Biological Opinions for the Reinitiation of Consultation on the Long Term Coordinated Operations of the Central Valley Project and State Water Project

Summary

October 2019

CENTRAL VALLEY PROJECT / STATE WATER PROJECT

Reinitiation of Consultation on the Long Term Coordinated Operations of the Central Valley Project and State Water Project

Introduction

In August 2016, the Bureau of Reclamation (Reclamation) and the California Department of Water Resources (DWR) requested reinitiation of consultation on long-term coordinated operations of the Central Valley Project and State Water Project (the Projects) with the National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (USFWS) (jointly, the Services). This reinitiation, pursuant to the Endangered Species Act (ESA), responded to Reclamation and DWR's desire to update the existing Biological Opinions (BiOps) in response to multiple years of drought, low population abundances of listed species, and new scientific information developed as a result of ongoing collaborative science efforts over the last ten years.

Multi-million dollar investments in research and monitoring by Reclamation, DWR, the Services, water and power users, non-governmental organizations and other stakeholders resulted in improved scientific understanding since the 2008 and 2009 Biological Opinions. These advancements in science will allow Reclamation and DWR to better manage the Projects to meet both fish and wildlife needs, and the needs of all the other myriad users who rely on the Projects for water, including farmers, recreational users and municipal users.

Recognizing the importance of the Projects to the nation, on October 19, 2018, the White House issued a memorandum to accelerate the process initiated in 2016. The memorandum directed the Secretary of the Interior to complete a biological assessment for the coordinated long-term operation of the CVP and SWP (ROC on LTO) no later than January 31, 2019. The memorandum also directed the Secretary of the Interior and Secretary of Commerce to issue final biological opinions for ROC on LTO on June 17, 2019, within the 135-day ESA statutory timeframe. The memorandum envisioned that the Services would coordinate their consultations and resulting BiOps to ensure consistency so that the Projects are better able to meet their authorized purposes.

The Services' initial analyses of Reclamation's preliminary proposed action identified significant adverse effects to ESA-listed fish species, and the three agencies determined that more time would be needed to complete the consultation. Through ongoing consultation over the following four months, Reclamation and DWR continued to clarify and refine the proposed action to address these concerns. This resulted in a final proposed action, transmitted to the Services on October 17, 2019. The Services relied on these modifications and clarifications to substantially revise their analyses of anticipated effects. On October 21, 2019, the Services transmitted their conclusions to Reclamation and DWR that the proposed action is consistent with the requirements of the ESA.

Project Overview and Consultation History

The species considered in these BiOps were once abundant throughout California. Winter-run Chinook salmon population estimates hit a high of 120,000 fish in the 1960s. Historically, spring-run Chinook salmon were the second most abundant salmon run in the Central Valley and one of the largest runs on the west coast. The Central Valley drainage as a whole is estimated to have supported spring-run Chinook salmon runs as large as 600,000 fish between the late 1880s and 1940s. Historic California Central Valley (CCV) steelhead run sizes are difficult to estimate but may have approached one to two million adults annually; by the early 1960s, the CCV steelhead run size had declined to about 40,000 adults.

Fig. 1 - Winter-run Chinook salmon, as well as Green Sturgeon, Steelhead, and Spring-Run Chinook Salmon

Green sturgeon are known to range from Baja California to the Bering Sea along the North American continental shelf, and through the Bay Delta and up the Sacramento, Feather, and Yuba rivers. There are no reliable historical estimates of green sturgeon populations, but recent estimates put the population around 2100 adults and 11,000 subadults. Southern resident killer whales occur throughout the coastal waters off Washington, Oregon, and Vancouver Island and travel as far south as central California and as far north as Southeast Alaska. Historic estimates for Southern resident killer whales are unreliable, but over the last 50 years, the population has fluctuated from about 80-90 individuals. The current population is 73 individuals. The delta smelt is found in San Francisco Bay estuary. In 2002, its abundance was estimated to be over one million; in 2019, numbers were estimated at around 5600.

By the time Reclamation began constructing the CVP in the 1940s, humans had already radically altered the landscape and impacted these species. Beginning with the gold rush in the 1850s, with its estimated 5,000 miles of mining flumes and canals, mankind altered and destroyed habitat, having impacts that are still severely affecting fish species. Construction of shipping channels, dams, hydropower facilities, levees, and diversion structures, along with draining of land for agricultural and residential uses, also completely transformed the landscape. Since settlement of the Central Valley in the mid-1800s, it is no exaggeration to state that human alteration of fish habitats has resulted in dramatic declines in populations of delta smelt, Chinook salmon, steelhead and sturgeon. Since 1900, approximately 95 percent of freshwater wetland habitat has been lost, and dams block access to more than 80 percent of historical salmonid spawning areas.

It wasn't until 1954 that Congress specifically authorized the CVP to provide water for fish and wildlife purposes, in addition to the original purposes of flood control, storage, power and navigation. In 1992, Congress reauthorized the CVP through the Central Valley Project Improvement Act to authorize mitigation, protection, restoration, and enhancement of fish and wildlife as additional project purposes and included actions to benefit fish and wildlife.

By the early 1990s, several species affected by project operations were in peril. Pursuant to the ESA, NMFS originally listed Sacramento River winter-run Chinook salmon as endangered in 1994, California Central Valley steelhead as threatened in 1998, Central Valley spring-run Chinook salmon as threatened in 1999, the southern Distinct Population Segment (sDPS) of green sturgeon as threatened in 2006, and southern resident killer whale as endangered in 2005. The USFWS originally listed the delta smelt as threatened in 1993, and in 2010 found that reclassifying it as an endangered species was warranted but precluded by other higher priority listing actions.

Nearly a century after it was authorized, the CVP is a massive project, fed by two major rivers, the Sacramento River and San Joaquin River, and a number of tributaries, which converge in the Sacramento-San Joaquin Delta and form an estuary that joins Suisun Bay, San Francisco Bay, and the Pacific Ocean, commonly known as the Bay Delta.

The CVP is one of Reclamation's largest projects, consisting of 20 dams, 21 reservoirs, 11 hydropower plants, and 500 miles of canals and aqueducts. It provides water to three-quarters of the irrigated land in California, and one-sixth of the irrigated land in the United States. Similarly, the State Water Project (SWP), approved in 1951, serves the water needs for two-thirds of all Californians, through 21 dams and reservoirs, 5 power plants, 16 pumping plants and 662 miles of aqueducts.

