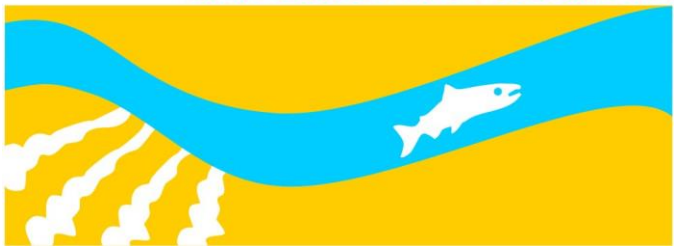
Appendix C

Summaries of Issue Background Papers

SAN JOAQUIN RIVER
RESTORATION PROGRAM



June 2017

SUMMARIES OF ISSUE BACKGROUND PAPERS

The process of developing this Fisheries Framework included extensive contributions by the San Joaquin Settlement Parties. In their early 2015 planning discussions, these representatives identified 14 key issues to be considered in developing a framework for Chinook salmon restoration. At their direction in May 2015, a contractor team prepared a background paper for each issue that described possible approaches to address the issue, and identified a recommended approach along with the rationale for each recommendation. These were discussed by the Settlement Parties at meetings in July and November 2015 and subsequently helped inform their recommendations that were incorporated into the 2016 Fisheries Framework.

Provided below is a summary of each background paper followed by key points the group felt needed to be resolved either through additional discussions among themselves, data collection or long-term monitoring. The full text of each June 2015 issue backgrounder is available from the USFWS.

The 14 issues identified by the Settling Parties are:

1. Spring-run Chinook Salmon Prioritization
2. Adult Abundance Goals
3. NEPA Process
4. Rearing and Spawning Habitat Availability
5. Fish Passage and Screening
6. Wild Spring-run Chinook Salmon Broodstock
7. Steelhead in Restoration Area
8. Spring-run Chinook Salmon Take at Pumps
9. Accountability
10. Management Triggers
11. Water Temperature
12. Relationship Between Restoration Actions to Other Parts of the System
13. San Joaquin Fall-run Chinook Salmon Management (later eliminated as an issue)
14. Other Species in Restoration Area

1 Spring-run Chinook Salmon Prioritization Summary

A major goal of the SJRRP is to restore spring-run and fall-run Chinook salmon to the mainstem of the San Joaquin River below Friant Dam. Historically, the two races of Chinook salmon spawned in different portions of the basin and at different times. The spatial and temporal separation of these two Chinook salmon races ensured that the hybridization (i.e., genetic introgression) rate between the runs was low. Such separation maintained the adult spring-run and fall-run migration timing exhibited by the two populations. Under restoration conditions, both spring-run and fall-run Chinook salmon may spawn in the same river reaches during similar periods of the year. Competition between spring-run and fall-run Chinook salmon for spawning and rearing habitat and the overlap in run timing may result in:

- Increased hybridization
- Superimposition of redds
- Competition for juvenile rearing habitat

Each of these three possible outcomes has the potential to reduce the probability that restoration goals for one or both Chinook salmon races would be achieved. The issue then is whether sufficient information is available on competition and the feasibility of segregation to prioritize spring-run Chinook salmon restoration over that of fall-run Chinook salmon.

1.1 Issue Resolution

Both runs of Chinook salmon will be introduced simultaneously to the Restoration Area. Actions will be taken to reduce risks to spring-run Chinook salmon from introgression and redd superimposition. Introgression is not expected to be an issue for a number of years and could be monitored by tagging and redd surveys. Juvenile competition for rearing space is not expected to be a concern.

1.2 Comments / Recommendations

The parties appear to agree that actions would be taken to reduce introgression and redd superimposition risks to spring-run Chinook salmon. These could include the following:

- Tagging and redd surveys to monitor introgression.
- Incorporate adaptive management principles to provide transparent decision-making.
- Define the start/end of spring-run and fall-run Chinook salmon migrations if control of fish into the system is necessary and determine if genetic sampling will be used.

1.3 Link to Framework

This approach is included in the document.

