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MEMORANDUM

TO: Scott Bettin, BPA
Fish Passage Center Oversight Board

FROM: Michele DeHart

DATE: August 18, 2008

RE: Adult Sockeye and ocean conditions

At the August 11, 2008, FPC Oversight Board meeting John Ferguson, NOAA, advised that our previous response to your data request (July, 21, 2008) contained an error. John advised that our previous memorandum to you indicated that 1998 was a good ocean year. John further advised that 1998 was the worst ocean year in recent history and referred us to the NOAA Fisheries web site www.nwfsc.noaa.gov/research/divisions/fed/oeip/g-forecast.cfm. We reviewed both the web site and our previous memorandum to you. We offer the following discussion of the points raised by John Ferguson, NOAA, in order to clarify and avoid any misunderstanding of our original memorandum.

Our original memorandum stated:
"Our analysis for Chinook and steelhead indicate that 1998 through 2002 were all good ocean years. However, past years with good ocean conditions, in which migration conditions were less favorable and included higher proportion of sockeye transported (e.g. MY 2001) did not result in high returns of sockeye adults to the Snake River (2003)."

The analysis referred to in the quote above, used ocean productivity indices that were based in part upon a NOAA paper, entitled, "Forecasting climate induced changes in the survival of Snake River spring/summer Chinook salmon (Oncorhynchus tshawytscha)",(Scheuerell, and Williams, 2005.) In that document NOAA states that:

"Beginning with the 1994 ocean out migration however, the survival of salmon in the ocean started to climb again through 1999."

In the Scheuerell & Williams paper, NOAA relates increased smolt to adult returns with stronger ocean upwelling in April and September and October downwelling (negative upwelling). Examining Figure 2 in Scheuerell and Williams (2005), migration year 1998 was characterized by positive upwelling in April, nearly the highest upwelling observed over the time series in September and negative upwelling in October. Based on these three ocean indices the model coefficients estimated by Scheuerell and Williams indicate that 1998 was a "good" ocean year. These generally good ocean conditions were used to forecast increases in the SARs from migration years 1998-2003 (Figure 3a. Scheuerell and Williams, 2005). Clearly Scheuerell and Williams characterize 1998 as above average ocean conditions.

The NOAA web site referred to by John Ferguson, identifies 1998 as the lowest ranking for ocean conditions of the 10 years for which ranks were provided (1998 to 2007). However the web site also ranks adult returns for Columbia River spring/summer Chinook entering the ocean in 1998 (worst ocean ranking) as the fourth best adult return. The web site does not include rankings for sockeye.

Although it appears that there may be disparity between the two NOAA sources characterizing ocean conditions that occurred in 1998, the out migration conditions are a matter of record and there is no disagreement on the mainstem passage conditions that occurred. According to the FPC sockeye memo dated July 14, Snake River sockeye outmigrating in 1998 experienced an average percent spill of 43% and average flow of 197 kcfs between Lower Granite and McNary dams; this represents the second highest spill and highest flow for the years analyzed (1998 to 2007). At 0.72, the proportion of juvenile Snake River sockeye transported in 1998 was relatively low. Among the years we analyzed the second highest adult sockeye return to Lower Granite Dam occurred in 2000 with a return of 299 fish. These fish would have outmigrated in 1998 through high flow and high spill conditions. If as indicated by the NOAA web site, 1998 ocean conditions were the worst of the last decade, the adult returns from the 1998 outmigration illustrate the importance of flow and spill passage conditions during the downstream migration because in this scenario downstream passage conditions appear to have been good enough to overcome the bad ocean conditions. If the alternative NOAA characterization of 1998 ocean conditions as above average (Scheuerell &Williams) is accepted, the relatively high adult returns from 1998 support the importance of downstream passage conditions and juvenile survival during the juvenile outmigration in combination with good ocean productivity, since smolts need to arrive to the ocean alive in order to benefit from good ocean conditions. The two alternative NOAA characterizations of ocean conditions for 1998 are disparate spanning the range from worst to above average indicating that caution should be applied in utilizing these indices in predicting adult returns or attributing adult returns solely to the ocean segment of the salmon life cycle. Our review of the NOAA ocean condition alternative indices did not indicate any basis to change the discussion or conclusion in our previous memorandum.

Literature Cited

Scheuerell, M.D., and J.G. Williams. 2005. Forecasting climate-induced changes in the survival of Snake River spring/summer Chinook salmon. Fisheries Oceanography 14(6);448-457