Shasta Dam and Reservoir, the largest reservoir on the Sacramento River system, stores winter and spring runoff from the Sacramento River. The Sacramento River also receives water exported from the Trinity River through Whiskeytown Reservoir. Folsom Dam and Reservoir

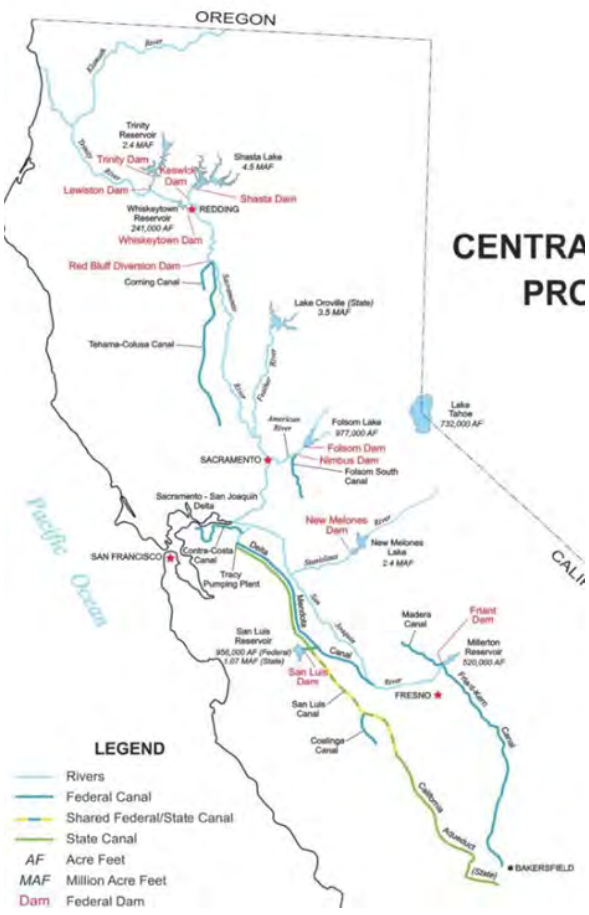

Fig. 2 – Map of CVP and SWP facilities

captures the runoff from the American River, a tributary to the Sacramento River. Controlled releases to the Sacramento and American Rivers are the major drivers of Project operations, providing water not only for irrigation and municipal uses, but also for the protection of endangered species and fishery resources, water quality, and protection against salinity intrusion in the Delta.

Oroville Dam and Lake, the tallest dam in the United States, stores water on the Feather River for water supply, hydroelectricity generation and flood control. Oroville operates in coordination with the CVP to release flows to the Delta and support exports that provide a major supply of water through the California Aqueduct for irrigation in the San Joaquin Valley as well as municipal and industrial water supplies to coastal Southern California.

Of course, the two Projects jointly impact and provide support for the species considered in the Services' BiOps, and there is a long history of ESA consultations for the operations of the CVP and SWP, beginning in the 1990s when the Services issued the first biological opinions for the Projects. The projects have undergone multiple rounds of ESA consultation since that time. Notwithstanding their listing for protection under the ESA, fish populations have continued to decline, likely due to inadequate stream temperature, altered flows, long term habitat degradation, naturalization of invasive species, modification of seasonal water quality, and other stressors, which cumulatively impacted species and the food web. The recent multi-year drought led to precipitous declines in ESA fish abundances, heightening delta smelt and winter-run Chinook salmon extinction risks.

The USFWS issued its most recent BiOp in 2008, concluding that operations of the Projects, as proposed, were likely to jeopardize the continued existence of the delta smelt and adversely modify its critical habitat. To avoid jeopardy and adverse modification of critical habitat, USFWS developed a reasonable and prudent alternative (2008 RPA) to the proposed action. The 2008 RPA included actions to reduce entrainment, provide for increased high quality low-salinity habitat in certain year types, create additional subtidal habitat, and monitor ongoing operations.

Likewise, in 2009, NMFS issued a BiOp concluding that operations of the Projects would likely jeopardize Sacramento winter-run and Central Valley spring-run Chinook salmon, California Central Valley steelhead, and the sDPS of North American green sturgeon, and adversely modify their critical habitats. NMFS also found that the Projects would likely jeopardize Southern resident killer whales. The 2009 BiOp also included an RPA (2009 RPA) to avoid jeopardizing and adverse modification of critical habitat.

The need to protect endangered species does not exist in isolation. California continues to face serious water challenges. Drought, growing human populations, existing and ongoing land use change, aging infrastructure, energy and environmental needs all strain existing water resources. In response to these challenges, the three Federal agencies have collaborated in developing proposed new operations for the CVP and SWP that incorporate elements from the 2008 and

2009 RPAs, with the goal of providing similar levels of protection for listed species while also giving Reclamation and DWR the flexibility they need to maximize water deliveries.

In the months since January 2019, the action agencies have made several significant changes to the January 31, 2019 proposed operations plan that began the consultation. The final proposed plan for operations includes an estimated $1.5 billion investment to support threatened and endangered fish over the next ten years.[1] The final proposed action ensures protection for the listed species affected by the Projects and also respect the needs of people who depend on the Projects for water and power.

Overview of the Process

In 2016, Reclamation and DWR requested reinitiation of consultation on the coordinated long-term operations of the CVP and SWP. The two agencies believed they could improve on managing limited supplies of water while still affording reasonable protections for listed fish species. Following the October 2018 White House memorandum, Reclamation and DWR worked to finalize the Biological Assessment, including working closely with NMFS and the USFWS (NMFS' participation was somewhat truncated by the month-long government shutdown that concluded five days before the Biological Assessment was finalized). The proposed action was developed specifically to incorporate and build on what has been learned through collaborative science processes to provide better conditions for protected species while also maximizing operational flexibility to deliver water. Reclamation completed its Biological Assessment on January 31, 2019 and submitted it to the Services. On June 6, 2019, following extensive consultation with Reclamation, USFWS and NMFS produced draft sections of their BiOps for peer review and review by Reclamation. In response to the draft BiOps, Reclamation and DWR submitted extensive comments, including concerns that the NMFS opinion did not correctly characterize the complex operations of the CVP/SWP as defined in the proposed action, that additional scientific information should be considered, and that the two BiOps needed to be better coordinated.

