ATTACHMENT 2 - REFORMATTED BULLET POINTS

2009 CVP/SWP Operations RPA Shasta Division Operations Adjustment Outline
September 23, 2016

DRAFT, FOR DISCUSSION PURPOSES ONLY

1. Background and rationale for adjustment

Conditions in the upper Sacramento River are variable and need to continue to be managed with variable hydrology in mind; the Shasta reasonable and prudent alternative actions (RPA) generally do this with different criteria and processes that are dependent on hydrology/storage. However, there are important lessons learned based on experience over last three years:

1) High temperature-dependent mortality likely led to winter-run Chinook salmon year class failures in 2014 and 2015.
2) Cold water pool volume is sensitive to Keswick releases in April, May and June – prior to the temperature management season on-set.
    a. Keswick release schedules (especially for April and May) need to be decided by April 15 in order for Sacramento River Settlement (SRS) Contractors to make planting decisions and purchases for the growing season.
3) Capping Keswick releases in June and July is an important and effective strategy to stretch the cold water temperature management season throughout September and October.
4) There was a loss of water temperature control when the full Shasta side gates were accessed for water releases
    a. Delay full side gate operations as long as possible
    b. Explore engineering solutions to access cold water volume below side gates
5) Water temperatures at upstream redd locations are not correlated with flow (*i.e.*, water quality, water quantity), but are strongly correlated with Keswick release temperatures.
6) Keswick releases could be maintained throughout the summer at 7,250 cfs for temperature management. They do not need to be upwards of 15,000 cfs.
7) Spring maximum storage that allows access to the upper gates is important to conserve cold water throughout the season. For this reason and to meet 55°F 7DADM at the CDEC station CCR, spring storage of 4.2 million acre-feet should the attained when possible.
8) Wilkins Slough can go, and be maintained, as low as 3800 cfs.
9) Stable flows are needed to prevent winter-run, spring-run, and fall-run redd de-watering and juvenile stranding.
10) There are opportunities for fall transfers and fall flood up/pacific flyway created by these conditions
11) The temperature model needs continued investment. The current Sacramento River Water Quality Model (SRWQM) has difficulty predicting water temperatures:
    a. This difficulty is exacerbated with low Shasta storage
    b. There is high uncertainty in the Shasta Reservoir lake stratification and temperature profile between February and May, making it difficult to plan for temperature management season prior to initial water contract allocations.

c. Inputs to the SRWQM are not conservative enough to reflect current warmer meteorological and climate conditions.
d. The SRWQM generally assumes that operations can achieve temperature targets, and often underperforms, as evidenced in the historical record. For example, it did a poor job of characterizing the Temperature Control Device (TCD) performance once the TCD side gate operation went into real-time effect and there was a loss of water temperature control in 2014 when the full Shasta side gates were accessed for water releases.
e. Outputs are sensitive to ambient air temperatures – Instead of using a 30-year historical average, we need to use warmer meteorological data to be conservative to more accurately reflect current warmer conditions
f. We need a reservoir model (stratification is difficult to predict)
g. We need a comprehensive reservoir/temperature model that addresses the complex operations of Trinity, Whiskeytown, and Shasta reservoirs.
h. There is a lack of stakeholder understanding behind the NMFS temperature dependent mortality model – we need to invest in collaborative science process with SRS contractors

12) The Shasta temperature control device leaks. There may be engineering solutions that should be investigated to prevent the loss of cold water (tarps, *etc*.)
13) Various operations and their effects on water temperature should be studied, for example, power peaking at Whiskeytown Reservoir.
14) Low Sacramento River spring flows were correlated with low survival emigrating juvenile spring-run from Deer and Mill Creeks.
15) Disease was documented to be more prevalent in the upper Sacramento River in 2015 than historically thought which may have impacted survival rates in 2013, 2014, and 2015. Further studies are needed.
16) Further studies are needed to understand other stressors in the upper Sacramento River such as predation, lack of spawning/rearing habitat, food web supply, bioenergetics, *etc*.
17) The performance criteria in the Shasta RPA have not been attained.
18) California WaterFix modeling indicates worsening of temperature effects, but agencies also share an understanding that the Reclamation wouldn't necessarily operate the system that way due to seasonal planning and temperature requirements in the Shasta RPA. Adjusting the Shasta RPA now may provide for a more robust set of operational criteria that protect cold water with a dual Delta conveyance system.