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**From:** Steve Zeug <stevez@fishsciences.net>  
**Sent:** Monday, May 6, 2019 11:55 AM  
**To:** Cathy Marcinkevage - NOAA Federal  
**Cc:** Barbara Byrne; Ellis, Gregg  
**Subject:** RE: a few questions for Steve re: Zeug and Cavallo 2014 and the salvage density method

Hi Cathy-

Below are answers to the questions you sent. Just let me know if you need any further clarification. Hope this helps.

1. The interpretation is correct although that value is only for the SWP. Additional mortality (0.009%) is imposed at the CVP. Based on the highest Delta mortality estimate from Perry et al. 2010, direct mortality from loss at the facilities accounts for a very small percentage of total mortality in the Delta.

2a. The analysis we did in water fix and for the BA is only for winter run. We did not include an analysis for cwt spring run because they were salvaged too infrequently and the model would not converge. We did not include steelhead because they are not coded wire tagged so their origin and the associated conditions they experienced could not be reliably determined. No analysis was performed for green sturgeon.

2b. I would not recommend using this model to make conclusions about steelhead and sturgeon. I think their survival and salvage rates may be very different from Chinook given their larger size and for sturgeon, more variable migration and rearing behavior. Assuming similarity for spring run may be more appropriate, at least for Sacramento River-origin fish. However, I will leave that up to you.

2. The parameters of the model were estimated from real historical data associated with the CWT releases. To make predictions for this analysis we used flow and export inputs from DSM2. Since this analysis was for winter run only, there was a single release location in the Sacramento River. For each month analyzed, we inserted the same number of fish to calculate the proportion lost. The actual numbers inserted are not particularly relevant since the output of the model is a proportion and there are no parameters related to abundance. When interpreting the results, the proportion lost would apply to whatever numbers are assumed to be in the Delta at that time. So, if the model predicts a 10 percent loss in March and October, the loss in March would likely be higher based on migration timing.

4. Similar to all the tagging studies, the analysis was performed on hatchery fish. It is unknown how well these represent wild fish although the winter run hatchery fish are probably the closest to wild fish given the operations of Livingston Stone as a conservation hatchery. I think the benefit of the CWT based analysis is that there is 100% certainty that they are true winter run and not subject to the inaccuracies of the length at date model.

**From:** Cathy Marcinkevage - NOAA Federal <cathy.marcinkevage@noaa.gov>  
**Sent:** Monday, May 6, 2019 10:57 AM  
**To:** Steve Zeug <stevez@fishsciences.net>  
**Cc:** Barbara Byrne <barbara.byrne@noaa.gov>; Ellis, Gregg <Gregg.Ellis@icf.com>  
**Subject:** Fwd: a few questions for Steve re: Zeug and Cavallo 2014 and the salvage density method

Hi Steve --

We have some clarification questions related to the salvage-density work...and unfortunately a quick turnaround. Could you take a look at the questions below and get back to us asap? This really helps us in having a better understanding of the results of the method.

Thanks,  
Cathy

----- Forwarded message -----

From: **Barbara Byrne - NOAA Federal** <[barbara.byrne@noaa.gov](mailto:barbara.byrne@noaa.gov)>

Date: Mon, May 6, 2019 at 10:52 AM

Subject: a few questions for Steve re: Zeug and Cavallo 2014 and the salvage density method

To: Cathy Marcinkevage <[cathy.marcinkevage@noaa.gov](mailto:cathy.marcinkevage@noaa.gov)>

Attached are Zeug and Cavallo 2014 and the CWF writeup on the salvage density method. Here are a few questions for Steve:

1. Table 5 of Zeug and Cavallo 2014: Consider the line with Migration mortality of 64.9% and relative loss of .449%. Is it correct to interpret that as saying that 99.551% of the through-Delta mortality occurs elsewhere in the Delta, as a sort of measure of the "tip of the iceberg" (in that direct loss at the export facilities is not the whole story for in-Delta mortality).
2. The CWF model write-up only mentions winter-run:
  - a. Were the same methods used for the spring-run, steelhead, and sDPS green sturgeon salvage density results provided?
  - b. If so, would you caution that the interpretation for steelhead and green sturgeon presume that the mortality dynamics are the same as for Chinook (more true for steelhead than sturgeon, probably).
3. I assume that the parameters for the zero-inflated negative binomial regression come from the CALSIM modeling (and some sub-monthly DCC assumptions?), but what is assumed to "insert" fish into the system? The 2014 paper has specific timing, location, and numbers of releases, but what is assumed for the salvage density analysis provided to us for the current consultation? Is there explicit "insertion" of fish from both Sac and SJ sides, and if so, based on what info? The 2014 paper has specific timing, location, and numbers of releases, but what is assumed for the salvage density analysis provided to us for the current consultation?
4. Should we consider the numbers for WR, SR, and steelhead to represent wild fish, hatchery, fish, or both?

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**Barb Byrne**

Fish Biologist

*NOAA Fisheries West Coast Region*

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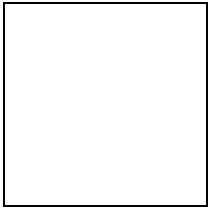
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