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MEMORANDUM

TO: Ed Bowles, ODFW

FROM: Michele DeHart, FPC Manager

DATE: May 1, 2008

RE: Review of NOAA document to ISAB by the CSS Oversight Committee

In response to your request, the Comparative Survival Study Oversight Committee has reviewed the NOAA document submitted to the Independent Scientific Advisory Board (ISAB) entitled "**Seasonal patterns in the efficacy of transportation**." Our detailed comments follow. The overall conclusion of our review is that :

> The NOAA analysis may be biased and may not validate the proposed management action, because specific data was excluded from the analysis.
> The NOAA analysis did not accurately present or address Comparative Survival Study data. NOAA has not presented the intent or objective of CSS mark groups and in some examples has attempted to utilize groups for purposes that they were not designed.
> Specific information that would more clearly define the risk of the proposed management action and the degree to which the data and analysis can support the proposal are not included in the NOAA analysis.

The NOAA analysis may be biased and may not validate the proposed management action, because specific data was excluded from the analysis.

On page 8 of the Methods section of the NOAA document, it is stated that "for the transport group, we used only fish transported from Lower Granite Dam." NOAA only considered transportation at Lower Granite Dam in their analysis although the resulting management recommendation applies to all collection projects. In most years transportation from Little Goose and Lower Monumental dams comprises half of the total fish transported. Because the NOAA analysis specifically excludes a large portion of the available data, only utilizing fish transported from Lower Granite Dam, it does not support the proposed

management action which applies to all three collection projects. This appears to impart a positive bias towards transportation. The analysis in Chapter 4 of the CSS 10-yr Retrospective Summary Report shows wild steelhead transport SARs from point of collection are highest from LGR, followed by LGS and LMN (Fig. 4.2). The Chapter 4 transport SARs did not include any mortality incurred migrating to collector projects. If applicable reach survivals were factored in, the SAR difference between transport projects would be magnified further. The exclusion of transportation data from LGS and LMN in the NMFS analysis appears to be an additional bias in favor of transportation.

In the analysis of TIR and D for 1997 and 1998 (Chinook salmon) and 2004 and 2005 (steelhead), NOAA did not include McNary to Bonneville reach survival estimates, and instead used per km expansions of survival estimates from upper reaches. If in fact MCN to BON survival was lower than that in the upper reaches, this would result in S_M (in-river migrant survival) being estimated as higher than it actually was. In turn, D would then be inflated as calculated: $D = S_M * T:M/S_T$.

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The lack of confidence intervals on any of their SAR estimates (or TIR, D estimates) is generally a problem in judging the significance between groups for the parameters that NOAA is making inferences. Having a rather large proportion of the one-week periods with small adult recovery numbers is problematic. For example, in Table 5, NOAA does not provide CIs for the SARs. It's obvious from the numbers of adult returns that the precision of SAR estimates varies widely between years, and in some years, the inferential ability is extremely small.. Nevertheless, they compute an unweighted geometric mean of the ratio of C1 to C0 fish. Their geomean for wild Chinook is highly influenced by 2004, where they had a grand total of 6 adult returns. If you exclude 2004, the geomean C1/C0 drops from 1.05 to 0.82. Further, if you exclude 2005 as well, because there were only 2 adult returns, the geomean is 0.79. Contrast this with the analysis in Chapter 4 of the CSS 10-year Retrospective Analysis Report, which accounted for differences in sample size between years (Figure 4.22). The NOAA document makes no mention of these CSS analyses or results.

Although NOAA relies solely on the SARs of bypassed fish in their analysis of one week time periods, they do not present the fact that SARs of bypassed fish are lower than other routes of passage. NOAA does not address the bias, or the impact on the management recommendation of relying on bypass groups. Utilizing NOAA's one-week periods with small adult recovery numbers on bypassed fish does not help address the question of limiting spill in later May to maximize transportation as favored by the action agencies. However, it is generally recognized that on an annual basis bypassed fish have lower SARs than undetected fish during years when spill has occurred. Since the dates when undetected fish are passing the collector dams are unknown, it is not possible to determine the SARs of fish that may be passing through spill during the latter half of May. If it were possible, the NOAA analysis could have substantially different results if only non-bypassed fish could be used as the in-river migrants.

When reviewing NOAA's second analysis based on the COMPASS model methodology, the model results should be considered with the following caveats:

1) The chief concern is that a model can only yield reliable outputs for the conditions/scenarios and inputs of the datasets upon which it is based. COMPASS modeling is based on data from a small number of years and these do not include the recent years with relatively high spill percentages in the latter part of spring. Furthermore, the model incorporates bypassed in-river migrants even though these have substantially poorer survival and would generally do better if transported rather than returned to the river. In short, if the model used only non-bypassed fish and/or included years of high spill percentage later in spring, the "proportion of maximum return rate" would be considerably higher along the entire lengths of the three spill-level curves, perhaps higher than for the no spill curve of Scenario 2 throughout its length. Furthermore, the plateaus of the spill-level curves would extend, and the peaks would occur, considerably later in the season.

