

**SUMMARY OF THE EXPECTED BENEFITS TO SALMONID SURVIVAL OF A
ROCK BARRIER AT THE HEAD OF OLD RIVER & PREFERENTIAL USE OF THE
CENTRAL VALLEY PROJECT EXPORT FACILITY**

Rock Barrier at the head of Old River

NMFS concludes that a rock barrier at the head of Old River will increase the overall through-Delta survival of San Joaquin basin steelhead by directing both fish and flow into the mainstem San Joaquin River. The preponderance of empirical data (collected on juvenile Chinook salmon) shows that (1) survival in the mainstem San Joaquin River route is greater than the survival in Old River route, and (2) survival tends to increase as channel flow increases, especially in the mainstem San Joaquin River route. Survival relationships based on analysis of experiments using coded wire tagged juvenile Chinook salmon predict the following survivals for individuals migrating along the Old River route vs. the mainstem San Joaquin River route at different levels of flow.

Route-specific through-Delta survival* rates for juvenile salmonids			
		Old River route	Mainstem San Joaquin River route
Flow	1,500 cfs	9%	18%
	3,000 cfs	9%	19%
	6,000 cfs	9%	21%

** Through-Delta survival is measured from near the head of Old River to Jersey Point.*

Overall survival through the Delta shows a general decline since the late 1990s, from a high of 79% in 1995 to less than 20% since 2001, and less than 10% in recent years. Because the survival relationships used in our analysis were parameterized with a data set that includes the higher survival years, the absolute survivals are higher than would be expected during 2012. However, NMFS assumes that the proportional changes in survival in different routes and at different flows still hold.

While the gains in survival of 9-12 percent expected at flows that allow installation of a rock barrier might seem small, it is important to note that a combined increase in survival of 9% represents a *doubling* of the survival chances of an individual in the mainstem San Joaquin River route relative to the survival expected for an individual in the Old River route.

An adaptive range of Old and Middle River (OMR) flows is included in the plan for 2012 operations in order to manage risks for steelhead emigrating from the Calaveras River or Mokelumne River. Because NMFS does not have empirical information about the relative survival of Calaveras or Mokelumne river fish with and without the rock barrier, the effect of the rock barrier has greater uncertainty for these populations than for steelhead entering the Delta upstream of the head of Old River. Particle Tracking Models (PTM) and other tools will be used to screen alternative operational scenarios within the adaptive range of OMR flows specified in the settlement.

Preferential diversion of water through the Central Valley Project facility

Preferential diversion of water through the Central Valley Project (CVP) facility instead of the State Water Project (SWP) facility (without changing combined exports) will reduce the loss of juvenile salmonids at the export facilities by reducing exposure to predation in Clifton Court Forebay. The magnitude of the expected improvement in survival depends on two key factors: (1) the greater the fraction of water that is shifted from the SWP to the CVP in relation to total exports, the greater the survival gain; and (2) the greater the realized effectiveness of the CVP fish collection facility, the greater the survival gain. The table below uses the loss equations developed for Chinook salmon to estimate survival through the export facilities for two alternate scenarios for diverting 2,000 cfs of combined exports at three louver efficiencies. Compared to the even split of diversions that is typical of springtime operations, shifting some diversions to the CVP (shaded column) under these conditions increases the survival of fish encountering the export facilities by 3-11%..

CVP Louver efficiency*	Overall survival rate through the export facilities for combined exports of 2,000 cfs	
	<i>SWP: 1,000 cfs CVP: 1,000 cfs</i>	<i>SWP: 500 cfs CVP: 1,500 cfs</i>
78%	42%	53%
60%	35%	42%
35%	24%	27%

**The loss equations assume 78% as the nominal louver efficiency at both facilities, though realized louver efficiency at the CVP is expected to be lower due to inefficiencies in the louver cleaning process.*