

### Proposed Longfin smelt Spring Outflow Methods for California WaterFix:

Longfin smelt (*Spirinchus thaleichthys*) fall abundance is highly positively correlated with winter-spring Delta outflow (Jassby 1995, Kimmerer et al. 2002, Kimmerer et al. 2009). The California Department of Fish and Wildlife (CDFW) seeks to develop minimum Delta outflow criteria for the spring period (March through May) which is similar to what occurs under current authorizations for the Central Valley Project (CVP) and State Water Project (SWP). Operating to the outflow criteria could help to minimize the effects of the California WaterFix (CWF) on Longfin smelt. The following discussion provides an explanation of the multiple approaches CDFW considered to develop minimum Delta outflow criteria for operations of CWF. The approaches differ from what was submitted as part of the 2081(b) Application in that this approach would require the CVP/SWP to operate to achieve a minimum Delta outflow, rather than operate to an operational criteria that may result in achieving a minimum Delta outflow. All approaches utilized the CalSim II model to determine if the objective was achievable.

#### Goals of this effort are as follows:

- Create criteria that will result in March, April and May Delta outflows approximating Delta outflows observed since water year 2010, both in frequency and in magnitude.
- The new criteria should ensure that climate change will not affect operations to the point where outflow is diminished from existing conditions.
- The new criteria should be implementable and avoid or minimize uncertainties associated with forecasting.

#### Approach described in the 2081(b) application:

- Uses the current month's Eight River Index (8RI) to determine outflows for the month of March based on a regression of historic 8RI to Delta outflow.
- Applies a San Joaquin River inflow (at Vernalis) to north and south Delta export (I:E) ratio of between 1:1 and 4:1 based on water year type or 1,500 cfs, whichever is greater, in all of April and May.
- Allows north Delta export increases if off-ramp of 44,500 cfs Delta outflow is achieved.
- Outflow requirements would be achieved solely through a reduction in total exports of no less than 1,500 cfs (currently considered health and safety level).

CDFW seeks input on the implement-ability and efficacy of this approach in achieving the goals stated above. Uncertainties with the approach are:

- Perfect 8RI forecasting is not possible.
- Forecasts are generally made on the 90% exceedance hydrology, which will likely lead to lower than appropriate outflow criteria for the month of March.
- Outflow criteria should be implemented beginning on March 1<sup>st</sup>, but the proposed approach relies upon forecasts which are not usually available until after the 10<sup>th</sup> of the month.
- Suitability of current (I:E) ratio for achieving April and May outflow criteria.

- Variability associated with a regression analysis will lead to unachievable outflow criteria in some years.

Exploration of other approaches (see presentation):

CDFW investigated the relationship between the current month's 8RI and historic outflows. While the relationship was fairly strong ( $R^2=0.7961$ ), the variability among individual data points for a given 8RI was still substantial (slide 3). CDFW staff assumed this variability was associated with the changes in infrastructure and regulations between 1930 and 2016. In order to correct for this variability, a simulation of existing conditions was used in place of the historic time series (slide 4). While the fit improved ( $R^2 = 0.9034$ ), CDFW staff were still concerned that the variability within the regression could still lead to unachievable outflow criteria in some years. For these reasons, combined with the concerns related to forecasting, CDFW decided to use the previous month's 8RI (PMI) in their analysis. While use of the PMI does not fully address the issues related to variability between years, it does eliminate the difficulties associated with forecasting.

CDFW considered a scenario in addition to the method presented in the CWF 2081 application. This scenario uses the PMI for March, April, and May to determine outflow criteria for each of those months. Implementation would occur by use of a lookup table of outflow targets for each month, capped at 44,500 cfs (slide 13).

CDFW would like the panel to consider the following questions during their review of the Longfin smelt spring outflow methods:

1. Is the CDFW approach to using the PMI to achieve the March through May spring outflow criteria for Longfin Smelt s more objective method than that proposed in the 2081(b) applications and likely to result in Delta outflows equivalent to existing conditions?
2. Are there alternative approaches to analyzing the relationship between 8RI and outflow which could improve the certainty in achieving a March through May outflow target for any given year?
3. Are there alternative methods or approaches that CDFW should consider in creating and achieving outflow targets to maintain outflow which is equivalent to existing conditions?