2 Adult Abundance Goals

The Program restoration goal is to restore and maintain fish populations in "good condition" in the mainstem San Joaquin River below Friant Dam to its confluence with the Merced River, including naturally reproducing and self-sustaining populations of salmon and other native fish. The two primary salmon populations of interest for the program are spring-run and fall-run Chinook salmon. The Fisheries Management Plan set minimum abundance targets of 500 adults for both spring-run and fall-run Chinook salmon; long-term adult abundance targets are 30,000 for spring-run Chinook salmon and 10,000 for fall-run Chinook salmon. The issue is whether the long-term targets are realistic and should continue to be used to guide program activities.

2.1 Issue Resolution

Spring-run and fall-run Chinook salmon goals (defined in the Fisheries Management Plan) will continue to be used to guide program activities. These goals are included in the working hypothesis for the program for both Chinook salmon runs. As new data are collected on fish performance as part of monitoring and evaluation activities, the abundance goals will be updated consistent with the data.

2.2 Comments / Recommendations

The parties agreed to the long-term abundance goals and recommended that life history and habitat goals should be included. They also recommended defining assumptions about survival at various points in the system and to identify where the measurement points should be.

2.3 Link to Framework

The issue is partially addressed. Have not fully identified Survival metrics and at what location are not fully identified, and the Framework is missing survival assumptions from the Restoration Area to the Delta. *Have a placeholder in Table in report*.

3 NEPA

Various NEPA processes have been completed and more will be required in conjunction with Program implementation. NEPA was identified as an issue by the Settling Parties during the May 2015 meetings, although no issue definition was provided. The issue may be that the duration of the NEPA process has compromised the Program implementation schedule. Unless the process is carefully structured, issues communicated clearly and addressed promptly, and technical and legal staff time prioritized, it is not unusual for these processes to become prolonged.

3.1 Issue Resolution

Settlement Parties responsible for NEPA analyses will coordinate activities so that program actions will not be delayed because of regulatory issues. Updates on regulatory compliance will be reported during implementation update meetings.

3.2 Comments / Recommendations

N/A.

3.3 Link to Framework

Not discussed.

4 Rearing and Spawning Habitat Availability

The Fisheries Management Plan set minimum adult abundance targets of 500 for both spring-run and fall-run Chinook salmon, and long-term adult abundance targets of 30,000 spring-run Chinook salmon and 10,000 fall-run Chinook salmon. To reach these adult abundance targets, an average of 1.575 million spring-run Chinook salmon and 750,000 fall-run Chinook salmon juveniles will have to be produced. Restored habitat of sufficient quantity and quality to support this many adults and juveniles will be required; otherwise, the likelihood that adult abundance targets can be achieved is reduced.

The issue is whether or not analyses conducted to date adequately define the quantity and quality of habitat required to achieve the adult abundance targets. A secondary component of the issue is whether restoration actions are being implemented to produce the amount of habitat identified by the analyses.

4.1 Issue Resolution

It is assumed that the analyses conducted to date adequately define the quantity and quality of habitat required to achieve adult and juvenile abundance goals. The analytic tools used to determine habitat needs are:

- **Ecosystem Diagnosis and Treatment (EDT) Model** – EDT modeling was conducted as part of a proof-of-concept analysis and to examine the effect Reach 2b restoration actions would have on resulting spring-run Chinook salmon production. The model produced estimates of juvenile and adult abundance and population productivity, capacity and diversity based on the quality and quantity of habitat the fish encounter over their entire life history (SJRRP 2010a; ICF 2014).
- **Minimum Floodplain Habitat Area for Spring-run and fall-run Chinook salmon** – A study of Minimum Floodplain Habitat Area (SJRRP 2012b) recommended the amount of juvenile rearing habitat required to meet spring-run and fall-run Chinook salmon targets. The analysis used the Emigrating Salmonid Habitat Estimation (ESHE) model to simulate the juvenile stages of future restored populations of Chinook salmon and estimated reach-specific amounts of suitable habitat required for each. The analysis used 2D modeling to determine existing habitat quantity and its suitability for salmonid rearing and migration. The study defined suitable habitat as the number of acres that met juvenile Chinook salmon depth, velocity and cover requirements. While sufficient habitat was estimated to achieve the adult long-term abundance targets, the report notes that there is considerable uncertainty associated with the habitat predictions. It also points out that the modeling inputs were taken from watersheds that are either tributaries to the San Joaquin or relevant analog streams.

