NOAA FISHERIES
West Coast Region

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Onset of the January 1 Old and Middle River (OMR) management requirement in NMFS 2009 biological opinion on long-term operations of the Central Valley and State Water Project

Frequently Asked Questions

Every year on January 1st, the Reasonable and Prudent Alternative (RPA) in the NMFS 2009 biological opinion on the combined operations of the Central Valley Project (CVP) and State Water Project (SWP) imposes a -5,000 cubic feet per second (cfs) limit on the reverse flows in Old and Middle River in California's Central Valley. The following FAQ is designed to provide more details about the need for this specific RPA action.

Why does the 2009 NMFS biological opinion set a -5,000 cfs Old and Middle River (OMR) flow limit beginning January 1st?

Fish location and distribution in the Bay Delta are key considerations when looking at timing of acceptable levels of reverse flows in Old and Middle River. Entrainment of salmon into the Federal and State water project export facilities is more likely to increase when local fish densities are high.

The -5,000 cfs OMR flow management limit in the NMFS 2009 biological opinion on the combined operations of the CVP and SWP begins on January 1st because it is intended to protect the current emigrating juvenile year class of Sacramento River winter run Chinook salmon, the majority of which will likely be in the Delta at this time. Historic data across a wide range of year types (2001-2012[1]) indicate that in most years, 25 to 50 percent of juvenile winter run salmon have migrated past the Sacramento River Knights Landing rotary screw trap by January 1st. These fish will distribute themselves within the Delta and are expected to rear for 3 to 4 months before continuing their emigration to the ocean. During this time, they are vulnerable to entrainment at the Federal and State fish collection facilities and the influences of altered hydrodynamics in the Delta created by export actions.

Where are the juvenile salmonids now?

The following table provides the Delta Operations for Salmonids and Sturgeon technical team (DOSS) estimates of the distribution of salmonids in the Bay Delta through January 3, 2017. (In this table, "last

[1] See data summary at: http://www.westcoast.fisheries.noaa.gov/publications/Central_Valley/Water%20Operations/Delta%20Operations%20for%20Salmonids%20and%20Sturgeon/DOSS%20WY2015/nmfs_reaffirms_january_1st_onset_of_omr_flow_management.pdf

week" refers to distributions as of December 27, 2016, and "this week" refers to distributions as of January 3, 2017.)

DOSS Estimates of Fish Distribution

DOSS estimates of the current distribution of listed Chinook, as a percentage of the population, are based on recent monitoring data and historical migration timing patterns.

Location	Yet to Enter Delta (Upstream of Knights Landing)	In the Delta	Exited the Delta (Past Chipps Island)
Wild young-of-year (YOY) winter-run Chinook salmon	20% - 35% (Last week: 30% - 40%)	65% - 80% (Last week: 60% - 70%)	0% (Last week: same)
Wild young-of-year (YOY) spring-run Chinook salmon	55% - 70% (Last week: 60% - 75%)	30% - 45% (Last week: 25% - 40%)	0% (Last week: same)

Why is the limit -5,000 cfs OMR? Why aren't higher reverse flows allowed?

Loss of older juveniles at the CVP and SWP fish collection facilities increases sharply at Old and Middle River flows of approximately -5,000 cfs. For any given increase in OMR flows more negative than -5,000 cfs, there is a significant increase in the amount of fish that are 'lost' -- in other words, those that never make it out of the export facilities[2]. Beyond -5,000 cfs, loss increases at a faster and faster rate as OMR gets more negative. Particle tracking models (PTM) also demonstrate that particle entrainment increases as OMR flow becomes more negative.

Why pay attention to results from Particle Tracking Models (PTMs)? Fish are not particles.

It is true that juvenile salmonids do not strictly behave as particles. Rearing salmonids might not be moving much at all, migrating salmonids are likely moving through the Delta faster than particles and with more active behavioral responses to flow conditions. This point was made in the NMFS 2009 biological opinion, where it was acknowledged that although fish do not behave as "neutrally buoyant particles," the PTM model does describe the fate of particles in the same body of water that fish occupy. In this way, it is important not to look at PTM results in absolute terms, but they are a good indicator of relative changes, and may inform relative comparisons about potential levels of entrainment at two different flows.

Since the usefulness of PTMs is limited, are you doing anything to develop better decision support tools?

Yes. With support from the U.S. Bureau of Reclamation, the U.S. Fish and Wildlife Service, the California Department of Water Resources, and the California Department of Fish and Wildlife, we are actively working to develop new science and decision support tools. These tools will allow us to better understand fish distribution and behavior in the Delta and help us make more informed real-time operations decisions in the future.

[2] E.g., see figures 6-65 and 6-66 in NMFS' 2009 biological opinion, which depict observed monthly average OMR flows and monthly juvenile salmon loss (pages 361-362 of the 2009 Opinion, available at: http://www.westcoast.fisheries.noaa.gov/publications/Central_Valley/Water%20Operations/Operations,%20Criteria%20and%20Plan/nmfs_biological_and_conference_opinion_on_the_long-term_operations_of_the_cvp_and_swp.pdf.

These new tools include an enhanced particle tracking model, developed by NOAA's Southwest Fisheries Science Center, that better describes fish passage and survival in the Delta by incorporating the swimming behaviors of fish into a PTM framework. In addition, we are increasing the number of fish outfitted with acoustic tags to improve our ability to monitor and track fish in the Delta in real-time. The tagging results also allow us to further validate the enhanced PTM, increasing its accuracy at describing fish passage and survival. We are also working to implement other core improvements to our existing monitoring program as recommended in the 2016 Salmon and Sturgeon Assessment of Indicators by Lifestage (SAIL) report to the Interagency Ecological Program (IEP)[3].

Can higher pumping rates, creating OMR flows more negative than -5,000 cfs, be allowed until you begin to see fish at the facilities?

No. The effects of more negative OMR flows extend beyond fish seen at the facilities. More negative OMR flows also change hydrodynamics within the Delta. Those hydrodynamic effects may increase residence time in the Delta, even for fish not entrained into the export facilities, increasing the exposure to predation and other stressors within the central and south Delta. Impacts to fish seen at the pumps are just the 'tip of the iceberg'; more negative OMR flows alter broader Delta flow dynamics, resulting in increased indirect mortality of fish in the entire region.

Most of these examples talk about modeling results—how do we know that more fish will be lost if we've never tried pumping the results in OMR more negative than -5000 cfs?

Flexibility was granted in March 2014[4] for the CVP and SWP to operate to an OMR no more negative than -6,000 cfs for up to a 14-day average. Older juvenile Chinook salmon loss for that water year began when OMR flows became more negative than -5,000 cfs. In addition, older juvenile Chinook salmon and steelhead loss continued for many days after the daily, 5-day average, and 14-day average OMR flows were more positive than -5,000 cfs.

[3] http://www.water.ca.gov/iep/docs/2016_IEP_Science_Agenda_FINAL.pdf

[4] 3/13/14 NMFS response letter and 3/19/14 NMFS acknowledgment of corrected operations plan available under "Biological Opinion Actions" at: http://www.westcoast.fisheries.noaa.gov/central_valley/water_operations/