2) The ability to reliably predict return rates, either for past simulated years or for future years, based on retrospective annual models that themselves showed substantial variation among years is quite questionable.

3) In-river migrant data, particularly for steelhead and especially non-bypassed steelhead, used to construct some of the annual COMPASS models was often sparse.

4) Despite the vaunted stochastic nature of COMPASS, there are no confidence intervals provided for output from that model.

The NOAA analysis did not accurately present or address Comparative Survival Study data. NOAA has not presented the intent or objective of CSS mark groups and in some examples has attempted to utilize groups for purposes that they were not designed.

In the Discussion, NOAA claims that the aggregate of PIT-tagged Chinook from the five hatcheries where PIT tagging occurs for the CSS is not representative of the mixture of all hatchery stocks arriving Lower Granite Dam. They state "*finally, in the case of CSS hatchery fish that we have used in our PIT-tag analyses, the PIT- tagged hatchery fish do not represent the overall untagged hatchery population. The CSS study tags a higher proportion of fish from the McCall Hatchery (a hatchery with generally higher annual SARs) than of fish from other hatcheries, and it does not tag fish from the Clearwater Hatchery (a hatchery with generally the lowest SARs). Therefore, we expect that hatchery fish tagged upstream of the dam will have higher SARs than the sample of fish collected and tagged at Lower Granite Dam.*" NOAA is simply commenting that the CSS hatchery groups were not designed to meet the NOAA objective of creating a single hatchery stock aggregate of fish arriving at Lower Granite Dam. The CSS was designed to analyze each hatchery stock individually recognizing differences in timing, SARs and other characteristics of these five hatchery stocks., The CSS was not designed to create a single aggregate of hatchery Chinook for use in the estimation of SARs. The estimates of SARs, TIRs, and D in the CSS are presented separately for each of the five hatcheries. We agree that it is unwise to attempt to utilize data outside of the original study design parameters. The CSS tag groups provide highly valuable management data, within the context of their original design and purpose.

NOAA also claims that the aggregate of PIT-tagged wild Chinook created from the tagging at numerous traps in tributaries of the Salmon, Imnaha, Grande Ronde, and Clearwater rivers "*may not represent the untagged population of smolts*" The passage timing of PIT-tagged wild Chinook at Lower Granite Dam is earliest for the Imnaha River fish and latest for the Clearwater River fish, and intermediate for the Grande Ronde and Salmon River fish. However, the distribution created by summing the daily detections across these four sub-basins (expanded to daily passage indices) matched well with the distribution of the run-at-large (untagged and tagged) wild Chinook population estimated from the Smolt Monitoring Program (Figure 1).

In the Discussion, NOAA claims there is potential bias in CSS results due to "*stock specific response to transportation (for example, over-representation of Imnaha stocks that migrate early and respond poorly to transport)*". Whether or not some stocks are over-represented is completely irrelevant to their analysis, since NOAA is explicitly looking at seasonal differences. Further, it was also irrelevant to the analysis presented in Chapter 4 of the 10-yr CSS Retrospective Analysis Report, which also looked at seasonal differences in SARs of transported and untransported fish (Figs 4-18 to 4-21). NOAA neglect to make any reference to the CSS analysis, either.

However, NOAA misrepresents the Imnaha wild Chinook stock when they state "*…Imnaha stocks that migrate early and respond poorly to transport*." Imnaha wild Chinook do begin migrating earlier than wild Chinook from the other subbasins above Lower Granite Dam, but it does not appear to generally respond poorly to transport. In two of the three years when there were enough Imnaha stock adult returns in each CSS study category to compare with the other drainages, the Imnaha stock's SAR(T_0) values were at or above that of the other drainage stocks (Table 1).

Table 1. Smolt-to-adult survival rates (SARs) of PIT-tagged wild Chinook from the four drainages above Lower Granite Dam in transport (T_0) and inriver (C_0, C_1) categories.

Migration Year	Drainage	SAR(T_0) %	SAR(C_0) %	SAR(C_1) %
1998	Clearwater	1.09	1.06	0.69
	Grande Ronde	1.70	1.07	0.78
	Imnaha	0.46	0.93	0.94
	Salmon	1.89	1.93	1.59
1999	Clearwater	0.76	2.36	1.29
	Grande Ronde	2.38	2.29	1.79
	Imnaha	3.45	1.80	2.24
	Salmon	2.38	2.13	1.92
2000	Clearwater	NA	2.25	1.27
	Grande Ronde	1.98	2.35	2.72
	Imnaha	1.85	2.73	3.05
	Salmon	1.63	2.43	2.21
2002	Clearwater	0.62	0.55	0.73
	Grande Ronde	0.90	1.96	1.22
	Imnaha	NA	1.61	1.06
	Salmon	0.85	1.09	1.01