- The **2014 Monitoring and Analysis Plan** (MAP) describes the conceptual population model being used to determine fish habitat needs. The state of knowledge and analysis completed are described for the following themes: 1) rearing habitat, 2) spawning and incubation, and 3) adult migration. The report lists possible questions that need to be answered regarding the themes of predation, fish passage, fish reintroduction, and water management. The studies being implemented to address these issues are identified in the 2014 and 2015 reports. Finally, the report provides a summary of the limiting factors for both spring-run and fall-run Chinook salmon that must be overcome if the program is to achieve identified abundance goals.

What has not been clearly communicated to date is whether restoration actions are being implemented (or are even possible) to produce the amount of habitat identified by the analyses. To alleviate this problem, updated reach specific information about habitat quality and quantity is needed.

4.2 Comments / Recommendations

The Settling Parties seek greater clarity on habitat conditions, limiting factors, performance metrics, etc. They would like to see a better link between objectives/stressors to life stage survival by run. A clearer understanding of the working hypothesis for habitat/flow/temperature by reach and water year is needed.

4.3 Link to Framework

Stream flow is thoroughly addressed, although temperature assumptions by reach are not. The stressors and life stage relationship are based on professional opinion of the technical team.

5 Fish Passage and Screening

The long-term vision for the SJRRP is to develop a completely volitional upstream and downstream passage system through the Restoration Area. This will require the construction of both adult upstream passage structures and juvenile downstream screening facilities. Until such systems are in place, the issue is if, when, and for how long adult and juvenile trap-and-haul systems should be used to restore salmon to the Restoration Area.

5.1 Issue Resolution

The Restoration Administrator recommended that adult and juvenile trap-and-haul operations be used to establish spring-run and fall-run Chinook salmon populations in the Restoration Area (Johnson 2015). The parties agreed that trap-and-haul methods would be used as both an interim measure to move fish in and out of the Restoration Area and a long-term measure to enhance fish survival during periods of drought or other unfavorable environmental conditions. This tool may be abandoned when natural Chinook salmon populations exceed the Program's long-term adult abundance levels.

5.2 Comments / Recommendations

It was agreed that trap-and-haul operations should be used in both the short-term and long-term to transport spring-run and fall-run Chinook salmon, especially when environmental conditions are poor (i.e., result in low juvenile or adult survival rates). Use of adult abundance as the trigger to discontinue trap-and-haul activities is a protocol that should be addressed yearly. More specific guidance on transporting resident fish (lamprey, sturgeon, etc.) is needed to refine the current criterion which is to pass all fish sometimes.

5.3 Link to Framework

The Framework is lacking anything on transport or protection of resident fish.

6 Natural Origin Broodstock Selection (Spring-run Chinook Salmon)

A number of historical program documents state that multiple sources (populations) of spring-run Chinook salmon would be used as broodstock for the conservation hatchery. The plans called for the collection of natural origin adults or eggs from natural origin adults to start the spring-run Chinook salmon hatchery program. To date, this has not been permitted, and therefore the program relies on Feather River spring-run Chinook salmon for hatchery broodstock.

6.1 Issue Resolution

The Program will incorporate natural origin spring-run Chinook salmon from other Central Valley populations into the hatchery broodstock. The USFWS will submit a new 10(a)(1)(A) for collecting natural origin adults, eggs or juveniles from these populations. The permit will list the populations that will be used for broodstock and the conditions under which adults, eggs or juveniles are removed.

6.2 Comments / Recommendations

The proposed issue resolution was accepted by the group. Further discussion will occur about future hatchery operations. These topics will clarify whether or not adult spring-run Chinook salmon returns to the SJR will be incorporated into broodstock to increase local adaptation, the need for long-term spring-run Chinook salmon hatchery production, and to more clearly define the purpose for hatchery operations (production vs. captive broodstock).

6.3 Link to Framework

The HGMP states that hatchery returns will be incorporated into broodstock for production purposes. This has been included in the Framework.

