	1.77
120	0.95	114	5000	285,000	0.35	99,750	0.5	49,875	0.9	44,888	0.2	8,978	0.05	449	0.5	224	1.87
120	0.7	84	5000	210,000	0.35	73,500	0.5	36,750	0.8	29,400	0.2	5,880	0.05	294	0.5	147	1.23
120	0.7	84	5000	210,000	0.35	73,500	0.5	36,750	0.7	25,725	0.2	5,145	0.05	257	0.5	129	1.07
120	0.7	84	5000	210,000	0.35	73,500	0.5	36,750	0.6	22,050	0.2	4,410	0.05	221	0.5	110	0.92
120	0.7	84	5000	210,000	0.35	73,500	0.5	36,750	0.5	18,375	0.2	3,675	0.05	184	0.5	92	0.77
120	0.7	84	5000	210,000	0.35	73,500	0.5	36,750	0.4	14,700	0.2	2,940	0.05	147	0.5	74	0.61

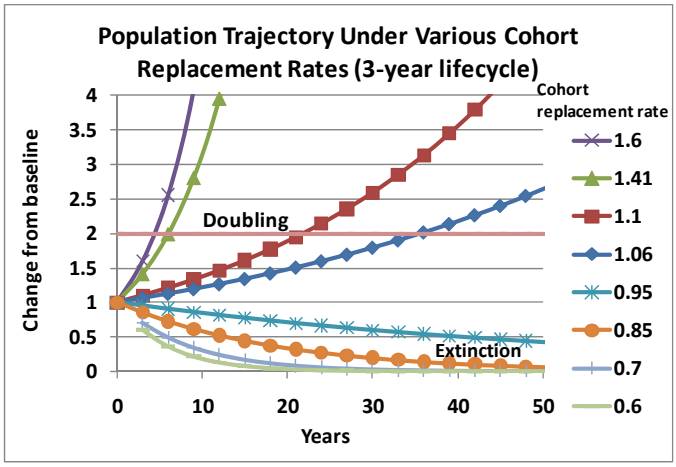


Figure 2. The effect of a constant cohort replacement rate on population trajectory.

Tests needed to assess likelihood of biological success

Survival through each lifestage should be assessed so in the event that fewer juveniles (originating upstream of the dam) arrive downstream of the dam per spawner transported above the dam than needed to produce a positive cohort replacement rate the limiting lifestage can be identified to determine whether low lifestage survival can be addressed and remedied.

1) Adult transport survival to release and spawn

The program would be removing listed fish from the population downstream of the dam and placing them upstream of the dam. This is a risky operation in that each potential adult spawner is important for providing viable offspring to the population. Transported adults would likely experience a lower survival than would occur for fish left in the river downstream of the dam under current climate scenarios in a majority of years (first scenario in Figure 1). During recent years populations of the listed species have been at relatively low levels. A determination would need to be made as to whether listed fish can be removed from the population for evaluating a passage program. The assumption would likely need to be made that the fish removed for the evaluation would not successfully contribute juveniles that would make it back to the river downstream of the dam (and subsequently survive to returning adult).

The San Joaquin River Restoration Program is currently struggling with this same issue. They are proceeding to develop a captive broodstock raised in a hatchery to provide fish to the program each year and reduce repeated take from listed populations. Such a scenario, although requiring hatchery facilities, may need to be considered for the passage program if the decision is made to move forward using listed fish. The habitat evaluation group is proposing using non-listed Chinook salmon as test fish for the program at Shasta. This would provide needed biological and habitat suitability data but because there are differences in aspects such as timing and potentially different size distributions that will need to be accommodated, some uncertainty would remain in design data needs for collection of juveniles of listed runs.

2) Spawning Success and Juvenile Production

Given verification of suitable habitat and water temperature conditions, adults are likely to be able to find spawning locations and an egg to fry survival rate in the 30% range for Chinook should be achievable. Adults will need to be tracked to determine whether spawning occurs in areas of suitable water temperature and to enable redd counts to occur. Redd counts are needed to assess adult survival to spawning and determine how many juvenile emigrants per spawner are produced. An estimate of juvenile production in the tributary will need to be obtained so that survival through the lake or through juvenile collection can be obtained to evaluate performance of a juvenile collection system.

3) Juvenile Passage

The RPA called for a preferred location(s) and design(s) for a juvenile collector to be chosen by the end of 2010. The RPA specifies that the first priority be given to a volitional passage system (ie. a system that requires no hauling of fish downstream). The satisfactory completion of this action as described requires information on how fish will respond when placed upstream of the dams. A volitional passage option would require either that juvenile fish survive from tributary mouths, through the reservoir, and to a collector at the dam or that a passageway, such as a canal, be constructed from the collection site at or near tributary mouths around or through the reservoir to the lower river. Prior to selecting a preferred option, juvenile fish would be studied in the tributaries and through the reservoirs to determine areas of juvenile concentration where they could be collected into a volitional passage system. Potential locations can be further assessed with topographic, bathymetric, and flow data. Floating surface collectors seem to be the option of choice for juvenile collection in Pacific Northwest systems with high head dams. These systems do not provide volitional passage and they require a narrow section of the reservoir (about one mile wide or less) that can be completely blocked by a small mesh net to exclude juveniles from passing through. The wide and branching nature of Shasta and Folsom reservoirs, high debris loads, and heavy recreational use

make such a system problematic. In addition, many of the juvenile Chinook emigrants are likely to be fry (small size) which are more difficult to collect and experience higher natural mortality.