The June drafts of the BiOps highlighted serious concerns with the proposed operations given the heightened risks to the listed species, including potentially significant effects of operations and the need to modify the proposed action to address those effects. However, due to the multiple iterations of the proposed action, June drafts of the BiOps also had gaps in the analysis between the proposed action as originally modeled and the proposed action as modified to that date that were intended to limit the modeled effects.

As the consultation proceeded, the complex nature of the proposed action, the significance of the identified effects, and the overlap in project areas for species administered by USFWS and

[1] Reclamation is continuing to evaluate the proposed action and other alternatives pursuant to NEPA. If the proposed action is modified through the NEPA process, Reclamation will reinitiate consultation on the modified proposed action as appropriate.

NMFS led the Departments of Interior and Commerce to conclude that it would be helpful to take additional time to address the identified project effects, and to create an inter-agency team for this consultation to better understand and integrate project operations in the BiOps. At the end of June 2019, the Regional Directors assembled a team to address the adverse effects identified by the Services in their initial review of Reclamation's January, 2019 proposed action, and to update the analyses in their respective opinions. In addition, coordination between Reclamation, DWR, NMFS, and USFWS was critical to ensure the BiOps and their respective incidental take statements were compatible so the action agencies could implement both opinions.[2]

A "strike team" of engineers, biologists, and attorneys was charged with ensuring that these goals were met. Team members were chosen based on their experience with complex and challenging consultations throughout the country, including several members with specific expertise in the species and operations of the Central Valley and State Water Projects. The team included members from the initial DWR, USFWS, NMFS, and Reclamation consultation teams to ensure continuity, but other members were added to provide "fresh eyes," improving the clarity of the documents.

On July 9, 2019, the team convened in Sacramento to review both the draft USFWS and NMFS BiOps. The charge for the strike team included the following critical tasks:

- Ensuring that the best available science is used in all documents and analyses consistent with Federal laws, policies, and regulations;
- Addressing peer review, water agency, Reclamation, and State comments as appropriate in the BiOps;
- Maintaining the integrity of the work done in the draft BiOps while addressing organizational and editorial issues to ensure that the final BiOps reflected updates to the proposed action;
- Completing final agency drafts of the proposed action, BiOps, and supporting documents to ensure they are consistent and accurate;
- Refining the proposed action to address the significant effects that had been initially identified; and
- Maintaining a comprehensive administrative record of the process.

As revisions were made to the proposed action over the next few months, NMFS and USFWS worked with strike team members to incorporate these iterative updates into their analyses. The quantitative analyses provided by Reclamation in April 2019 still form the basis of NMFS's and USFWS' analyses of effects. These analyses were then updated with qualitative considerations

[2] In parallel, the Department of Water Resources is pursuing an Incidental Take Permit for the operation of the SWP under the California Endangered Species Act, overseen by the California Department of Fish and Wildlife.

of proposed action revisions to reflect the final version of the proposed action, which modified the Services' initial analyses and conclusions.

Commitment to Scientific Integrity

The Departments of Interior and Commerce also committed to a rigorous peer review process for the 2019 BiOps: conducting a first review on early drafts and a second review that followed the strike team's work. The USFWS transmitted draft sections of its delta smelt analyses in April 2019. This was a very early draft, and the peer reviewers provided constructive comments that led to significant improvement of the BiOp. For the first peer review of its June 2019 draft, NMFS provided its Analytical Approach through Effects Analysis sections. The peer reviewers provided constructive recommendations and concluded that NMFS had applied the best available information in the development of the draft BiOp.

Interior and Commerce also agreed to incorporate a second peer review of their revised draft BiOps. The second group of peer reviewers had a more complete version of July 30, 2019 drafts of both BiOps. Similar to the first review, the peer reviewers concluded that the Services generally used the best available science and that they had conducted a comprehensive analysis of the proposed action.

The strike team also operated independently and engaged the science advisor to the Secretary of Interior and NOAA's scientific integrity officer to ensure the process was also consistent with the scientific integrity policies for both agencies. Those policies require that scientific information be robust, of the highest quality, and the result of as rigorous a set of scientific processes as can be achieved. Most importantly, the information must be trustworthy. Both agreed that this process met that high standard.

The Proposed Action

Reclamation and DWR operate the Projects to meet multiple competing demands: flood control, irrigation, municipal and industrial water supplies, fish and wildlife, recreation, and hydroelectric power generation. Reclamation's proposed action incorporates a suite of strategies to protect threatened and endangered fish, including a commitment to actions that build a larger cold water pool in Shasta Reservoir and release that cold water in a more strategic way; flows to support fish habitat and life stage needs; export restrictions based on real-time loss, turbidity, and flow conditions; habitat restoration and intervention; and a new conservation hatchery, all backed by science oversight, monitoring, and research.

Both NMFS and USFWS identified uncertainty related to the effects of proposed action components that are reflected in their analyses of the initial January 31, 2019 proposed action. The Services identified uncertainties related to modeling limitations, alternative analytical tools, the lack of specific metrics, and information Reclamation provided regarding real-time implementation of the proposed action. In particular, NMFS concluded that there was notable uncertainty regarding Reclamation's ability to considerably increase total Shasta storage on May

1 under the proposed action as compared to operations under the 2009 BiOp. During the consultations, the Services both expressed concerns about the changes in Delta export operations being proposed by Reclamation and DWR.

Fig. 3 - Closures of the Delta Cross Channel Gate prevents entrainment of many fish into the poor habitat of the central and south Delta and reduces salvage.

Through ongoing consultation to pinpoint areas that appeared to be magnifying the potential impacts of the proposed action, Reclamation and DWR made multiple modifications to the proposed action. Major changes made to the proposed action since the original submittal in January included new protective actions in the Bay Delta, a more refined temperature management plan at Shasta Reservoir, funding for hatcheries and new major habitat projects, studies to further define the needs of the species, specific drought actions and an independent periodic review process for Project actions. With the extensive collaboration between the Services and Reclamation, which resulted in meaningful improvements to Reclamation's and DWR's proposed operations from the January 31, 2019 iteration of the proposed action, both Services ultimately concluded that Reclamation's proposed operations are not likely to jeopardize threatened or endangered species or destroy or adversely modify their critical habitat.