7 Steelhead in Restoration Area

The SJRRP will develop a volitional fish passage system that allows salmonids to move freely into and out of the Restoration Area. Although the primary objective for this system is to assist in the creation of self-sustaining populations of Chinook salmon, the facilities would create

conditions that would allow ESA-listed steelhead to enter the Restoration Area. Steelhead colonization of the Restoration Area would create a situation where landowners and the Program would be accountable for any "take" of this species due to impacts associated with, for example, irrigation diversions and pumping, operation of fish passage facilities and hatchery operations. Currently, there is an ESA 4 (d) rule for steelhead. Without ESA protection, landowners may oppose the program or ask for expensive remedies, the cost of which could impact the ability of the program to achieve its goals.

7.1 Issue Resolution

The intent is to translocate steelhead out of restoration reach until protection and/or construction activities are in place/completed. Steelhead will be allowed full access to the Restoration Area once volitional passage is established. The exchange contractors expect screening to be in place prior to river connectivity; however, if screens have not been installed, monitoring should extend to the affected withdrawal areas. A steelhead monitoring program is funded by program through 2022.

7.2 Comments / Recommendations

The parties agreed to the proposed resolution and see no regulatory or compliance issues at this time.

7.3 Link to Framework

Not discussed.

8 Spring-run Chinook Salmon Take at Pumps

Spring-run Chinook salmon juveniles may be indistinguishable from other salmon runs (e.g., winter Chinook salmon) on which there are strict take limits at state and federal pumping facilities. Once these take limits are met, pumping operations can be severely reduced, thereby negatively affecting entities that rely on these facilities. To prevent this from occurring, Program fish will either need to be uniquely marked or other methods developed to identify them when they are captured at the pumps.

8.1 Issue Resolution

The Program will mark (adipose fin-clip, coded-wire tag) all hatchery fish released from the Conservation Hatchery so they can be identified if captured at pumping facilities. The Program will follow NMFS guidance on this topic as provided in their annual memos.

8.2 Comments / Recommendations

This approach is acceptable to the parties.

8.3 Link to Framework

The Framework states that all hatchery fish will be marked.

9 Accountability

Some Settling Parties perceive a lack of accountability for Program actions and coordination. The parties would like to see a process developed that clearly defines the agencies (or others) that are responsible for each component of the SJRRP. This is especially critical moving forward as the parties are concerned that key permits, legal issues and additional data needs are not being addressed or their status is unclear.

9.1 Issue Resolution

Accountability and responsibility for each step in the salmon reintroduction program is defined in this Fisheries Framework document. This includes a commitment to quarterly tracking of implementation status (budget and schedules). System structural improvements, time frames for implementation and costs are provided in the Revised Implementation Plan (SJRRP 2015).

9.2 Comments / Recommendations

The parties assume that the framework documents will provide needed accountability.

9.3 Link to Framework

This issue is addressed in the BOR's 2015 Revised Framework for Implementation.

10 Management Triggers

To date, the program has had to react to changing on the ground realities that have substantially altered program progress. In the future, the Settling Parties would like to be more proactive in anticipating possible problems and to have a range of solutions or pathways identified to solve these problems.

10.1 Issue Resolution

Decision rules have been incorporated into the Fisheries Framework to address the issue. The Program may move between three restoration phases (Recolonization, Local Adaptation, and Full Restoration) based on decision rules associated with hatchery and natural adult Chinook salmon abundance and other parameters. The scientific basis for management triggers associated with each decision rule is defined in the Framework.

10.2 Comments / Recommendations

The use of phases and biologically based triggers appears to be an acceptable approach; however, NMFS has an issue with the approach if the Program can move back and forth between phases (at least for hatchery production). In addition to measuring adult returns, other objectives need to be identified, including interim measures.

Multiple reviewers want the proposed decision triggers, criteria, etc., to be reviewed by technical teams and refined as needed. Performance metrics dealing with fish passage criteria, identification of limiting factors, etc. need to be developed by water year type.

10.3 Link to Framework

The technical team did not provide any input on metrics; therefore, the hatchery program follows HGMP guidelines.