American River Pilot Testing Schedule

The BO identifies steelhead as the target species for the American River passage program. The situation with steelhead in the American River is that the population is dominated by Nimbus Hatchery produced fish originally derived from an out of basin stock and not considered by NMFS to be a part of the Central Valley steelhead DPS. The in-river spawners are predominantly hatchery produced fish. Therefore the passage program cannot use the existing American River steelhead to contribute to recovery of Central Valley steelhead. RPA Action II.6.1 calls for a study of replacement of Nimbus Hatchery broodstock with another source (likely a CV steelhead source if deemed appropriate). The passage program cannot move forward using the existing American River stock so either the broodstock replacement would need to be completed or a source of CV steelhead outside the American River would need to be found for seeding upstream habitats. The Nimbus steelhead stock could potentially for pilot testing but there would be a chance that these fish could introduce new genetic material into potential new broodstock source populations. A complicating factor for steelhead passage in any of the watersheds is that stocked trout exist upstream of dams and interbreeding could occur with these fish. Assessments will need to be conducted to ensure intermixing of transported fish with resident fish upstream of dams could be avoided or could occur without negatively affecting the Central Valley steelhead gene pool.

Items Specified in RPA Action NF3 – Development of Fish Passage Pilot Plan

Three Year Schedule of Activities Note: draft schedule from January – still need to update.

	CVP Fish Passage Program - Three Year Schedule		
Phase	Begin	End	
Preparation	1/1/2011	1/31/2012	Conduct Habitat Evaluations Upstream of Shasta
Preparation	1/1/2011	12/31/2012	Conduct habitat evaluations upstream of Folsom
Preparation	12/15/2010	12/31/2014	Nimbus steelhead brood source evaluations conducted to determine appropriate steelhead stock for the American River passage program
Preparation	1/15/2011	3/30/2011	develop a plan to obtain information needed to evaluate options for fish passage on the Stanislaus River
Preparation	10/1/2011	12/31/2013	evaluate juvenile collection options
Evaluation	10/1/2012	11/1/2012	Collect fall-run Chinook at Coleman Hathery, radio tag, and transport to priority Shasta tributary (McCloud or Sacramento R)
Evaluation	10/1/2012	11/1/2012	Operate Keswick trap to evaluate the feasibility of adult collection at that site?
Evaluation	10/1/2012	12/30/2012	Track adults released upstream of Shasta to determine survival, spawning success and spawning locations
Evaluation	2/1/2013	3/31/2013	Determine reproductive success by monitoring Chinook fry abundance at spawning locations - snorkel surveys
Evaluation	2/1/2013	12/31/2013	Monitor juvenile Chinook habitat use upstream of Shasta - snorkel surveys until juveniles have emigrated
Evaluation	2/1/2013	6/15/2013	Monitor juvenile emigration near mouth of tributary - rotary screw trap (if juvenile collector prototype not in place near mouth)
Evaluation	2/1/2013	6/15/2013	juvenile collector prototype installed near mouth and operated as long as juveniles present
Evaluation	2/1/2013	6/15/2013	Collected juveniles tagged and transported downstream of Keswsick and released.
Evaluation			
Evaluation			
Evaluation	10/1/2013	11/1/2013	Collect fall-run Chinook at Coleman Hathery, radio tag, and transport to priority Shasta tributary (McCloud or Sacramento R)
Evaluation	10/1/2013	11/1/2013	Operate Keswick trap to evaluate the feasibility of adult collection at that site?
Evaluation	10/1/2013	12/30/2013	Track adults released upstream of Shasta to determine survival, spawning success and spawning locations
Evaluation	2/1/2014	3/31/2014	Determine reproductive success by monitoring Chinook fry abundance at spawning locations - snorkel surveys
Evaluation	2/1/2014	12/31/2014	Monitor juvenile Chinook habitat use upstream of Shasta - snorkel surveys until juveniles have emigrated
Evaluation	2/1/2014	6/15/2014	Monitor juvenile emigration near mouth of tributary - rotary screw trap (if juvenile collector prototype not in place near mouth)
start up	2/1/2014	6/15/2014	juvenile collector prototype installed near mouth and operated as long as juveniles present
Evaluation	2/1/2014	6/15/2014	Collected juveniles tagged and transported downstream of Keswsick and released.
Evaluation	10/1/2014	11/1/2014	Collect fall-run Chinook at Coleman Hathery, radio tag, and transport to priority Shasta tributary (McCloud or Sacramento R)
Evaluation	10/1/2014	11/1/2014	Operate Keswick trap to evaluate the feasibility of adult collection at that site?
Evaluation	10/1/2014	12/30/2014	Track adults released upstream of Shasta to determine survival, spawning success and spawning locations
Evaluation	2/1/2015	3/31/2015	Determine reproductive success by monitoring Chinook fry abundance at spawning locations - snorkel surveys
Evaluation	2/1/2015	12/31/2015	Monitor juvenile Chinook habitat use upstream of Shasta - snorkel surveys until juveniles have emigrated
Evaluation	2/1/2015	6/15/2015	Monitor juvenile emigration near mouth of tributary - rotary screw trap (if juvenile collector prototype not in place near mouth)
Evaluation	2/1/2015	6/15/2015	juvenile collector prototype installed near mouth and operated as long as juveniles present
Evaluation	2/1/2015	6/15/2015	Collected juveniles tagged and transported downstream of Keswsick and released.

Plan for funding the passage program

Reclamation has requested funding for 2012 and future years to address the fish passage program. Funding availability for 2012 is likely.

1) Operational requirements needed for the program.

We are proceeding under the assumption that the program will not affect water operations and will be designed to operate under the current constraints on water operations outlined in existing biological opinions and other agreements.

2) Protocols for handling ESA-listed fish at collection facilities.

