

Appendix A

California Department of Fish and Game Pulse Flow Monitoring Study Plan

Chinook salmon (*Oncorhynchus tshawytscha*) straying between rivers has been a concern for several years. Coded wire tag (CWT) data is regularly collected and compared to determine straying rates, particularly in the Mokelumne River. East Bay Municipal Utility District (EBMUD) and the California Department of Fish and Game (DFG) will cooperatively develop a monitoring program to evaluate reduction of Mokelumne River fall-run Chinook salmon straying and cooperate with Reclamation to further refine water quality modeling utilized for managing Delta Cross Channel (DCC) closures for Mokelumne River fall-run Chinook salmon escapement. EBMUD and DFG will conduct an analysis of the fish migration response based on fish passage at Woodbridge Dam, detection histories of acoustically tagged fall-run Chinook salmon, and CWT data from inland recoveries. Daily passage is recorded on digital video camera in the Woodbridge Dam fish ladder. The number of adipose fin clipped fish will also be recorded, but biological samples will not be collected at Woodbridge.

DFG will implement an acoustic tagging study. DFG will tag up to 30 adult Chinook salmon of hatchery origin (adipose fin clipped) with Vemco V13 acoustic transmitters and Floy-anchor tags in the Forks of the Mokelumne River downstream of the DCC facility. Tagging sites will include: Jersey Point, on the San Joaquin River, (river km (rkm) 95) 38°02'53.333"N, 121°41'56.18"W; and an alternate tagging site at Santa Clara Shoals on the San Joaquin River (rkm 103) 38°05'24.43"N, 121°38'22.86"W. Capture in this reach will provide a higher likelihood that salmon are of Mokelumne River hatchery origin. Tagging locations were chosen so that tagged fish still would have the potential to continue up the San Joaquin River to the Mokelumne River, or travel downstream to the Sacramento river or other routes such as 3 Mile Slough or Georgiana Slough, which may take them through the DCC. Fish will be tagged and released prior to, during, and after pulse flows and DCC gate closures.

Salmon will be captured using a drifted commercial gill net (200 feet x 12 feet, 5-7 inch stretch nylon mesh) or a trammel net (200 feet x 10 feet, 6 inch stretch nylon mesh). Once captured, salmon will be removed from the net, brought aboard a boat and placed in an aerated 150 gallon holding tank filled with ambient river water. Injured fish or fish that exhibit extensive stress from handling will not be tagged, but allowed to recover in the holding tank prior to release. Prior to tagging, fish will be inspected for the presence/absence of an adipose fin to

ascertain if it is a hatchery origin or “wild” fish. Non-adipose fin clipped fish without acoustic tags will be Floy-anchor tagged to gather information on recaptures of these fish from anglers or hatchery personnel and immediately released back into the river.

If the adipose fin is missing, which indicates it should have a CWT, the salmon will be scanned with a portable “tag wand” to verify presence of a CWT and tagged. If an adipose fin clipped fish does not have a verified CWT, it will be Floy-anchor tagged to designate its status, and then released. Fish with a CWT will receive both an internal ultrasonic transmitter and an external Floy-anchor tag. The ultrasonic transmitter will be placed via the esophagus and into the gastric cavity using a pill dispenser device, commonly used on livestock. External Floy-anchor tags will be sequentially numbered and have contact information to gather information from fish taken by anglers and recovered at hatcheries. Successfully tagged fish will be released approximately 0.8 kilometers (km) upstream from the tagging site. CWT information from tagged fish will be recovered at hatcheries. By placing a Floy-anchor tag on acoustic tagged salmon, hatchery personnel will be alerted to the presence of the acoustic tag and will recover the acoustic tag and CWT tag together. Along with the location where the fish was tagged, staff can correlate the route taken, origin of the fish and where the fish returned and determine if it strayed or returned to its natal stream. Acoustic information may tell us if the salmon used the DCC gates and if it was during, before, or after the pulse flow. During tagging, fish will also be assessed for tagging suitability and data will be collected regarding overall condition and specific conditions, including presence of sea lice and color.