Reclamation added certainty through additional commitments on actions that improve conditions for listed species and clarified confusing language. Based on the significant adverse effects that were analyzed in early drafts of the Opinion, and incorporating the Services' expertise, Reclamation proposed additional actions to improve conditions for the listed species including:

- An estimated total of $1.5 billion dollars in proposed funding to support threatened and endangered fish survival and recovery through research and restoration actions
- A more detailed description of Shasta Dam operations and a commitment to Cold Water Management Tiers
- Performance metrics for incubation and juvenile production of salmonids under the proposed Shasta Cold Water Pool Management strategy
- Performance Metrics for managing Old and Middle River reverse flows to limit salmonid loss to similar levels observed under the previous BiOp through explicit reductions in export pumping
- Commitments to manage Old and Middle River reverse flows for limiting larval and juvenile delta smelt entrainment based on modeled recruitment estimates
- Independent Review Panels to evaluate the science behind actions and outcomes
- Ramping rates specificity for reservoir releases to reduce the risk of stranding

- Commitment to implement condition-appropriate actions after two years of low winter-run Chinook salmon egg-to-fry survival
- More specificity on collaborative planning with specific habitat restoration and facility commitments:
    - Delta Cross Channel Improvements
    - Modifying the Head of Old River Scour Hole
    - Fish Passage on Deer Creek (a non-Project watershed)
    - Adult Straying Barrier on the Knights Landing Outfall Gate (a flood and drainage system)
- A "drought toolbox" to prioritize a proactive approach to drought planning, including early coordination with senior water right users
- Support for NMFS Steelhead Monitoring and Collaboration Activities with Non-Project Tributaries

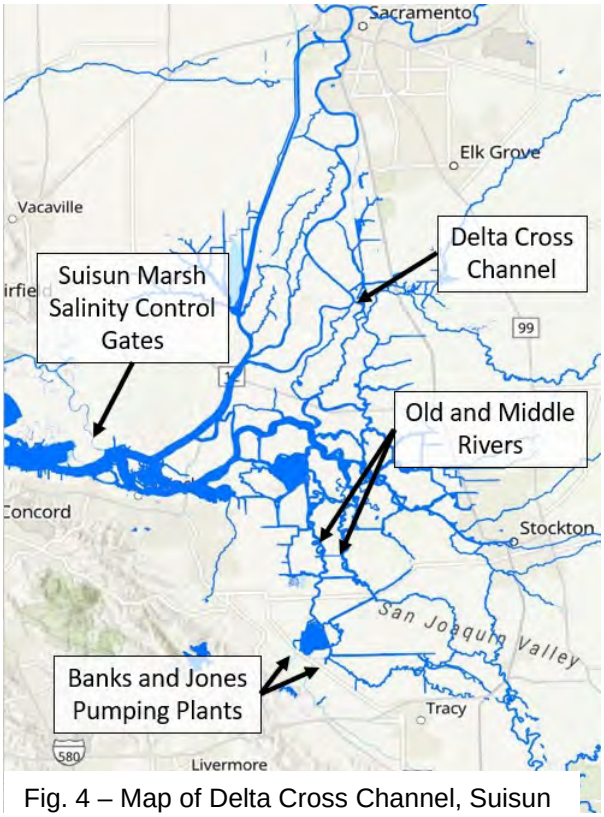

Fig. 4 – Map of Delta Cross Channel, Suisun Marsh Salinity Control Gates, Old and Middle Rivers, and the Banks and Jones Pumping Plants

- $14 million commitment to expedited implementation of the Battle Creek Restoration Project including reintroduction of winter-run Chinook salmon
- A conservation hatchery to support delta smelt and other imperiled fisheries in the wild
- A stronger commitment to actions maintaining low-salinity habitat in the Delta Smelt Summer-Fall Habitat Action with commitments regarding SMSCG operations and projects for other elements of habitat
- A commitment to sediment supplementation and food-web studies for the protection of delta smelt
- A commitment to oversight of the process by independent panels at four-year intervals (to allow sufficient time to develop new information) to review whether the proposed action is meeting expectations.

Most significantly, Reclamation and DWR have taken the lessons learned from 10 years of implementing both RPAs and have incorporated numerous components of the RPAs that are

either the same, or are new but similar to the previous RPA actions and are intended to provide a similar level of protection as current operations (see detailed chart attached to this summary[3]).

Additional Conservation Commitments

Fig. 5 – Reclamation is committing more than $15 million dollars to support listed species.

In July 2019, NMFS provided a draft conclusion that Reclamation and DWR's proposed operation of the CVP, as described in the January 2019 Biological Assessment, would likely jeopardize the continued existence of Sacramento River winter-run Chinook salmon, Central Valley spring-run Chinook salmon, California Central Valley steelhead and would adversely modify their critical habitats. The USFWS did not provide draft conclusions during the consultation process, but also expressed serious concerns about impacts to delta smelt and its habitat. In response, Reclamation and DWR made several additional significant commitments to support listed species:

Winter-run Chinook Salmon Reintroduction to Battle Creek: Reclamation is making a $14 million commitment to support the accelerated implementation of the Battle Creek Winter-run Chinook Salmon Reintroduction Plan and the Battle Creek Salmon and Steelhead Restoration Project, which is intended to reestablish approximately 42 miles of prime salmon and steelhead habitat on Battle Creek, and an additional six miles on its tributaries. The intent is to use fish passage construction and strategic reintroduction of Sacramento River winter-run Chinook salmon to expand spawning beyond its current range, which is limited to a single spawning population in the upper Sacramento River below Keswick Dam. Expanding the range of the winter-run Chinook salmon into vacant but historically occupied habitat like Battle Creek is one of NMFS' high-priority recovery actions for salmon in the Central Valley.

Reclamation's commitment of an additional $14 million in funding will cover the costs of construction, staffing, and acquisition to further implement the Plan.

Deer Creek Habitat/Fish Passage: Reclamation is also committing $1 million dollars to Deer Creek habitat and fish passage improvements. Deer Creek, along with Mill Creek and Butte Creek, supports high quality habitat for holding and spawning of one of three remaining self-sustaining Central Valley spring-run Chinook salmon populations. Deer Creek also provides spawning and rearing habitat for CCV steelhead. Reclamation's funding will support construction of a fishway to provide salmonids access to over 25 miles of prime upstream spawning. The action will also contribute to the recovery of CCV steelhead and Central Valley spring-run Chinook salmon.

[3] See Appendix A.