Due to uncertainty regarding the potential for initial success of a passage program and a need to use fish for pilot testing prior to investing in passage facilities, there is a chance that using ESA-listed fish for tests of aspects of the passage program would result in undesirable population effects to the source population. We expect that availability of ESA-listed fish for pilot testing will be limited at the current population levels. Therefore the program is recommending that non-listed Chinook and/or steelhead be used as test fish for determining passage methods and survival potential. This avoids time consuming regulatory processes involved with using a limited number of listed fish of unknown availability. If it is determined with greater certainty that the program may be beneficial to listed species then we will pursue further feasibility evaluation using listed runs and develop protocols at that time.

3) Number, origin, and species to be released upstream of dams, incorporated into hatchery broodstock, or taken to other destinations.

Non-listed (fall or late fall-run Chinook) are the recommended Chinook runs to be used in the initial pilot effort. This will enable survival testing through individual lifestages to occur without removing listed individuals from populations downstream of the dams. Coleman and Livingston Stone National Fish Hatchery personnel familiar with trap operations at Keswick Dam recommended that Coleman Hatchery be the source of fish (or eggs) for pilot testing.

Source Populations

Two source populations/capture locations for non-listed Chinook salmon are being considered for the initial testing phase of the program. The potential sources are fish captured in the trap at Keswick Dam and Chinook that enter Coleman Hatchery on Battle Creek. The Keswick Dam fish trap works for collecting fish but there are issues of identifying the run of fish. There is overlap between runs. Currently fish are held for

genetic testing at Livingston Stone before determining their final disposition. The trap has never been run for fall-run. There may not be enough fish captured at Keswick to use for a pilot program. There may be potential to operate the trap during the fall/late fall-run to determine whether enough fish can be captured during that time period. Coleman Hatchery could be another potential source of test fish. Coleman Hatchery is on Sacramento River tributary Battle Creek. Transported adults could potentially head downstream and stray from the intended tributary if transported from Battle Creek to upstream of Shasta due to different water source.

Another potential option is planting eggs or juveniles into the upstream habitats. The source of broodstock to obtain eggs or juveniles could be from the same populations– Sacramento River (Keswick trap) or Battle Creek (Coleman Hatchery). Naturally spawned eggs and juveniles could also be obtained from in-river stocks (obtained from redds or juveniles netted or captured in emigrant traps. It is likely that a long term program would need to use adults rather than relying on additional intervention (via hatchery or active capture of juveniles or eggs) so the pilot project will first attempt to transport adults. Transporting adults will provide opportunity for initial tests of survival through the transport process and natural spawning upstream of reservoirs.

An additional source using Chinook salmon from New Zealand has been proposed by local residents. This stock came from the Sacramento River originally and has reproduced naturally in New Zealand since then. If approved by fishery agencies Reclamation would support use of this stock. This option would avoid the issue of removing fish from any local populations for the program and could reintroduce some genetic diversity into local stocks.

There are disease concerns with introducing anadromous fish upstream of hatchery water sources (upstream of Livingston Stone Hatchery and Nimbus Hatchery). Coleman Hatchery installed an expensive ozone treatment system to deal with this, but no such system exists at Livingston Stone or Nimbus.

The RPA specifies the target species for passage at Shasta is Chinook salmon (winter and spring runs) and at Folsom the target is steelhead.

Numbers of Individuals

We are initially proposing to transport 120 adult Chinook spawners with a goal of having 100 of those successfully spawn. Transport of adults is proposed so that survival through all lifestages can be tested. Table 1 shows hypothetical lifestage survival rates and effects on juvenile production and returning adults from an initial 120 transported

adults. If disease concerns prevent transport of adults then the eggs or fry produced from 100 adults would be transported and planted in the upstream habitat. If disease concerns continue to preclude transporting adults then the program may not be viable.

4) Fish collection and transportation requirements for moving fish, avoiding the use of facilities or equipment dedicated for other purposes.

The protocol for collection and handling at Coleman Hatchery is described below.

Adults

Adult fall Chinook salmon (FCS) volitionally return to Coleman NFH from the middle of September through late November. Salmon are collected by means of a fish ladder at the base of a permanent barrier weir. On October 1, the fish ladder is open, thus allowing the adult FCS to ascend the ladder and enter the holding pond. From there the FCS adults are crowded and sorted into three holding ponds.

To promote genetic similarity between natural and hatchery stocks, both natural-origin and hatchery-origin FCS returning to the hatchery are used as broodstock.

For the purpose of collecting and fertilizing eggs, broodstock are crowded from the holding ponds into the spawning building.

Upon entering the spawning building fish are anesthetized with CO_2.

At this time fish that are determined to be “ripe” are euthanized with a strike to the head and spawned; fish that are “non-ripe” or “green” are returned to the holding ponds for use on a subsequent spawning day.

“Green” fish would be the ones designated for transport upstream of Shasta Reservoir. Green fish would be transferred to a nearby work station for collecting various data information (i.e. scales, length, sex, etc.) and insert a tracking tag (radio/acoustic).

After the information has been collected the adult FCS would be transported via wet burlap bag to the distribution truck for recovery.

After the desired number of FCS adults have been collected, the distribution truck would travel to the designated release site. Once at the release site the driver would empty the fish from the tank through the discharge pipe into the river/lake.

The total number of FCS adults that could be transported from Coleman NFH cannot jeopardize the hatchery from reaching fish production goals. The predicted run size and

the number of adults spawned would ultimately determine the exact number of adults that could be available to be transferred from Coleman NFH. See the discussion regarding number of adults to be transported.

Fish Health

Fish Health Professionals from USFWS and CDFG should be involved in determining the pro & cons of transporting adult FCS from Coleman NFH above Shasta Dam. FCS from Coleman NFH are IHN positive and the release of these adults would pose a moderate risk of transferring this disease horizontally into Shasta Lake fisheries and also the water source for Livingston Stone NFH.

