

From: Jon Rosenfield & Greg Reis, The Bay Institute  
Re: the effect of storage, diversion, and exports on flows through the Delta  
January 26, 2017 (rev. 1/27/17)

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Fall and early winter of WY 2017 have been very wet in the San Francisco Bay's watershed. TBI plans to provide regular updates on how all this water translates into flow to the San Francisco Bay Estuary. For information on the numerous public benefits produced as flows through the Delta increase, please see TBI's recent report: [San Francisco Bay: The Freshwater-starved Estuary](#).

**Total Central Valley Runoff** -- For the water year so far (October-January 22), total runoff in the Central Valley has been 17.4 Million Acre Feet (MAF). Of that total, 8.4 MAF has been stored, diverted, or exported. After capturing most of the storm pulses that occurred in October-December (and eliminating the important ecological signals and services that these flows provide), numerous northern California reservoirs began making significant flood control releases in late-December and January to protect downstream property (Figure 1). As a result, the percentage of Central Valley runoff that has not been diverted but made it out of the Delta for this water year has been increasing over the past several weeks -- from 39% of total Central Valley unimpaired (as of 1/8) to 52% (as of 1/22).

**San Joaquin Runoff** -- On the San Joaquin side, flows reaching the Delta have only recently begun to reflect the wetter conditions. As has been the pattern throughout the drought, almost all of the storm pulses were captured and the San Joaquin provided very little flow to the Delta until recently (Figure 2). Prior to January 8th, 79% of San Joaquin Valley flows were stored or diverted upstream of the Delta. With January storms, some flood prevention releases have begun (e.g., at New Don Pedro). But diversions and reservoirs throughout the southern Central Valley are still capturing a phenomenal amount of water -- as of January 22, just 25% of the total San Joaquin valley runoff had made it to the Delta (i.e., 75% stored or diverted upstream).

**Delta Exports** -- Combined exports from the state (SWP) and federal (CVP) Delta water export facilities totaled 1.87 MAF as of January 22<sup>nd</sup>. In recent weeks, combined exports have been at or near Project pumping capacity -- for the past week exports have been ~14,400 cfs. Under the terms of the SWP's permit from the Army Corps of Engineers, SWP project capacity depends on how much water is flowing down the San Joaquin River.<sup>1</sup> As in most years, Project exports have been significantly limited by Delta inflows, particularly on the San Joaquin side (Figure 2). San Joaquin flows are integral to determining SWP project export capacity (see footnote #1) and also affect several other triggers that can limit exports (e.g., salinity, inflow:export ratios, Old and Middle River flows, and total Delta outflows). Last week, San Joaquin River flows increased to levels that allowed SWP exports to reach 10,300 cfs -- this is the highest level of SWP export since 1993.

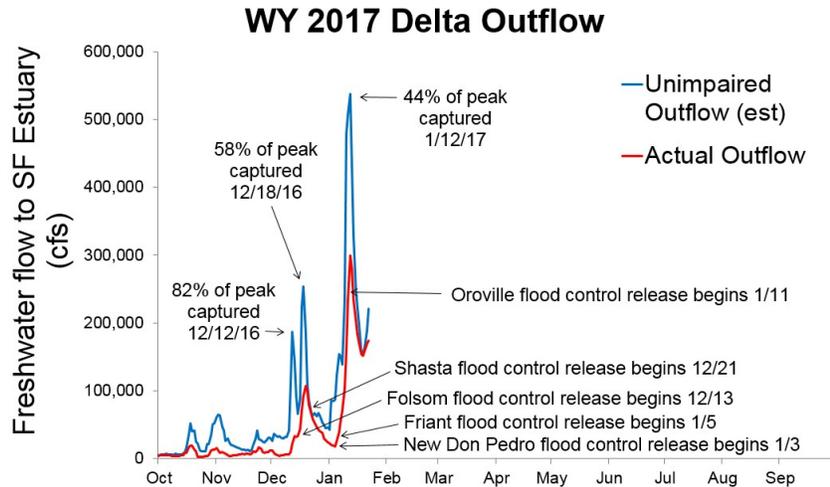
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<sup>1</sup> In other words, combined Project export capacity is not a fixed number. SWP capacity during the period Dec 15-Mar 15 is limited to 6,680 cfs + 1/3 of San Joaquin River flow, above 1000 cfs, (by the Army Corps of Engineers) up to a max of 10,350 cfs (by the SWRCB water right permit). CVP Export capacity is ~4,600 cfs. The combined maximum (~14,950 cfs) is almost never attained because San Joaquin flows are rarely high enough to permit such exports; also, it may not be possible to run the system at capacity for more than a few days (we're looking into this).

