

Old and Middle River (OMR) Flow Management in the NMFS BiOp

Old River and Middle River are the main channels in the south Delta (Figure 1), and they are naturally tidal. Central Valley Project (CVP) and State Water Project (SWP) exports modify not only the magnitude, but also the direction, of flow in channels of the south Delta. Absent CVP and SWP exports, both positive (downstream) and negative (upstream) flows would be expected to occur over the course of a day in those channels during ebb and flood tides, respectively, with a positive net daily flow. During much of the year, CVP and SWP exports result in a negative net daily flow (i.e., “reverse flow”) in portions of these channels, which leads to localized effects on salmonid survival (e.g., entrainment into and mortality at the export facilities themselves) and/or far-field effects on salmonid survival (e.g., disruption to migration cues or migration speed, which in turn may lead to increased mortality from predation or other stressors in the south Delta). OMR limits are included in the NMFS reasonable and prudent alternative RPA to limit the extent of reverse flows in Old and Middle River and minimize these effects on through-Delta survival of ESA-listed salmonids during rearing and outmigration (Table 1).

For an overview of recent science relevant to water project-related effects on hydrodynamics and salmonid migration and survival in the south Delta, NMFS recommends the comprehensive January 2017 report, “Effects of Water Project Operations on Juvenile Salmonid Migration and Survival in the South Delta” (2017 SST Report)¹. Written by the Salmonid Scoping Team (SST) convened by the Collaborative Adaptive Management Team (which included technical staff from multiple agencies and stakeholder groups), the report provides an overview of the findings and uncertainties related to salmonids and water operations in the South Delta. The 2017 SST Report identified a gap in linking hydrodynamics to fish behavior -- smaller scale, mechanism-oriented, studies may be necessary (as a complement to measures of through-Delta survival) to better understand how fish react to local conditions.

There is a variety of stressors affecting juvenile salmonids outmigrating through the Delta, captured well in a recent conceptual model from the 2017 SST Report (Figure 2). The SST report focused on exports, inflow, and barriers, since CAMT wanted the technical team to focus on the “management knobs” in the current RPA, but this conceptual model acknowledges the other drivers and stressors in the system, many of which likely interact with project operations.

¹ Available at: http://www.westcoast.fisheries.noaa.gov/central_valley/water_operations/OCAPreports.html