Livingston Stone NFH Water Source

The water supply for LS NFH is Sacramento River water and is diverted at the penstocks in Shasta Dam at the 850 foot level. Sufficient head is available to distribute water to the hatchery site and no pumps are required. There is also no water treatment/sterilization currently operated at LS NFH. Currently endangered winter Chinook salmon and threatened Delta Smelt are reared at LS NFH. Any fish or egg transfers could have an impact on these species raised at LS NFH. Chinook salmon are routinely stocked in Shasta Lake, but these fish must be quarantined and certified disease-free prior to their release into the Lake.

Eggs

Depending on water temperatures FCS eggs are developed to eyed stage at Coleman Hatchery starting in early November through mid-December. During this time frame FCS eggs could be transported from Coleman NFH into designated hatching box located in tributaries of Shasta Lake.

Fish Health

Again Fish Health Professionals from USFWS and CDFG should be involved in determining the pro & cons of transporting FCS eyed eggs from Coleman NFH above Shasta Dam. Transporting FCS eyed eggs from Coleman NFH would pose a lower risk than transferring FCS adults into Shasta Lake.

Juveniles

5) Optimal release locations for fish, based on access, habitat suitability, disease concerns, and other factors.

The best locations for truck access at release sites are boat ramps. There is a boat ramp in Shasta Lake near the mouth of the Sacramento River. The nearest boat ramp in the McCloud Arm is seven miles downstream (through the lake) of the Gilman Road bridge. Releases in the lake would likely result in a lower proportion of the adults reaching the intended spawning habitat so are not recommended. The Sacramento River has upstream areas with roads very close to the river that may be potential sites. Rainbow trout are regularly stocked in the upper Sacramento River in Dunsmuir. The McCloud has road access near the base of McCloud dam that could potentially be used.

Adults

Recommended release sites are within the desired tributary, close to the lake (or potentially higher up to avoid fish leaving the tributary). The top priority tributary for testing has not yet been decided on.

Juveniles

Fry release locations would be distributed through the tributary with emphasis placed on locations near the spawning habitat likely to be used by the target run. A helicopter transport bucket could be used to distribute fish throughout desirable habitat. Roaded access to desirable juvenile fish release sites in the McCloud River would be limited primarily to the base of McCloud Dam. A paved road exists to McCloud Dam. One end of the dam could be used as a staging area for releases by helicopter. Release locations would be primarily upstream of Squaw Valley Creek. The Sacramento River has multiple locations accessible by vehicle for juvenile releases via pipe or bucket brigade. We deployed water temperature loggers at nine sites in the upper Sacramento River in 2011 to identify areas with temperatures appropriate for the target species. Existing water temperature data for the upper Sacramento River is sparse.

Eggs

Eyed eggs, likely obtained from hatchery spawned fish, could be placed by hydraulic injection in the gravel, placed in whitlock-vibert boxes, and/or potentially placed in streamside incubators. The only accessible location within the expected suitable spawning reach for winter-run would likely be near Ah-Di-Nah Campground and the Nature Conservancy preserve where some spawning habitat patches exist in cool water habitat near roads. The Sacramento River has more accessible areas in the upstream reaches where eggs could be planted if the Sacramento is selected for testing.

6) Options for ESA regulatory assurances for non-Federal landowners above dams.

The initial years will use non-listed Chinook as test fish so regulatory assurances will not be required. We will propose to use something similar to what NMFS approves for the San Joaquin River Restoration Program if we decide to proceed with listed fish.

7) Interim downstream fish passage options through reservoirs and dams…focus first on volitional passage before non-volitional.

As a part of Action NF 2, the Fish Passage Steering Committee assigned a habitat evaluation sub-group to evaluate salmonid spawning and rearing habitats above Shasta and Folsom dams. The sub-group is in the process of collecting existing information and developing surveys to identify a priority tributary in each watershed, which will become the preferred location for experimentally transplanting salmonids. The initial evaluation is placing a higher priority on habitats above Shasta Lake because the American River system has issues with the steelhead broodstock at Nimbus Hatchery, which will delay implementation of any passage program there. In addition, Action NF 4.5 specifies that a juvenile collector in Shasta Lake is the first site to be completed. The Shasta Lake evaluation has identified potential options for juvenile collectors but we recommend not finalizing a preferred location and design until the habitat evaluation is complete. Therefore we are not identifying any single option at this time.

Once the habitat evaluation subgroup has provided an objective classification of potential tributaries for reintroduction, it will make a recommendation concerning the top priority tributary to the Fish Passage Steering Committee. Likely tributaries include either the McCloud River or upper Sacramento River. Once the Fish Passage Steering Committee identifies the priority tributary, additional assessments of the fish passage program including juvenile fish collection prototypes will be initiated.

Field evaluation of priority sites will use non-listed Chinook salmon as test fish, with NMFS approval, prior to introducing ESA-listed salmonids, and will include monitoring emigration to determine timing, fish size distribution, and areas where juveniles concentrate. Understanding emigration and fish size will be helpful in designing a facility for the anticipated flows and choosing a location, although the listed runs would have different timing and potentially different size distributions that will need to be accommodated. Additionally, identifying areas of juvenile concentration will be necessary in final location and design for a juvenile collection prototype. In addition to developing additional biotic information we will be working on collecting physical data (bathymetric, hydrological, existing structure designs). These pieces of information will go into a synopsis of juvenile passage prototypes with descriptions of physical parameters such as costs, guidance/exclusion devices, collection devices, dewatering facilities,

bypass or conveyance device, outfall points, and water project operations. The biological parameters described will include baseline biological studies undertaken, species of interest, targeted life stage, numbers expected, site selection rationale, sorting/handling requirements, facility performance standards and metrics , and site-specific operation and maintenance issues.