San Luis Reservoir (the off-river storage facility that is used to capture exports for which there is not immediate demand) is filling quickly. Both state and federal water projects have a share of storage capacity in San Luis; staff with the Department of Water Resources [estimate](#) that the State share of San Luis Reservoir will fill by early February, and the Federal share may fill in late March. San Luis has not been full since 2011. Even when San Luis Reservoir fills, the CVP and SWP can continue pumping water from the Delta for those contractors who can store it in their own facilities, like the Kern Water Bank or Diamond Valley Reservoir. This water (called Article 21 water under the terms of the State Water Project contract) is *in addition to the SWP and CVP allocations*, and is generally made available to contractors at very low cost. The SWP may pump several hundred thousand acre-feet of water of Article 21 water this year.

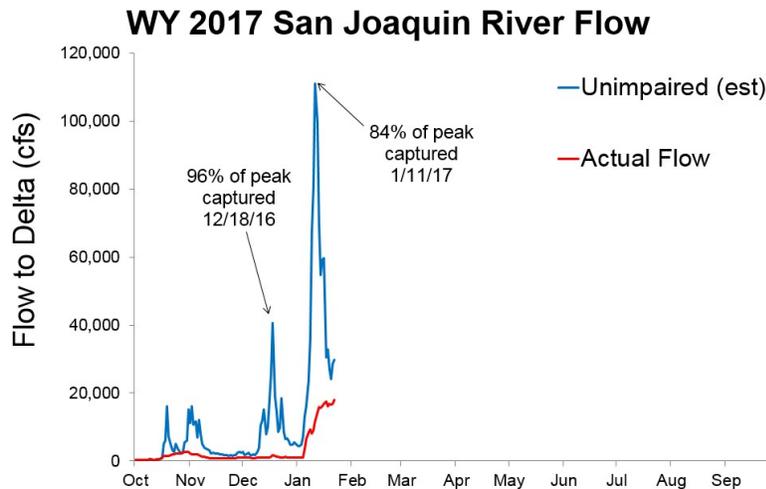
**Impact of fish and wildlife and other “environmental” safeguards** -- Despite the filling reservoirs and physical limits of the export system (some of which would change little, if at all, with the Delta tunnels), we still hear complaints that too much water is making it out of the Delta to the ocean. The implications (sometimes stated explicitly) that (a) this outflow is not beneficial to California’s fish and wildlife and (b) that that all or most of this Delta outflow would be captured were it not for imperiled fish are absolutely incorrect. First, there is overwhelming scientific evidence that native fish populations increase and are more widely distributed as outflows increase; for many species, these benefits have been observed in the increasingly rarer years when flows in excess of regulatory minima occur. In addition, some very important ecosystem services like sediment transport (that maintain and build wetland and beach habitats downstream) only occur when Delta outflows reach high levels.

Second, of the almost 9 MAF of Delta outflow that has occurred to-date, we calculate that approximately ~8.7 MAF could not be exported, even if there were no protections for fish and wildlife, because the volume of water exceeded project export capacity (i.e., the permits to operate the Projects) and/or was necessary to keep salinity out of the Delta for the protection of human consumptive uses. Outflow increased by ~0.15 MAF as a result of ESA protections for fish, most of that related to protections for imperiled salmon, steelhead and sturgeon (i.e., NMFS biological opinion). An additional ~0.13 MAF of exports were forgone voluntarily (without ESA enforcement) to protect Delta smelt. A smaller amount of additional Delta outflow was related to safeguards for public fisheries and wildlife in general, under the Water Quality Control Plan. In total, all of these environmental protections represented not more than 1.7% of Central Valley runoff.



**Figure 1:** Water year 2017 unimpaired flow to San Francisco Bay’s estuary (blue line; estimated flow that would occur without dams, diversions, and exports, lagged to account for travel time to and through the Delta) as compared to what actually flowed to the Bay (red line), through January 22, 2017. Almost half of the winter storm runoff has been stored or diverted before it reached the San Francisco Bay Estuary.

Noted are severe reductions in peak flows; these peaks provide essential ecological cues and services. Also noted are the onset of flood control releases from Central Valley dams; these result in increased flows and reduced capture of storm peaks, however they are necessary to maintain empty storage space for controlling subsequent storm events – i.e., they are designed to prevent floods.



**Figure 2:** Water year 2017 unimpaired flow to the Delta from the San Joaquin basin (blue line; estimated flow that would occur without dams, diversions, and exports) as compared to what actually made it into the Delta (red line), through January 22, 2017. Noted are severe reductions in peak flows; these peaks provide essential ecological cues and services. To date, only 25% of the San Joaquin’s unimpaired flow has actually reached the Delta. The result has been a loss of ecological services and, until just recently, limitation of export capacity (e.g., as a result of the SWP’s permits).