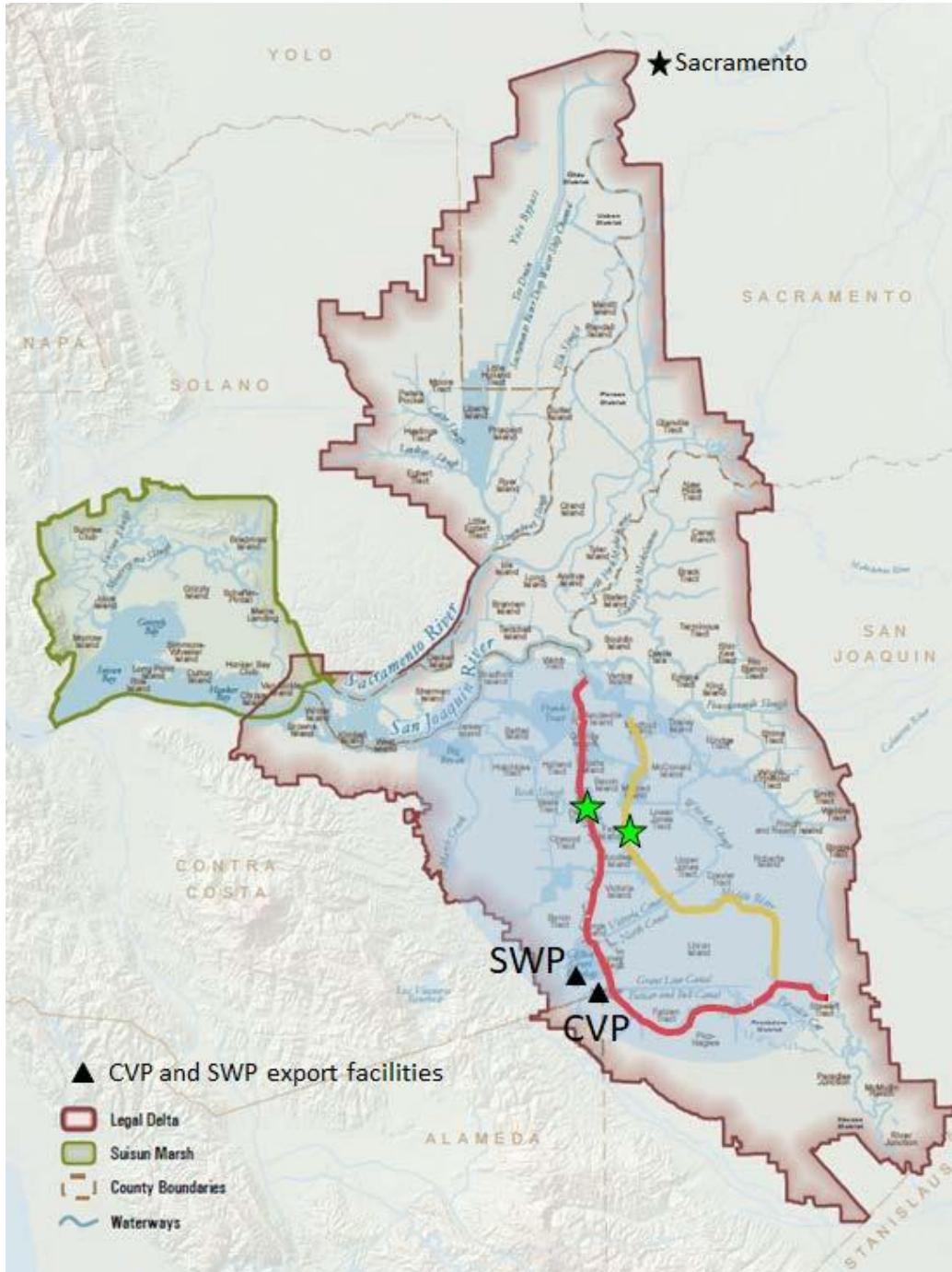


Figure 1: Map of the Sacramento-San Joaquin Delta (Delta) modified from Figure 1-1 of the Delta Plan². Old River (in red) and Middle River (in orange) are two of the key channels in the south Delta region (highlighted by the pale blue oval). Old River passes directly by the SWP export pumping facility (fronted by Clifton Court Forebay) and the CVP export facility. The green stars show the locations of the OMR gages on Old River and Middle River originally used to measure OMR flow (now estimated by an OMR Index).