11 Stream Temperature

Restoration flows for the San Joaquin River have already been agreed to and are being implemented as the channel configuration allows. However, some Settling Parties are concerned that the river temperatures required for each stage of the freshwater component of the Chinook salmon life cycle may not be met. If river temperatures are inadequate, the Program abundance targets for Chinook salmon may not be achieved. The issue is whether or not the Program is on a pathway to produce the river temperatures required for all freshwater life stages of Chinook salmon.

11.1 Issue Resolution

Water temperature analyses for all reaches will be reviewed and used to update the working hypothesis for the Program at the annual technical meeting.

11.2 Comments / Recommendations

The parties agree that stream temperature and other habitat metrics need to be updated. Program hypotheses and assumptions about temperature and habitat and timing of fish returns need to be transparently displayed. A challenge is that many variables out of the control of the Program play into river temperature, making predictions highly uncertain. It was suggested that a reach by reach analysis would be useful.

The parties emphasized that temperature issues will have an effect on Program success and the approach to reintroducing fall-run Chinook salmon. In the early years of the Program, it is possible that a high percentage of spring returning fish may "miss" the thermal window of suitable temperatures for immigration to the SJR. How this would affect fisheries reintroduction efforts is uncertain and hypotheses about how spring-run Chinook salmon may adapt to the system are needed (e.g., would they migrate earlier?). One approach considered by the TAC in 2008 was a reintroduction strategy of late fall-run Chinook salmon; it would seem that a discussion of whether to consider genetics other than spring-run Chinook may be warranted. It was also suggested that a fry release strategy be considered to improve survival of fall-run Chinook salmon due to thermal squeeze.

11.3 Link to Framework

Temperature analysis is lacking in the Framework, there is no discussion of a fry release strategy here or in the HGMP, and a fall-run Chinook salmon hatchery is not proposed.

12 Relationship Between Restoration Actions to Other Parts of the System

The Parties are currently focused on implementing the myriad of actions required in the Settlement Agreement. Yet they recognize that fisheries management actions outside of the Restoration Area will have a large effect on attaining Program goals. For example, harvest policies in ocean and freshwater fisheries, hatchery fish production, straying of hatchery fish, and river flows through the Delta can increase or decrease the number of adult Chinook salmon returning to the San Joaquin River each year. The issue here is defining how and when the Settling Parties should engage in and attempt to influence decisions being made in other parts of the system that can affect program success.

12.1 Issue Resolution

The Fisheries Framework will be implemented in three phases. In each phase, decision rules will be used to determine when Program managers may need to engage in and influence management decisions about other Central Valley Chinook salmon populations.

12.2 Comments / Recommendations

The parties appear to agree with the need to coordinate and engage in fisheries management issues dealing with fall-run Chinook salmon hatchery strays, harvest rates and fish marking, etc. at some point. NMFS is of the opinion that stray hatchery Chinook salmon are not a problem or if they are, will be addressed in processes external to the restoration effort. Other parties appear to accept the approach of allowing any fall-run Chinook salmon, regardless of origin, to recolonize habitat. During the recolonization phase, there isn't a natural population to be compromised by hatchery strays. This becomes a question later (after 2019) but for now the strategy meets opportunistic program needs. Technical staff should assess the risks of this approach as it may affect achieving self-sustaining population goals.

Until such time as the SJR is connected and passable, discussions about the future of Hills Ferry Barrier are premature.

12.3 Link to Framework

A clear timeline is not identified for determining when and how Program managers will address these issues.

13 Other Fish Species

A major Program goal is to restore and maintain fish populations in "good condition" in the mainstem San Joaquin River below Friant Dam to the confluence with the Merced River, including naturally reproducing and self-sustaining populations of salmon and other fish. To date, the majority of the work conducted by the Program has focused on producing habitat and fish passage conditions required for spring-run and fall-run Chinook salmon. The issue is whether designing a system for salmonids will lead to the attainment of goals for other species.

13.1 Issue Resolution

One of the Program restoration goals is to restore the native fish assemblage; however, there is little management direction and no strategy about the goal. Salmon-centric planning may not protect other species. It was noted that there are ongoing discussions about this topic in other forums, for example the fish passage workshops led by USBR. The parties recommended that this plan explicitly acknowledge the objective to restore native fish and provide specificity about where and when.

13.2 Comments/Recommendations

None provided.

13.3 Link to Framework

Not currently addressed in the Framework.