The following options are being initially considered. We will narrow options as we collect biological information on the test fish (non-listed Chinook) as described above.

At-Dam collector or downstream juvenile passage facility

A) Most juvenile collection systems in the Pacific Northwest occur at or just upstream of dams or water diversion facilities. These systems are linear reservoirs without arms such as exist in Shasta Lake so that fish do not get "lost" in side arms of the lake. This would be the most likely volitional passage option. We will need to determine whether significant survival occurs through the lake before embarking on an at-dam collector or downstream passage facility.

McCloud River

A) Fish diversion weir upstream of the Shasta Lake high water mark. Water would be screened and fish separated out for trucking to a release site downstream of Keswick Dam. The weir could also be used to block adfluvial brown trout from entering the McCloud from Shasta Lake in the spring. This area is private land so an agreement would need to be worked out with the private landowners.

B) A variation of option A would divert juvenile fish into a constructed canal about two miles upstream of the Shasta Lake high water mark and piped with approximately 100 cfs of water through a 25 – 30 mile irrigation-type canal to enter the lower Sacramento river. This option also would occur on private land so would need to be worked out with the landowners.

C) An area with a 115 m wide channel is at 2 miles downstream of the Gilman Road Bridge. This vicinity could be a potential head of lake collector site. Shasta Lake experiences considerable water level fluctuation within and between years so in-lake collection systems present significant design challenges. The land is National Forest.

Upper Sacramento River

A) Fish diversion weir upstream of the Shasta Lake high water mark. Water would be screened and fish separated out for trucking to a release site downstream of Keswick Dam.

B) An abandoned boat ramp 0.8 miles upstream (still within the lake) from Antlers Resort and Marina could offer an opportunity for an in-lake juvenile collector close to the tributary mouth. Recreational use in the area appears to be fairly high so access through the site could be an issue. The high water channel width is about 170 meters and the wetted width currently is about 90 meters. The lake channel width is fairly consistent out to the resort. A narrow section 200 meters wide at Sugarloaf is just upstream from the confluence with Salt Creek Inlet (6.8 miles downstream of the railroad bridge). This site could also offer opportunity for an in-lake collector.

8) Scheduled and unscheduled maintenance that could adversely affect listed fish and how to minimize impacts.

This item will be addressed once we get further into pilot testing with non-listed fish.

9) Coordination procedures for scheduled and unscheduled maintenance.

See # 8

10) Protocols for emergency events and deviations.

To be developed as pilot testing phase proceeds.

11) Monitoring/Evaluation plan.

Evaluating survival rates at lifestages will be critical to determining the potential effectiveness and feasibility of a full scale passage program. We will need to determine survival of adults through the transport process to the river and to successful spawning, adult straying rate from the intended tributary, spawning areas and success, juvenile rearing habitat use, juvenile production rates (emigrants/spawner), and when a juvenile collection prototype is installed the efficiency will need to be estimated.

Adults

At Capture Site

Trapping would occur starting roughly September 1 to get relatively fresh fish but avoid getting spring Chinook. Number trapped and number kept recorded by day

Adult Chinook salmon selected for transport would receive a fin clip for potential genetic stock identification

Radio tag the adults prior to release upstream to track migrations and determine spawning location and success.

In-tributary

Conduct a weekly or bi-weekly float down the tributary or fly over to locate tagged fish. Map fish locations each survey.

Float river during spawning period to determine spawning locations and fate of fish (successful or unsuccessful spawning). Map redd locations and locations of radio tagged fish.

Determine survival rates: 1) capture to realease site and 2) release to spawning

Determine stray rate and locations: Fly over to locate tagged fish and determine number remaining in target tributary and number in other tributaries or in the lake.

Note: access to in-tributary habitat requires access agreements with private landowners.

Juveniles

In-tributary

Conduct bi-weekly snorkel surveys at selected sites, such as high density spawning areas and likely rearing fish concentrations, to determine expected level of emergence success and rearing habitat use.

Operate a rotary screw trap near the mouth of the tributary to estimate total number of juveniles emigrating from the tributary along with the size distribution and timing. Determine production of juveniles per female released and per female successfully spawning.

Mark all juveniles captured with a mark appropriate to the size of the fish (dye, cwt, or PIT tag)

Downstream of tributary

Prototype juvenile collector

……..If a collector exists then measure and mark all juveniles collected with a mark appropriate to the size of the fish (dye, cwt, or PIT tag).

Conduct collector efficiency tests by the determining the proportion of the fish released from the RST (or other upstream collection method) that are collected in the collector. Alternatively release some collected fish back upstream for efficiency estimation.

Release juveniles downstream of Keswick

Release marked juvenile test fish into Shasta Lake to determine whether any significant survival occurs through the lake and dam and into the lower river. Releases could occur at the mouth of the tributary and in the lake at Shasta Dam. Assess based on recoveries at RBDD and other downstream monitoring sites. Determine appropriate mark and tag…possibly use both cwt and PIT tags so that recoveries could occur in any sampling programs up through adult. If juveniles rearing in the tributary or lake reach a large enough size then use acoustic tags to determine behavior in the lake and at the dam.

Returning Adults

NMFS expressed the desire to have the upstream of dam population be a separate segregated population from the downstream population. Some natural spawning of adults produced upstream of the dam would likely occur downstream of the adult collection site by adults not trapped and moved so total segregation may not be possible. For some segregation to occur we need the ability to differentiate, non-lethally, the fish at the trap that were produced upstream of the dam. We could do this with PIT tags if the juveniles are large enough (~60mm) when emigrating. Alternatively we could use parental stock identification to determine whether the parents were from those released upstream (is that possible?).

