

August 25, 2008

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Mr. Andrew Kolosseus
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Dear Ms. Lut and Mr. Kolosseus:

Recently, you received a letter from Mr. Ron Boyce (Oregon Department of Fish and Wildlife) dated July 10, 2008, regarding the continued use of forebay monitors to manage total dissolved gas levels caused by spill for juvenile salmon and steelhead passage at mainstem hydroelectric projects. As you are aware, the Adaptive Management Team (AMT) requested that NOAA Fisheries staff run the Compass model to assess the potential relative benefits of eliminating the 115% forebay monitor restrictions currently in place. Mr. Boyce's letter reiterates comments NOAA Fisheries received (and addressed) in its recent biological opinion on the Federal Columbia River Power System and supporting documents. This letter is not intended to sway either Oregon Department of Environmental Quality (ODEQ) or Washington Department of Ecology's (WDOE) decision-making regarding the continued need for forebay monitors to manage spill levels for fish passage. The purpose of this letter is to present NOAA Fisheries' view of the Compass model and the proper use of its results to ODEQ and WDOE for their future deliberation.

Compass is based on extensive data sets, including over a decade of PIT-tag survival data and multiple radio telemetry studies at all mainstem projects. In addition, post-Bonneville survival is based on 4-5 years of adult return data (Bonneville to Lower Granite Dam). The philosophy that guided development of the Compass model was to rely on empirical data, rather than speculative relationships and results. The principle of predicting future behavior of a system based on observations and analysis of that system's previous behavior is one of the key principles of the scientific method. Nonetheless, some limitations exist in the scope of the data available. All results must be interpreted with the limitations of the model in mind.

When weighing estimates produced by the Compass model against other proposals it should be remembered that the model was developed by a basin-wide effort and the empirical data incorporated in the model were reviewed and selected by a multi-agency panel comprised of experts in FCRPS juvenile passage and survival. All data and survival relationships used in the model passed review by this group before being incorporated into the model and all participants had equal opportunity to propose hypotheses and comment. It was then subjected to external peer review by the ISAB, underwent cycles of comment, modification and response, and eventually peer reviewed and published in the *Journal Hydrobiologia*. In short, NOAA Fisheries believes that the COMPASS model is the currently the best empirically based tool available for assessing the relative effects of alternative FCRPS operations on juvenile salmon and steelhead.

The following are key issues raised by the ODFW letter followed by our responses. Additional information regarding the COMPASS model can be found at from the sources listed in the references section at the end of this letter.

1. Compass relies on a limited range of previously observed years for its ability to predict survival. This limits the Compass model such that it will not produce accurate estimates for years that are significantly different than the years used to develop the model.
 - There were relatively small differences in spill between current conditions, and the no-forebay monitor alternative which fall within the levels of spill used to develop survival relationships and calibrate the Compass model.
 - ODFW is apparently referring to the post-Bonneville SAR data, for which there 4 years and thousands of adults for steelhead and 5 years and thousands of adults for spring/summer Chinook salmon. They speculate that post-Bonneville return rates for fish migrating under high spill conditions will markedly improve compared to past data. This is speculative, and until data support this assertion, we believe it prudent to rely on observations.
2. Compass primarily relies on PIT tag survival estimates. For PIT tag fish to be detected, they must pass through a bypass system on a dam. Thus Compass survival estimates are biased by the effects of the bypass system on bypassed fish. If bypassed fish survive and return at a lower rate than fish which pass by other routes, it would lead to an underestimate of the survival and return rates of those non bypassed fish. Thus, if more fish are passed by non-bypass routes the model will underestimate the benefit of switching more fish to non-bypass (primarily spill) routes.
 - There is data indicating that SARs for pit-tagged juvenile Chinook at Bonneville is greater for fish which were not detected during their downstream passage through the hydrosystem (presumably they did not go through a bypass system to be detected). The SARs observed decreased with increasing number of detections as the fish moved downstream

through the hydrosystem. There was no significant effect of non detection or multiple bypass detections on SARs for steelhead (see Scheurell et al, 2006).

- Currently Compass does not address this phenomenon, but there are plans to address it as an alternate hypothesis in the future. One of the difficulties of interpreting this phenomenon is that the mechanism that causes the reduction in SAR remains unknown. There are also other factors that could account for the higher return rates of undetected fish, the simplest being that smaller, weaker fish have a higher likelihood of entering bypass systems. Thus, the lower SARs observed in detected fish may be because of their size and condition of the majority of bypassed fish, rather than any specific bypass effect.
3. The model uses data from two ESUs, Snake River Chinook and steelhead, for all analyses.
- The amount of empirical survival data for other ESUs addressed by the compass model, Upper Columbia Chinook and Upper Columbia steelhead, is limited. Comparisons of that data with survival data for Snake River ESUs in the Lower Columbia found no significant difference. This being the case, the more abundant and statistically robust Snake River data is used for all ESUs in the Lower Columbia River.

The estimates produced by the Compass model are dependent on input data and the conditions of the analysis specified by the investigator. It produces an estimate of survival based on those parameters. It does not yield a direct answer to any management question, but rather provides a source of systematic, repeatable estimation of the effects of management actions. In interpreting Compass results, the model is strongest in terms of comparing alternatives. In this analysis, the Compass model results indicate a small increase in SAR under the no forebay monitor condition for all species examined but one (Mid Columbia Steelhead, the ESU which suffers the smallest negative effects of the hydrosystem). NOAA Fisheries believes that these results comport with the best information available, are reasonable and intuitive, and represent the most likely outcome of such a change in operations.

Sincerely,

Ritchie Graves, Chief
Federal Columbia River Power System Branch
Hydropower Division

References

ISAB reviews and commentaries on the compass model 2006-2, 2006-6, 2006-7, 2007-1, 2008-3 <http://www.nwcouncil.org/fw/isab/Default.htm>

Scheuerell, M. D., and R. W. Zabel. 2006. Seasonal differences in migration timing lead to changes in the smolt-to-adult survival of two anadromous salmonids (*Oncorhynchus* spp.). Submitted to ISAB, December 2006, for review.

Zabel, R.W., J. Faulkner, S.G. Smith, J.J. Anderson, C. Van Holmes, N. Beer, S. Iltis, J. Krinke, G. Fredricks, B. Bellerud, J. Sweet, A. Giorgi. 2008, Comprehensive passage (COMPASS) model: a model of downstream migration and survival of juvenile salmonids through a hydropower system. *Hydrobiologia* (2008) 609:289–300
<http://www.springerlink.com/content/g7h9002457w6366k/fulltext.pdf>

FCRPS biop response to comments document - issue #28 Comments on the COMPASS Model (<http://www.nwr.noaa.gov/Salmon-Hydropower/Columbia-Snake-Basin/upload/Final-Cmnts-Response.pdf>) <<http://www.nwr.noaa.gov/Salmon-Hydropower/Columbia-Snake-Basin/upload/Final-Cmnts-Response.pdf>>;

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