Knights Landing Outfall Gates Fish Exclusion Device Reconstruction: Improving fish passage for migrating fish is a critical need to help support recovery and returning adults are the most valuable life stage, having survived river, ocean, and harvest conditions. Reclamation is committing $680,000 to reconstruction of the Knights Landing Outfall Gate fish barrier to enable State cost share. Currently, large numbers of adult winter-run Chinook salmon get trapped in the Colusa Basin Drain and are unable to successfully spawn. If it were functioning properly, the fish barrier at the Knights Landing Outfall Gate would prevent migrating winter-run Chinook salmon from getting trapped in the Colusa Basin Drain.

Reclamation provided the majority of the construction funding for the first fish barrier, which collapsed in 2016. Because the fish barrier has been identified as a top priority for winter-run Chinook salmon needs, Reclamation has agreed to fund reconstructing and upgrading the fish barrier to improve fish passage and prevent future losses of adults straying into the Colusa Basin Drain.

Delta Smelt Supplementation: Reclamation will implement a two-phase program to supplement delta smelt in the wild. The first phase will involve using the existing UC Davis Fish Conservation and Culture Laboratory (FCCL). Reclamation and DWR are the primary funding sources for FCCL, which maintains the refugial population of delta smelt and generates additional captive-bred fish for research. The FCCL can produce new generations of fish at their facility with or without the addition of new wild spawners and keep enough progeny alive to repeat the process for multiple generations.

Reclamation will fund a process that will lead to supplementation of the wild delta smelt population with captive-bred fish from FCCL within 3-5 years. A supplementation strategy will be developed within one year of the issuance of the BiOp that will include details about the capacity needed at FCCL to accommodate production of delta smelt needed to meet genetic and other hatchery considerations with a goal of increasing production to a number and the life stages necessary to effectively augment the population. Additional funding will support expansion of the FCCL facilities to increase rearing capacity to provide up to approximately 125,000 adults within 3 years.

Fig. 6 (left) - U.C. Davis Fish Conservation and Culture Laboratory (UCD FCCL) near Tracy, CA at the SWP Skinner Delta Fish Protective Facility

Fig. 7 (right) - Dr. Tien-Cheih describes hatching Delta Smelt in the UCD FCCL.

For the second phase of supplementation, Reclamation will partner with DWR to construct and operate a conservation hatchery for delta smelt by 2030. The conservation hatchery would breed and propagate a stock of fish with equivalent genetic resources of the native stock and at sufficient quantities to effectively augment the existing wild population.

Water Infrastructure for the Nation Act

In addition to the ESA consultation requirements, Section 4004 of the Water Infrastructure Improvements for the Nation Act of 2016 requires the Secretaries of Interior and Commerce to ensure "that any public water agency that contracts for the delivery of water from the Central Valley Project or the State Water Project that so requests shall … receive a copy of any draft biological opinion and have the opportunity to review that document and provide comment to the consulting agency through the action agency, which comments will be afforded due consideration during the consultation." Reclamation accordingly provided sections of the draft USFWS BiOp to the public water agencies on April 12, 2019. Reclamation provided sections of both draft BiOps to the public water agencies on June 3 and July 31, 2019. Reclamation also provided the draft incidental take statements for both BiOps on August 28, 2019 to the public water agencies and additional organizations requesting the documents. These constituents provided written comments on these drafts, through Reclamation, which were afforded due consideration during the consultation.

Conclusion

The 2019 Reinitiation of Consultation on the Long Term Coordinated Operations of the Central Valley Project and State Water Project reflects the evolution of many initiatives and billions of dollars invested over the last several decades to improve the operation of the Projects for the benefit of delta smelt, salmon, steelhead, and other listed species. The Projects have been significantly shaped by ongoing disputes over the equally important—but sometimes competing—uses of water identified in the Central Valley Project Improvement Act as well as the directives of the ESA and other laws. The Central Valley and State Water Projects of 2019 and beyond are not the same Projects that NMFS and the USFWS first consulted on in the early 1990s. They have been transformed by these ongoing consultations, by litigation, and by the significant investments in science and monitoring that has occurred over the last thirty years.

While the disputes are often contentious, the Projects also stand out as a model for collaboration. Strong and ongoing partnerships among all the stakeholders have led to the development of an increased, although still imperfect, understanding of the relationships between the fish, Project operations, and the ongoing impacts on these imperiled species from a landscape that has been and continues to be impacted by humans.

The agencies have overhauled the system since NMFS and USFWS issued the first BiOps in 1993 and 1995, respectively. Substantial improvements are the result of operational changes,

such as alterations to system flows and the spill regimes at dams, as well as transportation of juvenile fish by truck to better their chances of survival. With these structural and operational changes, there have been significant benefits for salmonids in both juvenile survival numbers and adult returns. And yet, notwithstanding these changes to the Projects, populations of listed fish have declined, likely due to a combination of factors including historic operations of the Projects, and, particularly in the last two decades, drought and extreme drought conditions from 2007-2009 and 2012-2016, as well as low in-river survival and poor ocean productivity. With the end of the drought in 2016, the trend is toward improvement, at least for salmon and steelhead, but the agencies recognize the need for a cautious approach to avoid the impacts that occurred during the drought years. Implementation of a drought toolkit is designed to ensure that the agencies are vigilant and stay ahead of the curve in crafting responses to multi-year droughts.

Given all these factors, this consultation was challenging--not only because of the complexity of the Projects and their myriad operational aspects, the current status of the species and the multiple revisions to the proposed action--but because the Services concluded in their previous 2008 and 2009 Biological Opinions that RPAs were required to avoid findings of jeopardy and adverse modification, and Reclamation and DWR were working from a starting point of trying to craft a proposed action that met similar or better requirements. It must also be acknowledged that the current status of all these species continues to be imperiled, and that one of the objectives of the proposed action is to maximize the available supply of water for irrigation, municipal, and industrial deliveries.

Fig. 8-12 – New science considered in developing a Proposed Action considered a range of fish life stages across the CVP and SWP.

Further, there is uncertainty regarding the extent to which the fish were impacted by the droughts that occurred during the time frame covered by the previous BiOps versus Project operations, plus a need to maintain the precautionary approach to ensure that the Projects do not imperil the fish.