Keep track of the number of returning adults that originated upstream of the dam to track the transported juvenile to adult survival rate each year.

The ultimate success of fish transported upstream compared to the success of fish downstream of Keswick Dam will be a critical information need in assessing the efficacy of removing listed fish from the downstream population and introducing them in to the habitat upstream of the dam. Determine the cohort replacement rate for each generation of returning adults in each location (below dam, above dam, within tributary).

Issues

Disease – transfer of fish upstream of the water source for Livingston Stone and Nimbus Hatcheries has the potential to transfer diseases which would be carried in the water back to the hatchery and infect fish in the hatchery.

Effects on populations of the listed species – removing individuals from downstream populations could negatively effect listed species if survival of fish transported upstream of the dams is low.

Effects on private property owners – upstream landowners are concerned that introducing listed fish above the dams could affect permissible activities on their lands. Activities would likely need to occur on some private lands.

Productivity of upstream habitats – anadromous access to upstream habitats has been blocked for over 60 years. The productive capability of these habitats (juvenile emigrants produced per spawner) is unknown, particularly for dry/warm years when these habitats are hoped to provide survival benefits over habitat downstream of dams

Water temperatures – will upstream habitats have cooler water than is provided by reservoir releases during dry years when coldwater pools are most limited?

Resident fish – will predation by brown trout and/or other species in upstream habitats be too high for the project to be successful? Will interbreeding of steelhead with resident trout negatively affect CV steelhead genetics?

Lake Rearing – Will juvenile Chinook rear successfully, without being eaten, in Shasta and Folsom reservoirs?

Outline of upstream Habitat Assessment Plan – Action NF2

CVP Fish Passage Program Upstream Habitat Assessments – RPA Action NF2

Objective from the RPA: To quantify and characterize the location, amount, suitability, and functionality of existing and/or potential spawning and rearing habitat for listed species above dams operated by Reclamation.

Goal: Determine whether sufficient habitat exists upstream of Shasta and Folsom dams for a reasonable number of the target species to reproduce. A minimum number is set at 1,000 adults (500 pairs) in a major tributary based on literature indicating 500 as a minimum viable population size. The BiOp identifies that the target species above Shasta are winter-run and spring-run Chinook and that the target species above Folsom is steelhead. The determination of the productivity of the habitat will be made by releasing test fish (likely non-listed Chinook) into the habitat and monitoring juvenile production.

We will compile existing data and identify data needs in order to accomplish the following tasks:

1. Determine accessibility of potential upstream habitat with regard to people being able to get there to conduct habitat assessments and monitor fish habitat use.
2. Determine extent of anadromous access upstream of the reservoirs.
    a. Check for adult migratory barriers. Delineate on a map the stream reaches likely to be accessible to Chinook and steelhead.
        i. First priority is on mainstem habitat.
        ii. Second priority is on large tributaries likely capable of supporting Chinook and steelhead reproduction.
3. Determine whether sufficient spawning and rearing habitat exists for a reasonable number of Chinook and steelhead to reproduce successfully.
    a. Spatially quantify the amount of potential spawning habitat (eg. by river mile) to roughly estimate spawner capacity.
    b. Locate and delineate on a map where significant adult holding, spawning and rearing habitat patches exist.
4. Determine river reaches with temperature regimes suitable for target species/run spawning, egg incubation, and rearing.
    a. Identify temperature requirements for the target species in these habitats.
    b. Identify new temperature monitoring locations for those tributaries where sufficient stations do not exist and install temperature monitors at those sites.
    c. Identify potential coldwater refugia locations (e.g. springs)
5. Evaluate the hydrograph of each river to determine suitability for target species spawning and rearing with regard to:
    a. Baseline flows
    b. Flow fluctuations
    c. Flow peaks
    d. Upstream dam operations
6. Determine the top priority tributary stream in each watershed (ie. American River and Sacramento River) to begin a pilot program with adult (and/or juveniles or eggs) test fish releases.
7. Identify potential areas for adult releases.
8. Identify potential sites/options for collecting emigrating juveniles.
    a. Within tributaries
    b. At head of lake
    c. At dam

Action NF 4.7 Submittal to NMFS (Stanislaus River Fish Passage Assessment)

NF 4.7. Stanislaus River Fish Passage Assessment

Objective: *To develop information needed in order to evaluate options for achieving fish passage on the Stanislaus River above Goodwin, Tulloch, and New Melones Dams.*

Action: *By March 31, 2011, Reclamation shall develop a plan to obtain information needed to evaluate options for fish passage on the Stanislaus River above Goodwin, Tulloch and New Melones Dams and shall submit this plan to NMFS for review. This plan shall identify reconnaissance level assessments that are needed to support a technical evaluation of the potential benefits to CV steelhead that could be achieved with passage above the dams, a general assessment of logistical and engineering information needed, and a schedule for completing those assessments by December 31, 2016. Reclamation is encouraged to use information developed for the American and Sacramento Rivers in Action NF 3 above, when also applicable for the Stanislaus River.*

By December 31, 2016, Reclamation shall submit a report, including the results of the assessments and proposed options for further consideration, to NMFS. By December 31, 2018, Reclamation shall include recommendations for fish passage on the Stanislaus River in the Comprehensive Feasibility Report (Action NF 6.) The report will outline the costs of potential projects, their biological benefits and technical feasibility, potential alternatives, and steps necessary to comply with all applicable statutes and regulations.