² <http://deltacouncil.ca.gov/delta-plan-0>

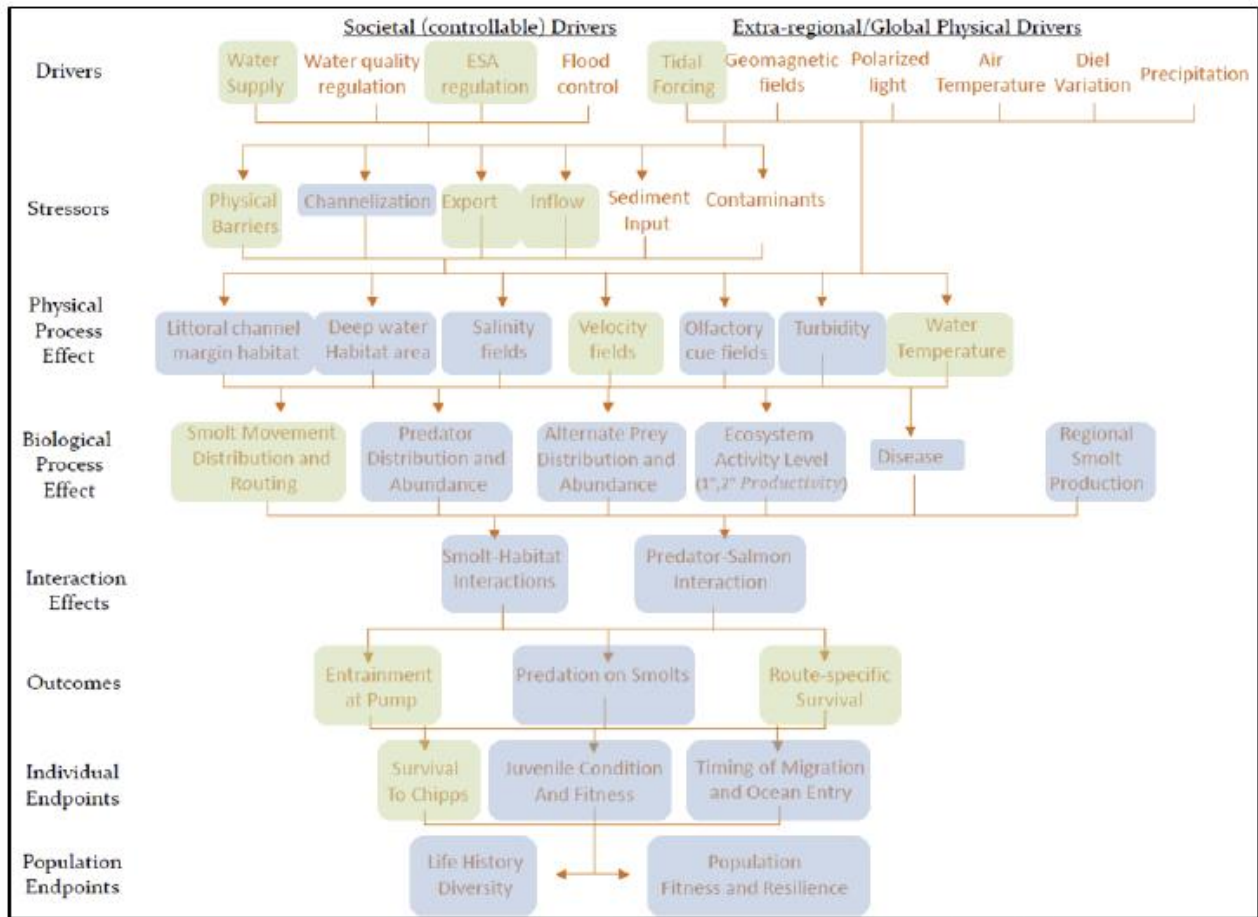


Figure 2: Conceptual model describing factors affecting survival of juvenile salmonids in the South Delta. Notes: Green highlights indicate model components included within the narrower scope of the SST report. Blue highlights indicate model components also potentially relevant to export effects and recommended by the SST for inclusion in an expanded research program (Excerpt of Figure 2-1 from p. 4 of the 2017 SST Report, Volume 1).

Table 1: Summary of species presence in the Delta (darker shading indicates greater abundance) and within-year timing and overlap of some key RPA actions in the FWS and NMFS BiOps, including OMR flow management.

		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Species presence in the Delta	Juvenile winter-run												
	Juvenile spring-run												
	Juvenile steelhead												
	Delta smelt												
		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
OMR management in FWS and NMFS BiOps	NMFS Action IV.2.3 (juvenile migration and entrainment)									June 15 or temperature offramp			
	FWS Action 1-A (adult migration and entrainment)			Dec 1-20									
	FWS Action 1-B (adult migration and entrainment)			After Dec 20									
	FWS Action 2 (adult migration and entrainment)			Follows Action 1									
	FWS Action 3 (larval entrainment)												
		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Other actions in NMFS BiOp	NMFS Action IV.1.2 (Delta Cross Channel operations)												
	NMFS Action IV.2.1 (I:E ratio)												
	NMFS Action IV.3 (Export management)												