The Services expressed concerns that Reclamation and DWR's initial proposal fell short of the ESA's stringent requirements. NMFS's initial analysis identified significant adverse effects of the proposed action to Sacramento River winter-run Chinook salmon, Central Valley spring-run Chinook salmon, CCV steelhead, and Southern resident killer whales. The June peer review draft of the NMFS BiOp highlighted heightened risks to the listed species and their critical habitats, especially with respect to the proposed operations at Shasta Dam that were expected to result in high levels of temperature dependent egg mortality and egg-to-fry mortality; adverse effects to species related to routing into the interior and southern Delta at the Delta Cross Channel; loss of individuals at the State and Federal export facilities resulting from increased exports, particularly during spring months; and expected effects to San Joaquin Basin steelhead related to the discontinuance of the San Joaquin inflow to export ratio.

The initial draft also highlighted concerns regarding warm water temperatures affecting Central Valley spring-run Chinook salmon holding and spawning in Clear Creek; warm spring and summer water temperatures affecting spawning and rearing California Central Valley steelhead in the American River; hatchery management practices at the Nimbus Fish Hatchery affecting California Central Valley steelhead; temperature-related effects to California Central Valley steelhead in the Stanislaus River; and adverse effects to Southern Resident Killer Whales resulting from an expected reduction in their prey base (Chinook salmon). Likewise, the USFWS expressed concerns about the effects of the proposed action on delta smelt and its critical habitat. Specifically, the initial proposal for protective actions for larval and juvenile delta smelt likely was not similarly protective for early life stages as current operations. Additionally, the Summer Fall Habitat Action as initially proposed lacked certainty around how or when the action would be implemented.

The final BiOps are built on a comprehensive science assessment of the listed fish and on an evaluation of a proposed action that has been substantially revised since the initial proposed action incorporated in the January 2019 Biological Assessment. The NMFS Biop explains that implementation of the long-term coordinated operation of the CVP and SWP will result in certain adverse effects to listed species and their critical habitats, and in some cases, such as the expected temperature dependent egg mortality levels for Sacramento River winter-run Chinook salmon that will occur in Tier 3 and 4 years, the adverse effects remain significant and will be subject to careful monitoring and evaluation. Although some actions, such as performance objectives to limit injury and mortality at pumping stations, have broad effects that benefit most of the listed species, other actions are tailored to the specific needs of a particular evolutionarily significant unit (ESU) (e.g., the Sacramento River winter-run Chinook salmon ESU in the case of Shasta Cold Water Pool management). Based on the analysis in the BiOp, NMFS has concluded that the proposed action is not likely to jeopardize the continued existence of

Sacramento River winter-run Chinook salmon, Central Valley spring-run Chinook salmon, California Central Valley steelhead, Southern Resident Killer Whales, or the Southern DPS of Green Sturgeon or destroy or adversely modify their designated critical habitat.

Likewise, the FWS also determined that implementation of the proposed action will result in adverse impacts to delta smelt and its habitat. Continued operation of the CVP and SWP under the proposed action will have impacts to delta smelt reproduction, numbers and distribution. However, Old and Middle River (OMR) Management actions and Additional Real-Time OMR Restrictions are designed to provide adult protections to minimize entrainment and are expected to provide conditions similar to current operations. In addition, a suite of protective OMR actions will generally keep OMR flow and turbidity within levels that are expected to be similarly protective of dispersing adult delta smelt as those that have occurred over the past decade. Reclamation also proposes to implement single-year loss thresholds for salmonids that FWS expects will contribute to maintaining conditions that are as protective for delta smelt adults as those that have been in place since 2009.

The intent of actions slated from December to March will be to minimize the effect of entrainment to adult delta smelt dispersing into the south Delta, which will minimize the number of entrained individuals and their progeny that are subjected to entrainment, poor habitat conditions and predation. The proposed larval and juvenile delta smelt protective action is intended to limit entrainment of this life stage to a level that will not exceed the threshold identified by USFWS life cycle models through real-time management. The Summer-Fall Habitat Action relies on a yearly structured decision-making process that may change the outcomes, including habitat quality and availability through the rearing season for juvenile delta smelt. Maintaining X2 at 80 km provides substantially more rearing habitat than maintaining X2 at 81 km (Service 2017). Reclamation and DWR will maintain X2 at a monthly average 80 km in September and October of Wet and Above Normal years which will provide suitable rearing habitat for juvenile delta smelt in Honker and Grizzly bays. Additionally, Reclamation and DWR propose to operate the SMSCG for up to 60 additional days in the summer and fall of Below Normal and Above Normal years and in Wet years when there is evidence of benefits. Reclamation and DWR also propose to implement several food subsidy actions to address deficiencies in the food web. Based on the analysis in the USFWS BiOp, the USFWS has concluded that the proposed action is not likely to jeopardize the continued existence of delta smelt or destroy or adversely modify its designated critical habitat.

The analysis in the BiOps began with a careful look at the effects of the proposed action on each of the individual populations, examined the results for each of the major population groups, and finally determined the overall effect for each species. In order to make a finding of no jeopardy and no destruction or adverse modification, the Services asked Reclamation and DWR to make meaningful changes to the proposed action to address those effects. The culmination of several months of consultation, incorporating input from the expert peer reviewers and the public water agencies, is a proposed action that NMFS and USFWS reasonably concluded commits to actions

that benefit the species, and is not likely to jeopardize delta smelt, salmon, steelhead and Southern resident killer whale, as well as several other listed species, or adversely modify critical habitat.

The detailed outcomes of the analyses for each species including current status and recent trends, limiting factors and the aggregated effects of the status of the species, environmental baseline, cumulative effects, and effects of the proposed action and species conclusions are found in the accompanying NMFS and USFWS BiOps. The purpose of this summary is to provide a general overview of the consultation process and development of the proposed action as evaluated the Services' BiOps.

This summary is not intended to interpret or change the Biological Assessment, or NMFS and USFWS BiOps in any way, and if there are any inconsistencies between this summary and the BiOps, the latter controls. Only the NMFS and USFWS 2019 Biological Opinions on Long-term Operation of the Central Valley Project and State Water Project constitute the final decisions of NMFS and USFWS and are the legal documents required by the Endangered Species Act, Section 7(b). Additionally, Reclamation is continuing to evaluate the proposed action and other alternatives pursuant to NEPA. If the proposed action is modified through the NEPA process, Reclamation will reinitiate consultation on the modified proposed action as appropriate.

