UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
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July 24, 2008

MEMORANDUM FOR: Bruce Suzumoto

FROM: Ritchie Graves

SUBJECT: Initial Critique of Fish Passage Center's July 14, 2008 MMemorandum from Michelle DeHart to Liz Hamilton re: Sockeye adult returns in 2008.

NOAA Fisheries agrees with several points made in the FPC Memo:

- Sockeye returns in 2008 were substantially better than those that have occurred for many decades.
- Inriver survival estimates for juvenile sockeye were relatively high in 2006 and 2007.
- Increasing the number of juvenile sockeye smolts that enter the ocean in good condition should (on average) positively affect the number of adults returning.
- Sockeye hatchery programs may effectively address some limiting factors by increasing abundance (supplementation) and spatial distribution (reintroduction).

However, the memo suffers from several important short-comings. These include, but are not limited to, the following:

- Ocean productivity substantially influences the recruitment of Chinook and coho salmon stocks,[1] and is, therefore, likely an important determinant of sockeye recruitment as well. The memo fails to consider how variability in ocean productivity may have affected the number of returning adults and instead seeks to attribute the variance in returns primarily to in-river operations.[2] Such attribution is not reasonable nor supportable given the likely magnitude of ocean productivity effects.
- The memo fails to consider many factors in the freshwater environment that are likely to influence the number of adults returning to the Columbia River Basin. These factors include:

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[1] See: http://www.nwfsc.noaa.gov/research/divisions/fed/oeip/g-forecast.cfm

[2] A more recent Fish Passage Center memo dated July 21, 2008 does acknowledge that "ocean conditions are important for adult returns."

- The total number of juveniles (not just the number of hatchery produced fish) that started migrating to the ocean
- The survival of these fish through free-flowing river reaches prior to entering the mainstem Snake and Columbia Rivers[3]
- Other factors besides flow and spill levels that likely affect survival of juveniles migrating through the mainstem Snake and Columbia Rivers (temperature, turbidity, fish condition, recent installation of surface passage routes, etc.)

- The memo fails to provide any analysis of Smolt to Adult Returns (SAR) – a glaring omission considering that the apparent goal of the memo is to describe factors which likely contributed to the larger than expected returns of sockeye salmon in 2008.
- The significance of Water Transit Time (WTT) vs Reach Survival regressions used in the memo for Snake River fish are entirely driven by a single data point – 2001 – when essentially no spill occurred in the Snake River and substantially reduced spill occurred in the lower Columbia River. Thus, a much higher percentage of juveniles passed dams via turbines at the mainstem federal hydroelectric projects than was the case in any of the other years included in this analysis. This is a serious oversight which should be remedied by providing an analysis of the data without 2001. Such an analyses would show essentially no relationship (low R^2, highly insignificant) without 2001.
- Fish travel times and water travel times of Snake River sockeye (regression of unweighted data presented in table 4) are not well correlated ($R^2 = .226$). The memo fails to note this fact or to provide a mechanistic explanation for how fish survival and water transit times might be correlated, absent a correlation between fish survival and fish travel time.
- The memo fails to recognize other actions being taken in Canada (besides hatchery releases of fry) to increase the productivity of Okanogan River sockeye salmon – especially improved management of flows to protect redds.
- The memo fails to provide any data supporting the claim that more adults returned because transport rates were lower than usual. No Okanogan River or Lake Wenatchee sockeye salmon have been transported for years. Also, starting in 2006, essentially all (ca. 97%) of PIT-tagged SR sockeye salmon have been diverted back to the river. So few have been transported that we would not expect to observe any PIT-tagged adults that were transported as juveniles.
- The memo fails to provide a figure relating average spill to the survival of sockeye detected at RIS as was done for sockeye detected at Lower Granite Dam. The analysis should be consistent for the two groups of fish being examined.
- The memo fails to investigate the extremely high survival rates estimated for the 2006 outmigrations (88% from RIS to JDA for Columbia River populations and 86% for Snake

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[3] Only 26% to 47% of the juvenile fish migrating from Redfish Lake typically survive to Lower Granite Dam. In only one year, 1998 did fish survive at rates outside this range (73%). (NMFS unpublished data - 1996 to 2005).

River sockeye). The next highest reported values for these fish are 56% (2007) and 71% (2003), respectively, differences of about 57% and 21%. Similar magnitudes of difference were not observed in survival estimates for other spring migrating species in these years. Changes in survival of this magnitude are surprising. Therefore, these data should be carefully reviewed to ensure that they are not spurious.

- The memo fails to describe how the regressions were "weighted" in this analysis or to provide any assessment of how sensitive these analyses are to the "window" of time used to select which fish are included in the analysis.
- The memo contains many statements like "strong" or "likely" that are NOT supported with statistical results (i.e., significant P-values or high R^2 values). In fact, P-values are not reported for any of the analyses, leaving the reader unable to assess which, if any, of the relationships are statistically significant.