NMFS Evaluation of Flow Effects on Survival in Vicinity of Proposed North Delta Diversions BDCP Admin Draft Dec 2012

4/4/13

While the effects analysis of the December 2012 Admin Draft of the BDCP includes results of analytical tools that incorporate several components into the evaluation of survival, it is useful and informative to explore the exclusive effects of flow on survival. Flow-survival relationships from Perry (2010, acoustic tag studies) and Newman (2003, coded wire tag studies) are relevant to the area around the proposed north Delta diversions and can be used to infer impacts without the modeling influences of other parameters which have their own uncertainty and ranges. These two curves are shown in Figure 1 and Figure 2. The trend of steeper slope at lower flows and gentler slopes at higher flows is especially prominent for the Newman results, which extend to higher flow values. This implies a larger effect on survival with an incremental change in flow at lower flows than for the same incremental change in flow at higher flows.

The different pumping levels incorporated into the north Delta diversion (NDD) bypass rules show important demands on flow and therefore potential effects on survival. Figure 3 shows survival rates (based on Perry and Newman) for flows resulting below the diversions at four pumping levels (none, Level 1, Level 2, and Level 3) for a Freeport flow of 20,000 cfs. These show the potential for reduction in survival due to the increased withdrawal under Levels 2 and 3, especially because this is the flow range (10,000-20,000 cfs) to which a survival response is most sensitive (i.e., it is the steepest part of the Newman curve).

Figure 4 is specific to the relevant migration months of the different runs/species of salmonids (winter-run, spring-run, and fall-run Chinook and steelhead). While we often see results reflecting the probability of exceeding a particular flow, these plots translate the probability of exceeding a flow into the probability of exceeding the corresponding survival value, based on the Perry and Newman curves. Flows are represented by the average of CALSIM-generated flows for the appropriate months. The ESO operations consistently worsen flow conditions, and therefore decrease the survival probability compared to EBC2. HOS conditions are generally an improvement over ESO conditions, except in months important to winter-run Chinook migration. HOS conditions are at times even an improvement over the EBC2, which could contribute to meeting the biological goals and objectives without as much reliance on other conservation measures (e.g., habitat restoration, predation reduction, etc.).

NMFS welcomes continued dialogue in exploring the effects of diversion regimes that reduce or eliminate higher levels of pumping that may have the most detrimental effect on flow-related species survival. We also request to see an analysis similar to this in revised versions of the BDCP.

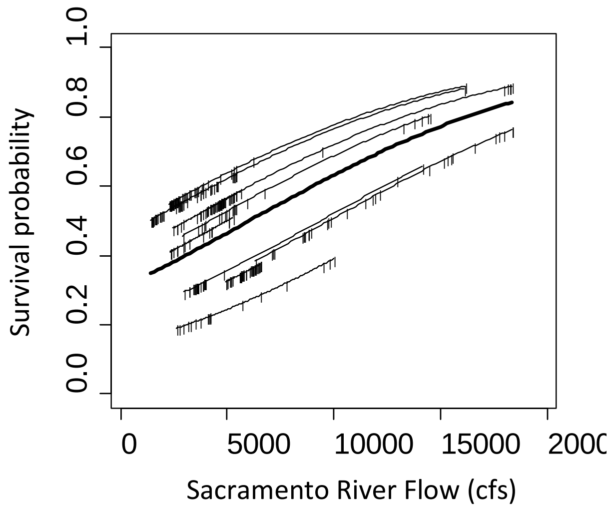

Figure 1. Flow-survival relationship for the Sacramento River from Perry (2010).

