

Install Behavioral barriers at Head of Old River, Delta Cross Channel, Georgiana Slough, or 3-Mile Slough.

Resources Area: Biological Resources; Aquatic Resources, AR-A-5

Related Options: WS-FL-4, AR-A-4, AR-A-6, AR-D-6.

Resource Issue: Chinook salmon and steelhead rainbow trout are the principal salmonids using the Estuary. There are four distinct salmon runs in the Sacramento system that are named for the season of their upstream migration: spring, fall, late fall, and winter. Today, fall run are the principal run found in the Sacramento and the only run found in the San Joaquin drainage. About 80 percent of all four runs of the Central Valley chinook are produced in the Sacramento River basin. Typically, over 90 percent of all Central Valley spawners are fall run fish. Traditional indices of salmon populations suggest that most runs of Chinook salmon in the Estuary and its watershed have declined significantly in recent years, with little evidence suggesting near-term improvement.

Some of the water flowing down the Sacramento River splits and flows into the lower San Joaquin River through two natural channels, Georgiana Slough and Threemile Slough, and a constructed channel, the Delta Cross Channel. Water flowing down the San Joaquin is also influenced by the project facilities in the south Delta to flow into the central and south Delta through several channels. Salmon follow the water during both their downstream and upstream migration. Thus, the transport of the fish along the Sacramento and /or San Joaquin River is interrupted by flow patterns taking place within the Delta. It is generally accepted that diversion of salmon from the Sacramento River and San Joaquin River decreases their survival, both by making them more vulnerable to direct and indirect effects of SWP/CVP facilities in the southern Delta and exposing them to other adverse conditions, such as elevated temperatures, more predators, and more agricultural diversions. Mortality of outmigrating salmon entering the Delta through the Delta Cross Channel and Georgiana Slough is estimated to be twice that of smolts remaining in the Sacramento's main stem.

Reverse flows, which occur when total upstream flow exceeds downstream flow as a partial consequence of the influence exerted by operation of the project pumps, tend to move fish in the Delta and their food supply toward the pumps rather than toward the Bay and ocean. With current project operations, net flow reversals occur essentially all the time now in Old and Middle Rivers, about one half to three-fourths of the time in the lower San Joaquin River in many years, and frequently in the San Joaquin River from Middle River to the head of Old River below Mossdale. The specific effects of reverse flow are compounded with other factors, particularly the magnitude of exports. Reverse flows may impede migration and have been theorized as one cause of mortality.

Discussion: The purpose of the proposed behavioral barriers is to prevent or reduce the movement of fish out of the Sacramento River into the central or southern Delta by discouraging the fish through underwater sound (acoustic arrays) or electrical barriers. Other potential behavioral barriers include the use of lights, air bubble curtains, and either floating or submerged guidance deflectors.

Objectives addressed: Biological Resources General and Specific 1, Water Supply Specific 1.

Aquatic resources experts will need to review migration, entrainment, and habitat impacts for fisheries.

Assumptions:

- Diversion of young fish from the Sacramento River and San Joaquin River decreases their survival, both by making them more vulnerable to direct and indirect effects of the State Water Project and Central Valley Project diversions in the southern Delta and exposing them to other adverse conditions, such as elevated water temperatures, predation and more agricultural diversions.
- Behavioral barrier do not influence water quality and water levels.

Key Feasibility Factors:

- Need to confirm diversion of fish is proportional to flow split.
- Need to confirm acoustic barriers are effective in modifying the path of migrating fish.
- Need to determine if there are any harmful effects on aquatic species.

Implementation Factors:

Most Likely Benefits:

- Increase in juvenile chinook salmon survival during emigration.
- No obstruction to recreational boater access as with physical barriers.
- No adverse effect on Delta hydraulics or water quality.

Other Benefits:

- Allow for greater periods when the Delta Cross Channel radial gates may remain open thereby providing recreational boater access and increased water supply availability to the central and south Delta.

Most Likely Negative Impacts:

- Habitat availability or suitability within the immediate vicinity of the behavioral barrier may be altered, affecting the behavior of resident fish and invertebrates.
- Audible discomfort to recreational boater or others using the area.

Other Negative Impacts:

- Acoustic barrier operations may affect recreation fishing success and the species composition and relative abundance of non-target organisms.

Possible Regulatory and Institutional Constraints:

- Corps 404 Permit
- CEQA
- CESA Sec. 2081 Permit
- Encroachment Permit
- FESA Incidental Take Permit
- NEPA
- DFG sec. 1600 Permit

References and Published Materials: Use Combined TAC Reference List.