2.2.5 Increasing Salvage Efficiency

Reclamation and DWR work to improve the efficiency of salvage operations at the Tracy Fish Facility and the Skinner Fish Facilities. Listed species are salvaged at both Jones and Banks and trucked to the Delta for release.

The following sections describe the existing requirements related to salvage, current science at both the SWP and CVP facilities which has occurred as part of meeting the current RPA requirements, and then proposes actions to address salvage efficiency with the current best available science.

2.2.5.1 Existing Requirement

- 2009 NMFS BO Action IV.4.1

Action IV.4.1 has the objective of implementing specific measures to reduce pre-screen loss and improve screening efficiency at Federal facilities. "Reclamation shall undertake the following actions at the Tracy Fish Collection Facility to reduce pre-screen loss and improve screening efficiency: … By December 31, 2012, improve the whole facility efficiency for the salvage of Chinook salmon, CV steelhead, and Southern DPS of green sturgeon so that overall survival is greater than 75 percent for each species. …"

2.2.5.2 Current Science

DWR is currently implementing several interim measures to address predation in Clifton Court Forebay, including electrofishing in Clifton Court, weed removal around Clifton Court, dredging (https://www.water.ca.gov/Programs/Bay-Delta/Bay-Delta-Environmental-Compliance/Clifton-Court-Forebay-Dredging-In-Depth-Study), and a predatory fish removal study planned to start in 2018. DWR is also working on predator bioenergetics modeling to inform Clifton Court predation (https://www.water.ca.gov/Programs/Bay-Delta/Bay-Delta-Environmental-Compliance/Clifton-Court-Forebay-Predation-Study).

DWR conducted an electrofishing study from 2016 – 2018 to evaluate removal of predators from Clifton Court Forebay (https://www.water.ca.gov/Programs/Bay-Delta/Bay-Delta-Environmental-Compliance/Clifton-Court-Forebay-Predator-Reduction-Alternative---Electrofishing). It found that most of the predators in Clifton Court were smaller than the size allowed to be kept for fishing by the Department of Fish and Wildlife. As part of this study DWR removed approximately 7,000 pounds of predators from Clifton Court in 2017, and approximately 12,000 striped bass. Predators re-populate Clifton Court through the radial gates after removal efforts. These studies have also found:

- Neither increasing the bag limit for fishing nor building a fishing pier would help remove predators from Clifton Court as most of the predators are smaller than the DFW size limit.
- High pumping rates at the State Water Project improves survival when the radial gates are open

At the federal Tracy Fish Collection Facility, the Tracy Fish Facility Improvement Program has continued to conduct scientific studies to improve the efficiency of the federal salvage facility to assist in meeting RPA Action IV.4.1. Most predation occurs before fish enter the holding tanks, and after fish are released into the Delta (Don Portz, personal communication). Based on 2009-2010 acoustic tag information, most fish in the Old River that survived to the end of the Delta had been salvaged from the federal water export facility on the Old River and trucked around the remainder of the Delta. (Buchanan, 2013).

- "In general, across both species tested, there tends to be an increase in facility efficiency as the number of Jones Pumping Plant (JPP) pumps in operation increase from 1 to 5, which suggests low pumping conditions may be more detrimental to salvage of Chinook salmon and steelhead. However, most statistical relationships suggesting improvements to salvage with increased pumping were weak due to low sample size, high variability, and the high number of fish that were assigned an unknown fate." (Karp, 2017: https://www.usbr.gov/mp/TFFIP/docs/tracy-reports/ttb-2017-1-juvenile-chinook.pdf)
- "The TFCF has some inefficiencies including predation, louver losses, and trash rack delay. Several observations noted here (residency of striped bass in the primary channel, departure of striped bass from the channel upstream of the trash rack, high rate of predation upstream of and within the facility, and delay of many of the salvaged experimental salmonids by the trash rack, over 75%), suggests opening the trash rack (either by removing panels or adding space between adjacent slats) in the spring when striped bass become migratory, would allow "resident" striped bass to move upstream and leave, and allow entrained fish an easier path to the fish diversion/collection system." (Karp, 2017: https://www.usbr.gov/mp/TFFIP/docs/tracy-reports/ttb-2017-1-juvenile-chinook.pdf)
- "The survival of juvenile Chinook Salmon through the lower San Joaquin River and Sacramento–San Joaquin River Delta in California was estimated using acoustic tags in the spring of 2009 and 2010. The focus was on route use and survival within two major routes through the Delta: the San Joaquin River, which skirts most of the interior Delta to the east, and the Old River, a distributary of the San Joaquin River leading to federal and state water export facilities that pump water out of the Delta. Survival through the southern (i.e., upstream) portion of the Delta was very low in 2009, estimated at 0.06, and there was no significant difference between the Old River and San Joaquin River routes. Estimated survival through the Southern Delta was considerably higher in 2010 (0.56), being higher in the Old River route than in the San Joaquin route. Total estimated survival through the entire Delta (estimated only in 2010) was low (0.05); again, survival was higher through the Old River. Most fish in the Old River that survived to the end of the Delta had been salvaged from the federal water export facility on the Old River and trucked around the remainder of the Delta." (Buchanan, 2013)
- "Results suggest predators are typically distributed evenly amongst all secondary channel components, and their biomass in the secondary channel is above what is typically observed in natural settings. Predators re-colonized the secondary channel within seven days, and, typically, more than one removal effort was necessary to assure the majority of predators were removed. The bioenergetics model indicates predators may have consumed nearly 14,000 fish over the modeled year. However, predator

consumption would have been < 0.2 percent of total salvageable fish at the TFCF." "Results of our bioenergetics model suggest that predators in the secondary channel and bypass tubes at the TFCF have a minimal impact on total salvageable fishes." "Re-colonization data suggests, on average, the majority of catfish and striped bass re-colonized in the secondary channel within 4 days after a predator removal. Therefore, as mandated by the most recent NMFS Biological Opinion, we recommend that, at a minimum, single effort predator removals be completed on a weekly basis when species of concern are present at the TFCF to minimize effects of predators on salvageable fish." (Sutphin, 2014: https://www.usbr.gov/mp//TFFIP/docs/tracy-reports/tracy-rpt-vol-51-predatory-fishes-in-tfcf-system.pdf)

- On average (± 95% confidence interval [CI]), striped bass residence time was 75.4 ± 30.6 d (range = 0.01–289.7 d). Prolonged striped bass residence time suggests velocities in the primary channel, bypass tubes, and secondary channel are not fast enough to guide striped bass into holding tanks; therefore, in order to remove these fish and reduce residence time within the facility, predator removal techniques should be further investigated, refined, and implemented at the TFCF. Results of this study suggest future predator removal efforts should be concentrated in the upper primary channel and secondary channel, which were the areas of the facility where the majority of acoustic detections occurred. (Wu, 2014: https://www.usbr.gov/mp//TFFIP/docs/tracy-reports/tracy-rpt-vol-46-use-of-acoustic.pdf)

Buchanan, R.A., J.R Skalski, P.L. Brandes, and A. Fuller. 2013. Route use and survival of juvenile Chinook salmon through the San Joaquin River delta. North American Journal Fisheries Management, 33(1): 216–229.