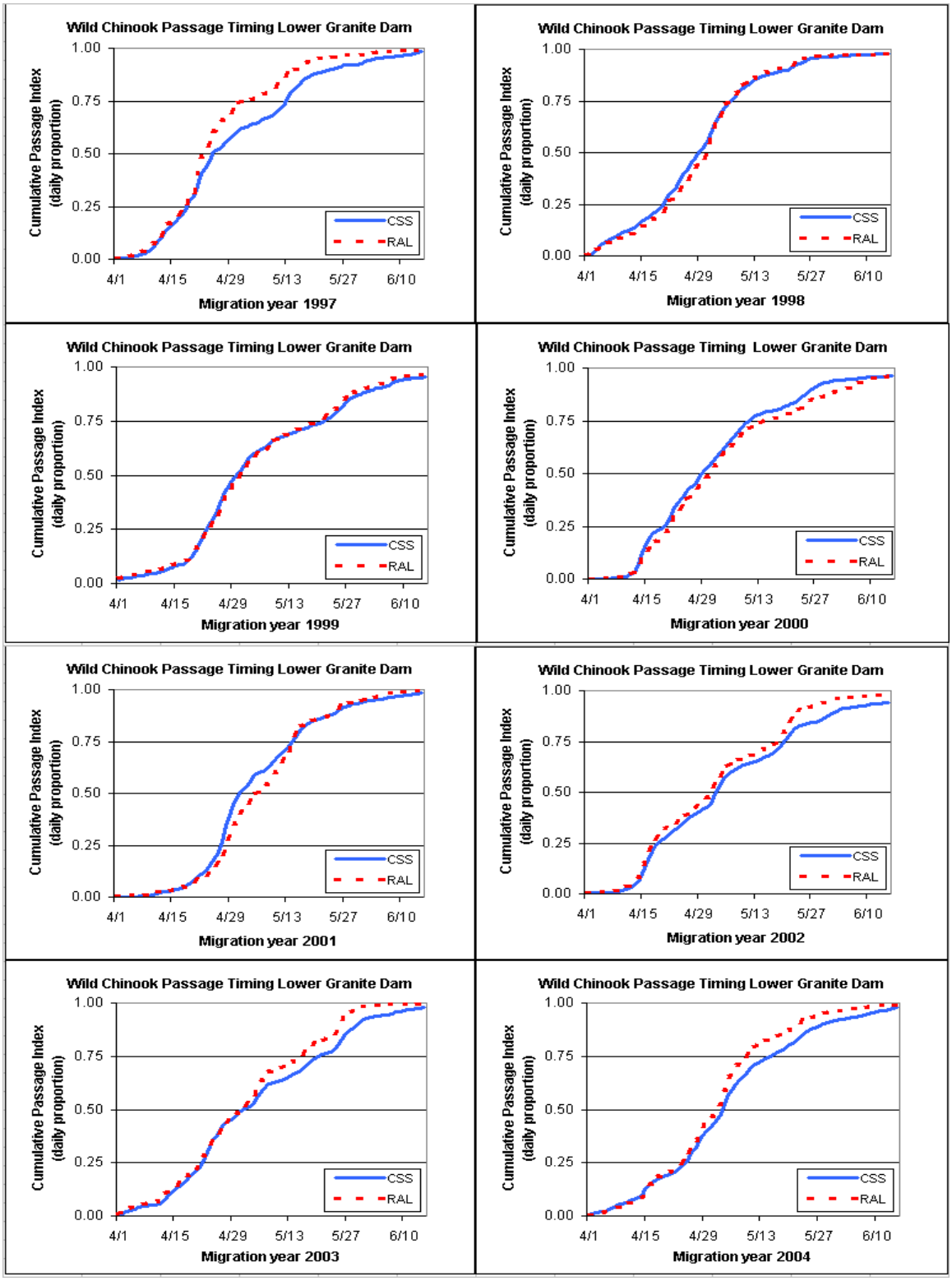

Figure 1. Cumulative wild Chinook passage timing distributions at Lower Granite Dam for the CSS PIT-tagged wild Chinook aggregate compared to the run-at-large (RAL), which consists of untagged and tagged fish numbers expanded from the facility sampling of the Smolt Monitoring Program.

Also in the Discussion, NOAA claims that the "*traps often are not operable under high flows which mostly occur in May – the period of time when transported fish do better and migrant fish do worse.*" The tagging sites of SNKTRP, CLWTRP, GRNTRP, and SALTRP (and IMNTRP to a lesser degree) are traps that may not operate under conditions of high flows in the latter part of May. However, most PIT- tagged fish from the drainages above these particular traps (except IMNTRP) in the CSS aggregate consist of wild fish that were PIT tagged at locations upstream of these sites in the late summer/fall months prior to the springtime migration. Therefore, the CSS aggregate will still contains fish that enter the hydrosystem in late May, even when the above named traps are out of service.