Rationale: *This assessment process will develop foundational information necessary for consideration and development of fish passage options above New Melones Reservoir to relieve unavoidable effects of project operations on the Southern Sierra Diversity Group of CV steelhead and on adverse modification of critical habitat.*

Information needed to evaluate options for fish passage on the Stanislaus River

1. Stanislaus River steelhead population data

We need steelhead population data for the lower Stanislaus River to determine whether enough steelhead are likely to be present to make transporting fish a worthwhile endeavor. The Stanislaus River weir enumerates steelhead passing upstream. Around a dozen suspected steelhead have been detected during years when the weir was run during the entire steelhead immigration period. The picket spacing provides 1 5/8" openings so a few smaller steelhead may pass through the pickets. Additionally, some steelhead could pass during periods of very high turbidity when only an outline of the fish is available making differentiation from Chinook

salmon impossible. The likely low number of adult steelhead is too few to fully seed the existing habitat below Goodwin Dam with juvenile steelhead.

It is likely that factors other than blocked passage at Goodwin Dam and water temperatures ultimately limit the steelhead population in the Stanislaus River. Until the factors limiting the current population are addressed and populations increased, passing steelhead upstream of New Melones is likely to be an ineffective and expensive endeavor and is unlikely to move towards recovery of Central Valley steelhead. The existing resident trout population below Goodwin Dam has persisted through warmer years indicating that the existing habitat in the Stanislaus River is currently suitable for steelhead reproduction and juvenile rearing. If emigrating juveniles are not surviving through the route to the ocean and back under current climate conditions then fish produced upstream of New Melones are unlikely to survive this same route under potentially more stressful conditions. Other options for increasing the steelhead population in the Stanislaus, prior to embarking on an upstream passage program, could be explored. We have identified a few options: 1) attempt a trap and haul program in the lower river to get outmigrating fish through the lower Stanislaus River and out past the San Joaquin River to San Francisco Bay, 2) Attempt to induce anadromy in higher numbers of the existing juvenile trout rearing in the river by experimentally varying flows and temperatures, 3) Capture juveniles rearing in the upper river and transport to holding sites with moderately saline water in the lower delta or bay to attempt to induce anadromy prior to release .

Schedule: continue to monitor results from the Stanislaus River weir October through March each year, through 2016, to cover period of steelhead immigration. Explore other options for increasing steelhead survival along the migratory route 2014-2016 in the event that the existing adult population size is insufficient to justify investing in a passage program on the Stanislaus.

2. Adult collection site information

Identify accessible areas of adult steelhead concentration downstream of Goodwin Dam for collecting a sufficient number adults, juveniles, or eggs. Currently the Stanislaus River weir location could serve as a location to collect adults. The site is downstream of steelhead spawning and holding areas so would enable the program to pass a known number of fish upstream to spawn below Goodwin Dam and collect a known number to haul upstream to ensure we do not deplete the area below Goodwin Dam of spawners. Another potential collection site would be near Goodwin Dam. A weir/trap could be installed in the ~1/4 mile reach directly below Goodwin Dam to collect adults that make it up to that point. This is an area of high resident O.mykiss population, with many large individuals, so there would need to be a way to determine which adults are anadromous. The channel is fairly well constrained through much of this reach so that high flows could have a greater effect on trap operations than in less constrained downstream locations. Adult steelhead distribution data is needed to select an adult collection site if a lower river site is not considered suitable. Distribution data could be obtained by radio tagging steelhead at the weir and determining where they go to hang out and

spawn. There may not be a sufficient number of steelhead migrating all the way to the dam to enable collection to occur there.

Schedule: obtain adult steelhead distribution data October 2014 - March 2016 to enable site selection for adult collection to occur.

3. Extent of potential anadromous access upstream of New Melones Lake

Determine accessible reaches of the north, middle, and south forks of the Stanislaus River for adult steelhead released at the mouths of the New Melones Lake tributaries. This would be done by assembling existing barrier data that may be available and walking and/or kayaking these upstream tributaries to check any barriers. Figure 1 shows the area of the Stanislaus River watershed upstream of Goodwin Dam where the assessment would occur.

Schedule: survey upstream stream reaches 2014 - 2016

4. Assessment of water temperature suitability for steelhead

Assemble existing water temperature data in the north, middle, and south forks and, where needed data does not exist, install temperature loggers. Assemble water temperature data from reaches downstream of Goodwin Dam. Compare upstream and downstream water temperatures to determine whether, during the years when temperatures are problematic downstream of Goodwin Dam, temperatures are more suitable upstream of New Melones.

Schedule: Assemble existing water temperature data in 2012 and install water temperature loggers in needed areas without existing data. Summarize data by 2016.

5. Assessment of suitability of flows for steelhead production

Assemble flow data for the upstream tributaries to determine if adequate year round flows occur for successful steelhead production. Obtain information on upstream dam operations if available from owners or FERC licenses.

Schedule: Assemble and assess flow data by end of 2015.

6. Assessment of spawning and rearing habitat availability

Quantify (roughly) likely spawning and rearing habitats in the north, middle, and south forks of the Stanislaus River and compare with water temperature data to determine areas likely to support successful reproduction and juvenile rearing. Habitats would be quantified through on the ground surveys to locate and measure significant spawning and rearing habitat patches and displayed in GIS maps.

Schedule: Conduct surveys in conjunction with item 3 above during 2014 – 2016.

7. Genetic data on resident O.mykiss.

Assemble existing genetic data on O. mykiss upstream of New Melones Dam to determine whether these resident fish are similar enough to Central Valley steelhead that intermixing (via spawning with CV steelhead or juveniles from upstream transferred downstream of Goodwin Dam and spawning with CV steelhead) would not be an issue. If intermixing of different stocks is an issue then passing CV steelhead upstream would likely not be advisable until non-Central Valley stocks upstream of New Melones are somehow isolated or removed.