Appendix A

2008 and 2009 RPA Addressed Concern	2019 Proposed Action
Shasta Cold Water Pool Shasta Dam water operations result in elevated water temperatures that have lethal and sublethal effects on egg incubation and juvenile rearing in the upper Sacramento River. Operational cause is lack of sufficient cold water in storage to allow for cold water releases to reduce downstream temperatures at critical times and meet other project demands. The 2009 RPA had a year-round storage and temperature management program for Shasta Reservoir and the Upper Sacramento River.	***Shasta Cold Water Pool*** Proposed action includes actions to build Shasta Reservoir storage in the fall and winter months and manage to a sustainable plan throughout the summer months. Efforts to explicitly build storage primarily include fall and winter refill and redd maintenance actions. Other actions which are likely to result in higher storage from historical include a modification to sharing responsibility under the Central Valley Project/State Water Project Coordinated Operation Agreement, reduced fall outflow and salinity targets in wet years and increased flexibility on summer releases for exports resulting from increased spring exports. The Shasta Cold Water Pool Management Plan addresses temperature goals with commitments to operate to the lowest tier possible, to stay within a tier once selected on May 1st and to coordinate temperature plans through the Sacramento River Temperature Task Group. Tier 3 and Tier 4 actions include intervention measures to reduce risks in drier/lower storage years and will be developed through collaboration with NMFS and others. The proposed action also includes a commitment to biological performance metrics and independent review process to evaluate performance and highlight areas for improvement.
Clear Creek Flows In Clear Creek, recent project operations have led to increased abundance of CV spring-run Chinook salmon, which is an essential population for the short-term and long-term survival of the species. The 2009 RPA ensures that essential flows and temperatures for holding, egg incubation and juvenile survival will be maintained.	***Clear Creek Flows*** Updated flow schedule for Clear Creek including pulse flows and channel mobilization flows with higher base flow of 200 cfs October 1 through May 31, 150 cfs from June to September in all except critical years. Commitment to temperature targets identified in the 2009 RPA and use of flow to meet targets in the late fall with acknowledgement that late summer/early fall temperatures cannot always be met and will be coordinated through the relevant technical group. Commitment to pulse flows and gravel movement to meet the intent of previous 2009 RPA actions.

Red Bluff Diversion Dam Red Bluff Diversion Dam on the Sacramento River impedes both upstream migration of adult fish to spawning habitat and downstream migration of juveniles. The 2009 RPA mandates gate openings at critical times in the short term while an alternative pumping plant is built, and by 2012, the opening of the gates all year.	***Red Bluff Diversion Dam*** Red Bluff Diversion Dam is no longer operational, and gates remain open year-round.
Juvenile Rearing Habitat Both project and non-project effects have led to a significant reduction in necessary juvenile rearing habitat in the Sacramento River Basin and Delta. The project's flood control operations result in adverse effects through reduced frequency and magnitude of inundation of rearing habitat. The 2009 RPA contains both short-term and long-term actions for improving juvenile rearing habitat in the Lower Sacramento River and northern Delta.	***Juvenile Rearing Habitat*** Delta outflow to meet D-1641 requirements; Suisun Marsh Salinity Control Gate operation for up to 60 additional days between June 1 and October 31, depending on year type; increased Delta outflow in wet and above normal year types in certain conditions. Old and Middle River Reverse flows based on species distribution, modeling, and risk analysis with provisions for capturing storm flows The proposed action includes implementation of the Yolo Bypass Salmonid Habitat Restoration and Fish Passage Project. Between 2017 and 2019, completion of the Wallace Weir Fish Collection Facility, Fremont Weir Adult Fish Passage Project, and Agricultural Crossings have alleviated adult salmon straying and delays. Signature of the Record of Decision in September 2019 and financing of the Yolo Bypass Salmonid Habitat Restoration and Fish Passage Project will provide necessary juvenile salmonid rearing habitat in the Lower Sacramento River and northern Delta as soon as 2021.
Delta Cross Channel Gates Another major effect of water operations is diversion of out-migrating juveniles from the north Delta tributaries into the interior Delta through the open Delta Cross Channel gates. The 2009 RPA mandates additional gate closures to minimize these adverse effects to winter-run, spring-run, and steelhead.	***Delta Cross Channel Gates*** Delta Cross Channel gates operation based on real-time information to close gates to protect fish and operations to avoid exceeding D-1641 water quality standards. Delta Cross Channel gate operations consistent with 2009 RPA except allowing for temporary openings to avoid D-1641 water quality exceedances rather than waiting for an actual exceedance before opening. Proposed action includes a commitment to reduce pumping to minimum health and safety levels before opening for avoiding a water quality exceedance from December 1 to January 31

Old and Middle River Flows Water pumping causes reverse flows, leading to loss of juveniles migrating out from the Sacramento River system in the interior Delta and more juveniles being exposed to the State and Federal pumps, where they are salvaged at the facilities. The 2009 RPA prescribes Old and Middle River flow levels and pumping restriction in April and May based on water year type and flows at Vernalis to reduce the number of juveniles exposed to the export facilities and prescribes additional measures at the facilities themselves to increase survival of fish.	***Old and Middle River Flows*** The proposed action makes a commitment to stay within the Delta pumping-related loss experienced under the 2009 RPA. Old and Middle River Reverse flows will be limited based on timing (no greater than -5,000 cfs Jan-Jun); water quality conditions (short term protections for first flush events); storm event flexibility (can increase beyond -5,000 cfs if there is not a risk to the species); observed annual salvage and loss (specific triggers for loss values similar to those seen under the 2009 RPA); cumulative loss and outcomes from independent review panels. Skinner Fish Facility Improvements: DWR would continue implementation of projects to reduce mortality of ESA-listed fish species. These measures that would be implemented include: (a) electro-shocking and relocating predators; (b) controlling aquatic weeds; (c) developing a fishing incentives or reward program for predators; and (d) operational changes when listed species are present.
San Joaquin River Restoration Program Flows Juvenile steelhead migrating out from the San Joaquin River Basin have a particularly high rate of loss due to both project and non-project related stressors. The 2009 RPA mandates additional measures to improve survival of San Joaquin steelhead smolts, including both increased San Joaquin River flows and export curtailments. Given the uncertainty of the relationship between flow and exports, the 2009 RPA also prescribes a significant new study of acoustic tagged fish in the San Joaquin Basin to evaluate the effectiveness of the 2009 RPA and refine it over the lifetime of the project.	***San Joaquin River Restoration Program Flows*** See Old and Middle River action description above. Salvage and loss threshold for steelhead divided into two time periods to protect San Joaquin steelhead that have a different emigration timing from other CV basin steelhead. The proposed action includes actions reducing project and non-project related effects such as predator hot spots in the South Delta, Stanislaus River outmigration flows, and specific performance objectives for juvenile steelhead loss, which may be modified to reflect updated population status information after four years. The proposed action includes significant new science investigations to develop this population status information for both CVP and non-CVP tributaries in the San Joaquin basin.