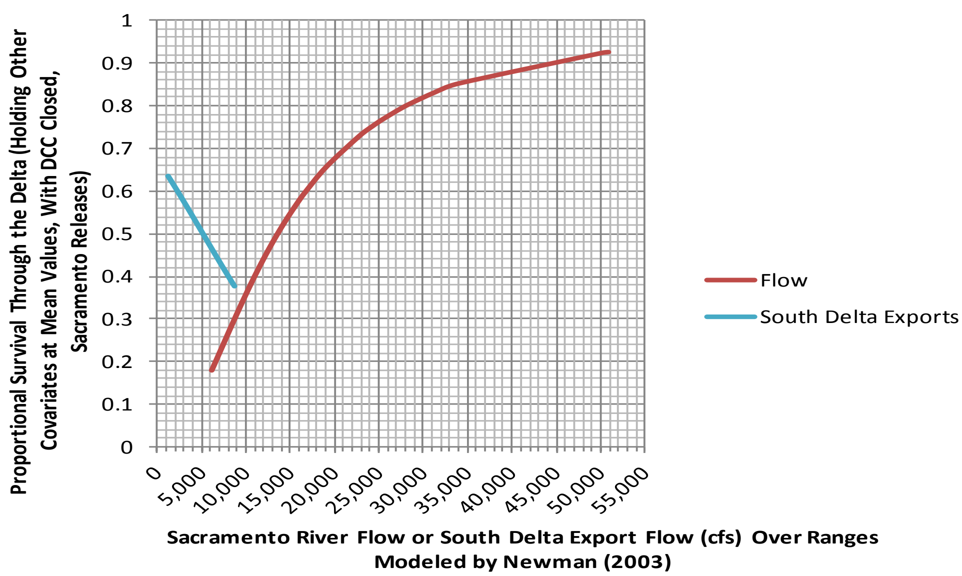

Figure 2. December 2012 BDCP Figure C.4-11: Effect varying Sacramento River flow and south Delta exports across the range of data modeled by Newman (2003), holding other covariates at mean values, assuming closed Delta Cross Channel gates, and fish releases from Sacramento.

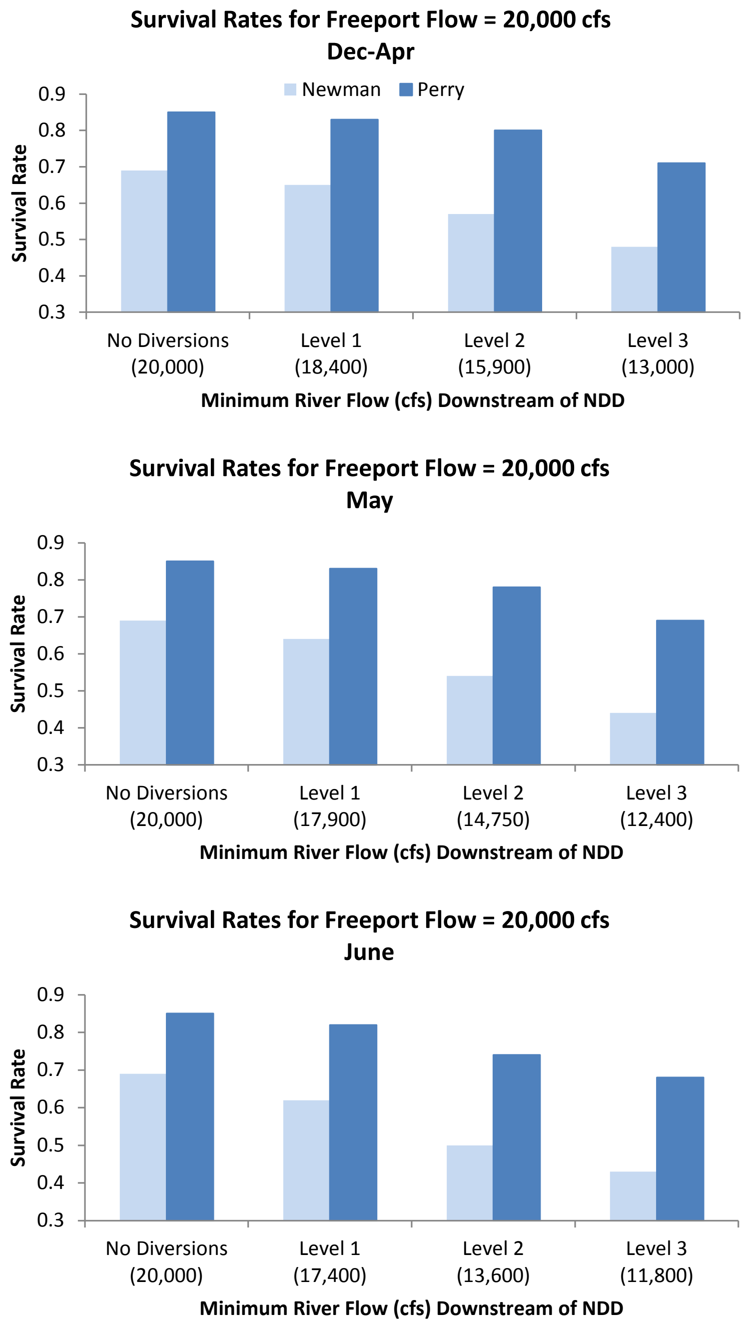

Figure 3. Perry (2010) and Newman (2003) survival rates for flows resulting after withdrawal at different north Delta bypass pumping levels.