Previous acoustic tagging studies have noted that some tagged adult salmon can exhibit milling behavior and move throughout the system for several days before moving to their spawning grounds while others move quickly upstream shortly after tagging. Although there is uncertainty regarding how environmental factors affect fish movement, increase in flow events seem to trigger upstream migration. Movement of tagged Chinook salmon and their time in the system will be monitored through stationary Vemco VR2-W receivers located upstream and downstream of the DCC gates as well as in the Mokelumne River (Figure 1). As part of the telemetry study, travel times in the Mokelumne River’s tidal and nontidal sections will be compared during periods when the DCC is open and closed and when the pulse flow is occurring and river flows are at their baseline. Storm events, specifically drops in barometric pressure, could also be a factor influencing the pattern of upstream migration. Telemetry data may be used to see if there is a delay in adults’ movement due to weather.

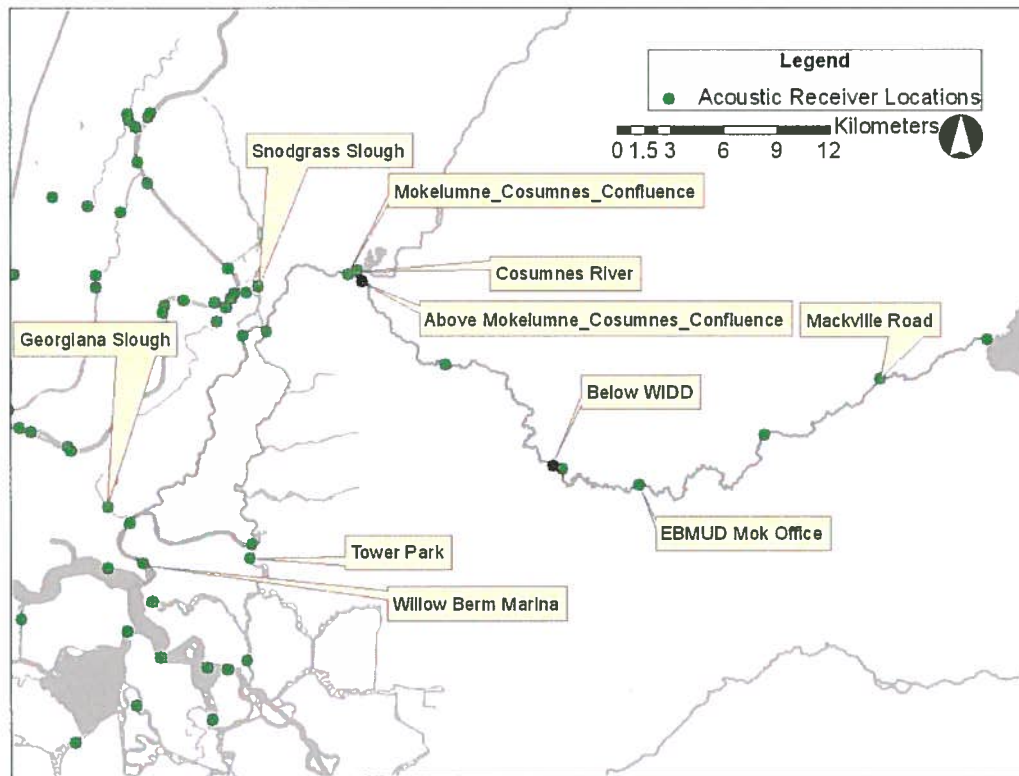


Figure 1. Acoustic Receiver Locations

Monitoring will evaluate the multiple factors that can influence straying, including but not limited to, tributary flow operations, Delta water management operations (including operation of the DCC), temperature, and planting practices for hatchery fingerlings and smolts. Straying rates will be determined by the recovery of CWTs in Central Valley river carcass surveys and hatchery returns. In addition to increased CWT tagging rates through the Constant Fractional Marking Program (CFM), EBMUD and DFG increased tagging rates of brood year (BY) 2008 and 2009 Chinook salmon production from the Mokelumne River Hatchery to 100%. Through tagging 100% of the production the amount of return data will be increased fourfold and allow for improved accuracy of all CWT recovery based indices, including straying percentages. The recovery data will include three brood years (two, three and four-year-old fish) of CWT Chinook salmon released at various locations from the Mokelumne River Fish Hatchery. These data will be used to focus the straying rate analysis to only evaluate straying rates of Mokelumne origin fall-run Chinook salmon to other Central Valley rivers and hatcheries. Annual results of the DCC closure, Mokelumne

River pulse flow, and stray rates will be summarized in annual investigation reports within 18 months of the DCC closure.