Schedule: Complete by 2015

8. Land Ownership

Assemble land ownership information for the reaches likely to support steelhead and determine the accessibility of these reaches for baseline data collection, monitoring, and fish transport and collection activities. Seek permission to access private lands as needed.

Schedule: Complete prior to entering land for items 3 and 6.

9. Areas of juvenile congregation above New Melones for downstream passage.

Determine areas of likely juvenile steelhead congregation in New Melones Lake and tributaries to enable development of juvenile downstream passage or collection and transport options. If determined worthwhile to pursue, then tests of collection or passage options could potentially be run with existing adfluvial trout populations or other test fish.

Schedule: Complete by 2016

10. Central Valley Steelhead Recovery Plan

Determine consistency with NMFS recovery plan actions in the Stanislaus River basin.

Schedule: complete within six months after recovery plan is finalized.

11. Potential juvenile downstream passage options

Determine potential options for juvenile downstream passage. Identify engineering data needs (topography, flows, lake levels, timing), from the passage options, for designing potential in-tributary, head of reservoir, or at-dam juvenile collection systems and engineering data needs for potential adult collection and release sites.

Schedule: collect needed physical data by the end of 2016.

12. Environmental compliance requirements

Determine and complete environmental compliance activities needed to carry out any assessment activities.

Schedule: Complete by 2015 or prior to conducting activities requiring special permitting.

13. Applicability of information developed for Sacramento and American Rivers to the Stanislaus River assessment.

Use the upstream habitat assessment plan developed for the Sacramento and American River watersheds to help guide tasks in the Stanislaus River.

The Sacramento/American River assessment plan outline is included above.

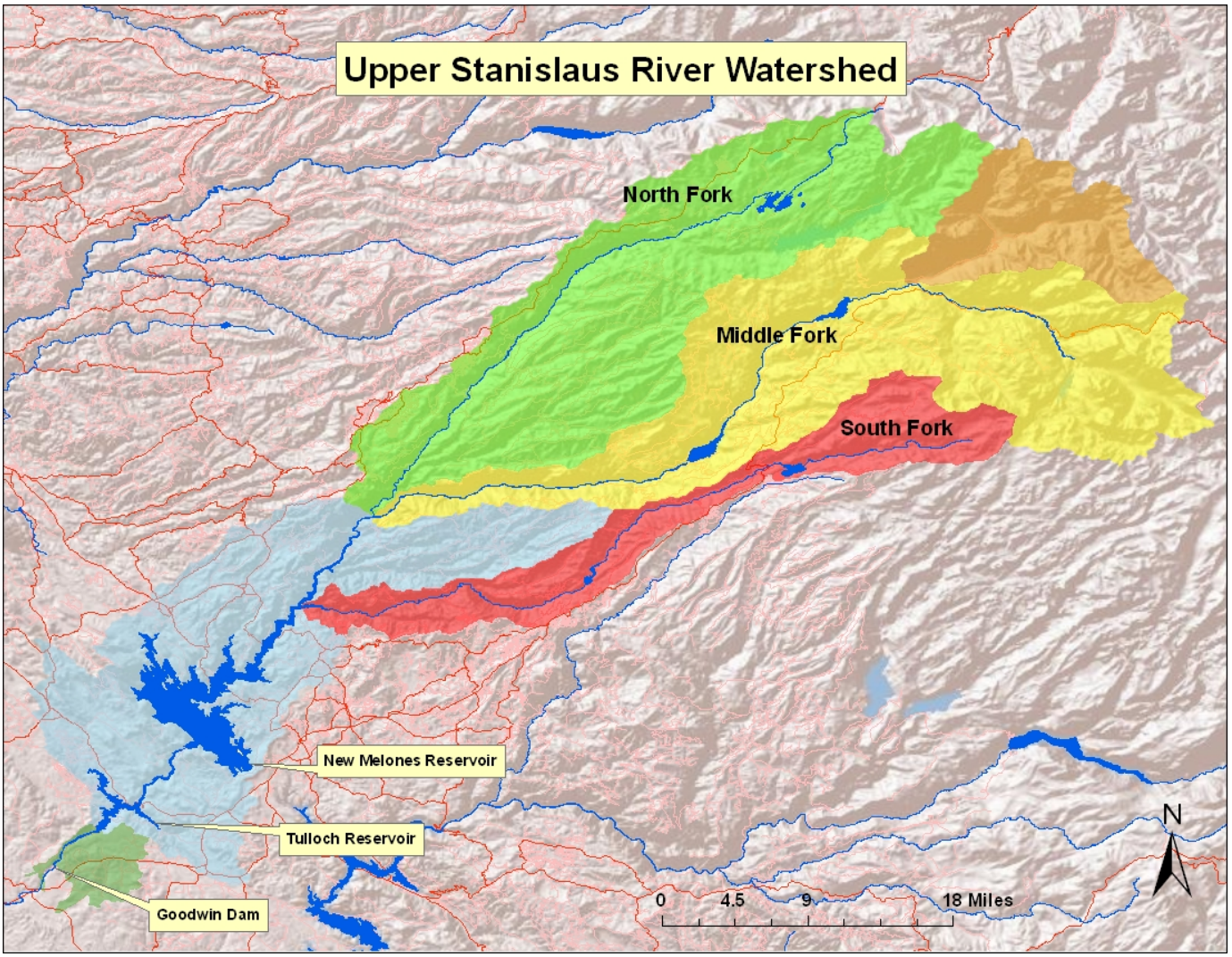


Figure 1. Stanislaus River watershed upstream of Goodwin Dam.