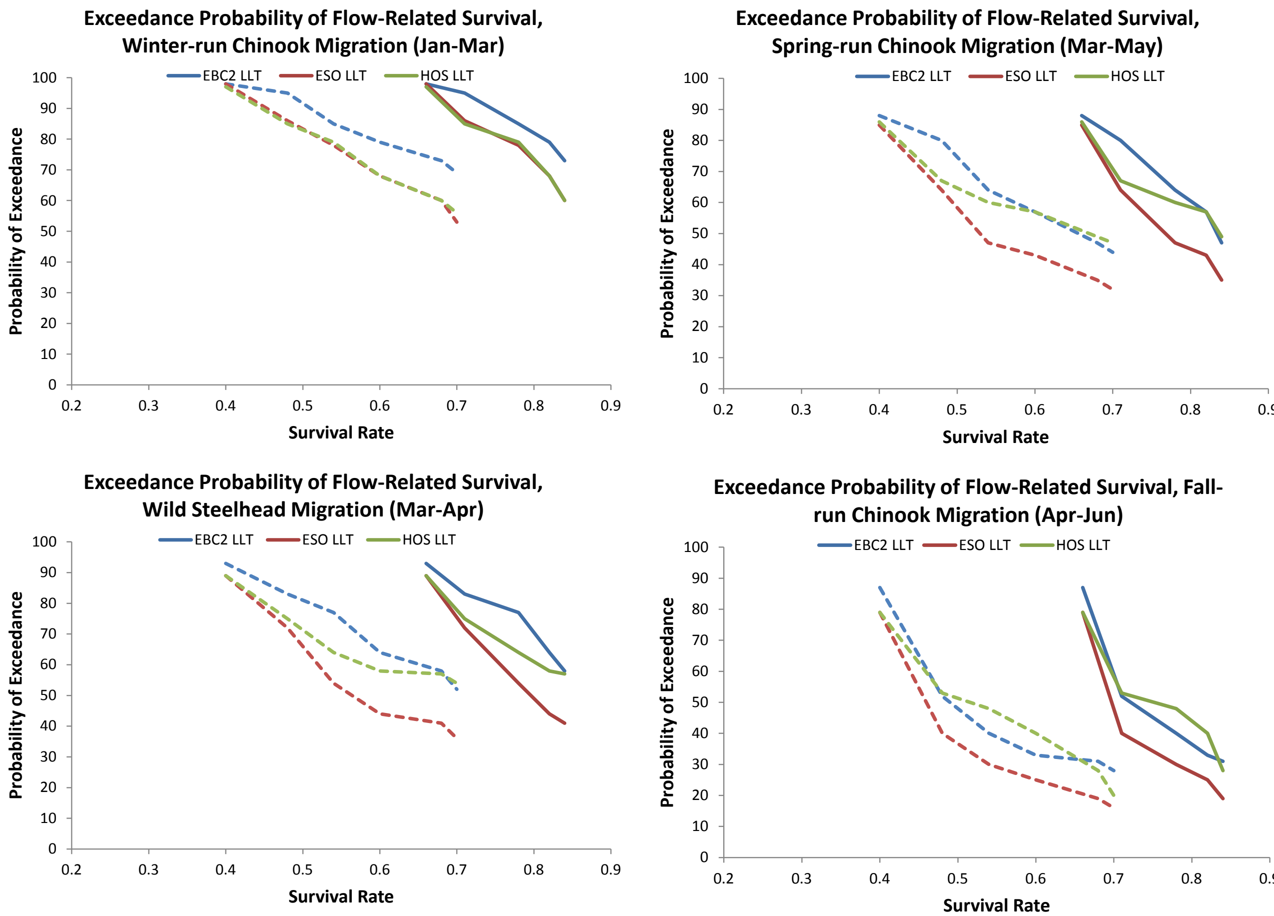

Figure 4. Probability of exceeding selected flow-related survival values during key migratory months for LLT based on Perry (solid lines) and Newman (dashed lines). Corresponding flows range from 11,000 – 21,000 cfs.