**Comments on "An Assessment of Risks for Non-native Hatchery Steelhead in the Elwha River Project"**

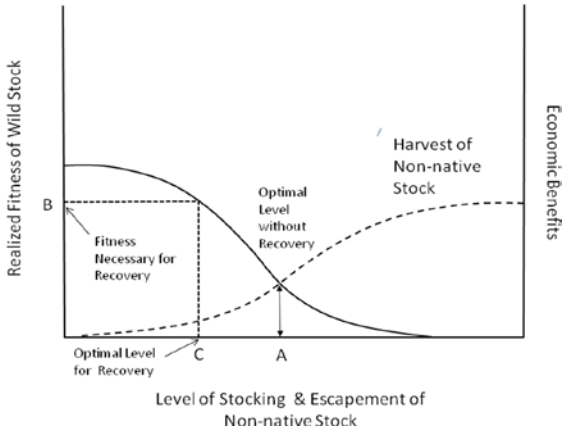
The objective of this review was to "assess how Chambers Creek steelhead may influence the rate and extent of recolonization of wild steelhead and other salmonids in the Elwha River following dam removal". The authors divided the review into three sections: 1) synthesis of the research on fitness and changes in genetic and phenotypic characteristics associated with hatcheries; 2) review of genetic and ecological risks of releasing hatchery salmonids; and 3) a qualitative assessment of risks and benefits at two levels of outplanting.

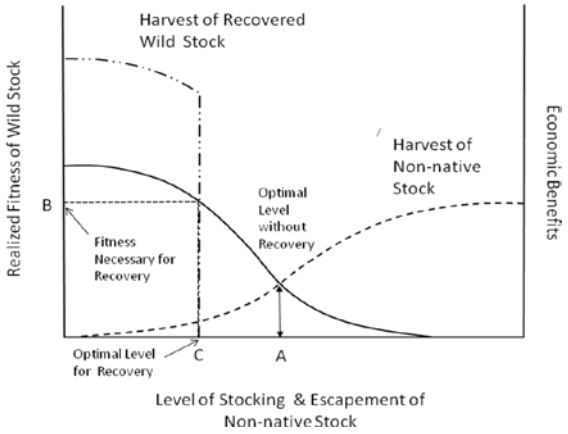
Overall, the authors did a nice job in the first two sections of the report. The review of the scientific literature was comprehensive and balanced. This kind of review is a necessary first step in risk assessment (Currens and Busack 1995). I would recommend this review to anyone wanting to know more about these issues. The third section, however, did not live up to the expectations that I thought the authors set up on page 11 of the report. The brief qualitative assessment that they presented did not really let me understand much more about "how Chambers Creek steelhead may influence the rate and extent of recolonization" other than that it will be unpredictable and most likely would be slower than if Chambers Creek were not used. In addition, the objective on p.11 indicates the authors looked at two different scenarios of smolt outplanting but the results in Table 3 only present calculations for returning adults and do not really address any of the impacts that are really the focus of the report.

The value of risk assessments is to help make good decisions. Without knowing more about what the Lower Elwha Klallam Tribe and Elwha River Fisheries Restoration Team needs to help make decisions about the use of Chambers Creek steelhead, I cannot really judge how useful this report is. Often, the first step is letting decision makers know whether there is significant debate in the scientific literature based on a comprehensive, balanced review or not. Sometimes, this is enough to make a decision. This document fulfills this kind of assessment nicely. The evidence overwhelmingly suggests that use of non-native stocks will likely negatively impact recovery.

A second step is often to help decisions makers frame the discussion of tradeoffs (economic vs recovery; short-term vs long-term) more rigorously. I think the authors have enough information to do that. For example, a simple illustration of tradeoffs between fitness and economic benefits of releasing Chambers Creek steelhead might look like Figure 1, where point A maximizes both short-term economic benefits and fitness of the wild stock. The problem with this is that for the reasons detailed by the authors, the fitness level associated with A will likely slow recovery of a wild population and may even prevent it. Consequently, it is necessary to achieve and maintain some level of fitness of the wild population, B, that will allow the population to recover that is associated with a more appropriate level of stocking, C. More importantly, without making the tradeoff to C, we delay or possibly prevent accessing the much greater benefit of harvesting a recovered, wild population. Figure 2 shows what might be the long-term economic benefits of recovery,

assuming that if the population drops below a realized fitness level of B, there will be no harvest on it, such ESA take prohibitions.




I believe we know enough from the literature that the authors reviewed to begin putting some number and ranges on those points to be able to illustrate these concepts more concretely to decision makers.

A third step, if needed, might be to begin providing information about "how much is enough." This is taking the heuristic concepts above and trying to model impacts more quantitatively. There are a number of theoretical models (most cited by the authors), applications of these models (e.g. the AHA spreadsheet, FITFISH, PCD-RISK among them), and expert and empirically derived data sets (e.g., Busack et al. 2005, Brakensiek 2007) that can be used to assess loss of fitness, competition, predation, and disease under a variety of scenarios. These tools have been useful for focusing discussion on tradeoffs more rigorously and for identifying critical monitoring and research in a number of Puget Sound watersheds. Depending on what kind of information is needed to help make these decisions in the Elwha River, more work on steps 2 and 3 might be useful.

Brakensiek, K. 2007. Ecological risks to natural populations of Chinook salmon by hatchery releases of Chinook and coho salmon throughout the Greater Puget Sound region, Washington: a PCD RISK 1 assessment. Mobrand-Jones and Stokes Final Report to National Marine Fisheries Service, Lacey, WA, and Northwest Indian Fisheries Commission, Olympia, WA.

Busack, C.A., K.P. Currens, T.N. Pearsons, and L. Mobrand. 2005. Tools for Evaluating Ecological and Genetic Risks in Hatchery Programs. Final Report BPA Project No. 2003-058-00, Bonneville Power Administration, Portland, OR.

Currens, K.P, and C.A. Busack. 1995. A framework for assessing genetic vulnerability. Fisheries 20(12):24-31