Temperature Management On the American River, project-related effects on steelhead are pronounced due to the inability to consistently provide suitable temperatures for various life stages and flow-related effects caused by operations. The 2009 RPA prescribes a flow management standard, a temperature management plan, additional technological fixes to temperature control structures, and, in the long term, a passage at Nimbus and Folsom Dams to restore steelhead to native habitat.	***Temperature Management*** The proposed action is consistent with the approach under the 2009 RPA with a modified flow management standard that targets preserving coldwater pool in the drier years to improve temperature management and reduce the magnitude and frequency of the high temperatures seen under the 2013-2016 drought. A commitment to modify the shutters in drought conditions is also included to improve temperature management.
Revised Flow Schedule On the Stanislaus River, project operations have led to significant degradation of floodplain and rearing habitat for steelhead. Low flows also distort cues associated with out-migration. The 2009 RPA proposes a year-round flow regime necessary to minimize project effects to each life-stage of steelhead, including new spring flows that will support rearing habitat formation and inundation, and will create pulses that cue out-migration.	***Revised Flow Schedule*** The proposed action is similar to the approach under the 2009 RPA with a revised flow schedule (Stepped Release Plan) for above normal and wet water year types that decreases minimum flows to target higher storage levels for addressing temperature concerns. Higher storage levels also increase the frequency of flood control releases to address the need for high geomorphic flow releases. The proposed action also changes water year type definitions to focus solely on hydrology rather than hydrology plus storage levels.
Hatchery and Genetic Management Plan Nimbus Fish Hatchery steelhead program contributes to both loss of genetic diversity and mixing of natural origin and hatchery stocks of steelhead, which reduces the viability of natural origin stocks. The Nimbus and Trinity River Hatchery programs for non-listed Fall-run Chinook also contribute to a loss of genetic diversity, and therefore, viability, for Fall-run. The 2009 RPA requires development of Hatchery Genetics Management Plans and genetic studies at Nimbus to improve genetic diversity of both steelhead and fall-run Chinook, an essential prey base of Southern Resident Killer Whale.	***Hatchery and Genetic Management Plan*** The proposed action is consistent with the 2009 RPA by including a commitment to complete a Hatchery and Genetic Management Plan and additional specificity on the goals of the HGMP.

Controlled OMR Flows Reduce entrainment of pre-spawning adults by controlling OMR flows during period of elevated entrainment risk.	***Controlled OMR Flows*** The proposed action is consistent with Action 1 of the 2008 RPA by providing for integrated early winter pulse protection which requires reducing exports for 14 consecutive days so that the 14-day averaged OMR index for the period shall not be more negative than -2,000 cfs, in response to "First Flush" conditions in the Delta. In addition, once OMR management begins, Reclamation and DWR will operate to an OMR index no more negative than a 14-day moving average of -5000 cfs, unless a storm event occurs, until that point in which OMR management ends in a season (when temperatures in south Delta become lethal or June 30, whichever is earlier). The Integrated Early Winter Pulse Protection action may occur more frequently than Action 1 in the 2008 RPA, providing equal or greater protection. The Turbidity Bridge Avoidance action in the proposed action is structured to manage Old and Middle River turbidity in a way that is protective of adults during the spawning period, and is also protective of larvae and juveniles, by reducing the likelihood of spawning in areas that will not contribute to the population. This action provides that OMR will be held at no more negative than -2000 cfs for up to 5 consecutive days to reduce turbidity in Old and Middle rivers, and longer should Reclamation and DWR determine it appropriate. Otherwise, OMR will be operated at no more negative than -5000 cfs. For these reasons, we expect this action will provide equivalent or greater protection than Action 2 in the 2008 RPA.
Implementing Life Cycle Models Limit entrainment of larval and juvenile delta smelt by reducing net negative flow conditions in the central and south Delta	***Implementing Life Cycle Models*** Under the proposed action, Reclamation and DWR will operate during this time period at no more negative than -5000 cfs. Additionally, Reclamation and DWR will use results of USFWS-approved life cycle models to determine how a range of OMR values affects larval and juvenile delta smelt entrainment risk. These models will be publicly-vetted and peer reviewed prior to March 15, 2020. The USFWS will work with Reclamation and DWR to determine how best to operationalize the life cycle model results, taking into account consideration of real-time spatial distribution of delta smelt and operational actions described in the proposed action. During the period of larval/juvenile protection, Reclamation and DWR will also be implementing operations consistent with the single-year loss thresholds to protect salmonids described in the proposed action. These protections are expected to provide equivalent or better protection to Action 3 in the 2008 RPA.

Suisun Marsh Improve fall habitat conditions for delta smelt by increasing Delta outflow during fall of Wet and Above Normal Years	***Suisun Marsh*** Under the proposed action, Reclamation and DWR will undertake a series of actions to provide low-salinity habitat in Honker and Grizzly bays and Suisun Marsh in Above Normal and Wet years and increase the frequency of low-salinity habitat in Suisun Marsh in Below Normal years. Additionally, food enhancement actions, described at a programmatic level at this time, may provide better feeding conditions for delta smelt in Suisun Marsh and Cache Slough Complex. In sum, these management intervention actions are anticipated to increase the frequency of years that suitable habitat conditions are available to the delta smelt population.
Delta Smelt Habitat Restoration Restore a minimum of 8000 acres of habitat in the Delta and Suisun Marsh	***Delta Smelt Habitat Restoration*** The proposed action includes completion of 8000 acres of habitat restoration for delta smelt, with the goal of providing food web benefits to delta smelt in the North Delta Arc. Momentum has been building and is expected to continue to fulfill this important measure.
Monitoring and Reporting Monitoring and Reporting	***Monitoring and Reporting*** The PA includes continued monitoring and reporting.