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MEMORANDUM

To: Eric Hockersmith

From: Michele DeHart

Date: February 3, 2015

Re: Comments on draft of *Compliance monitoring of yearling and subyearling Chinook salmon and juvenile steelhead survival and passage at McNary Dam, 2014*

At your request, we have read *Compliance monitoring of yearling and subyearling Chinook salmon and juvenile steelhead survival and passage at McNary Dam, 2014* and are providing the following comments. In general, we find that the study design used in this and similar performance testing cannot accurately represent the impact of dam passage on smolt survival. A number of issues raised previously by managers have not been addressed. Below you will find a brief summary of our concerns, followed by a detailed description of each.

- During the spring testing at McNary Dam, spill levels far exceeded the operations laid out by the Fish Operations Plan (FOP). For most of the study, spill levels also exceeded the +/- 5% spill target allowed by the Federal Columbia River Power System Juvenile Dam Passage Performance Standards and Metrics (2012). The operations used during the 2014 test are not representative of average outmigration conditions as established by the same document.

- The use of the virtual/paired-release design has the potential to artificially inflate dam survival if mortality is unequal between the two control groups. There is a considerable inflation in dam survival for both steelhead and subyearling Chinook in the 2014 results.

- The exact rejection rate of smolts smaller than 95 mm in length, the tagging limit, is not reported in this study. However, Figure 3.8 (d) shows that more than 30% of the subyearling Chinook run-of-river were below the tagging threshold. The results cannot represent the run-of-river with rejection rates of this magnitude.

- Performance testing uses only fish that have survived at least one juvenile bypass facility. If these fish have a behavior that predisposes them to juvenile bypass facilities, or physical characteristics that increase the probability of bypass survival, results obtained from these studies will not represent the run at large.

- Between the upstream release and inclusion in the virtual release, between 4% and 5% of fish were lost. This loss represents a high-grading of study fish that pass through the dam. Fish that survive the tagging process but do not survive long after reintroduction to the river will not be included in the dam-passage group, but will be included in the control group mortalities. This artificially inflates the V1 survival estimate.

- Performance tests do not incorporate a myriad of impacts that dam operations are known to have on salmon populations. Smolts passed through powerhouse bypass facilities are known to have lower survival through the estuary and oceanic stages and lower smolt-to-adult return rates than fish that pass without detection (Haeseker et al. 2012, Petrosky and Schaller 2010, Tuomikoski et al. 2010, FPC Memos October 6, 2010; January 19, 2011; and July 14, 2011). Forebay residence and water travel times both have an impact on adult returns. Whether or not standards are met, performance tests are misleading and do not represent the true impact of the hydrosystem on salmon populations.

Test conditions do not reflect either the study design or average operations

As outlined in the FOP, the spill target at McNary Dam during the spring migration is 40%. The actual operations during performance testing in 2014 are highly unrepresentative of the study design, as spill levels ranged from 42% to 62%, with an average of 53%. As spill operations change, the proportion of fish through each route of passage change, and overall survival levels are expected to change.

In 2012, the previous year performance testing has been conducted at McNary Dam, flow levels were similarly high and unrepresentative of planned operations. Similar to 2014 testing, the spill levels in 2012 ranged from 41% to 61%, with an average of 51%. No performance tests at McNary have tested the planned operation of 40% spill.

The Federal Columbia River Power System Juvenile Dam Passage Performance Standards and Metrics (2012) states that spill levels within 5% of the test plan will be accepted. If two years of testing exceed this criteria,

> *"the AAs with NOAA Fisheries concurrence, may elect to accept the highest actual spill level minus 5 percent . . . or an average of the two actual spill levels under which the two successful tests were conducted as the new target spill level to attain juvenile performance standards. Alternatively, to be determined on a case by case basis, the AAs with NOAA Fisheries concurrence may elect to either conduct additional testing at the original target spill level or adjust future target spill levels by the amount exceeding the acceptable variance as stated above."*

It is clear that by the criteria agreed upon, spring spill targets at McNary Dam should be increased, or further testing will be required.

The virtual/paired-release design can artificially inflate survival levels

The virtual/paired-release design used in this performance test utilizes two control groups: one released in the tailrace of the dam (R_2) and one released further downstream (R_3). The R_3 group is intended to account for any handling mortality experienced by the R_2 group which would inflate survival estimates.

Under this experimental design, however, upward biasing of survival estimates could be caused by high mortality in the R_2 group. It is unlikely that tagged fish in both stretches of river encounter the same environmental conditions, especially since predation rates are higher in the forebay and tailrace than mid-reservoir at many projects (Peterson 1994, Ward et al. 1995). If survival in the R_2 group is lower than survival in the R_3 group, the ratio of survivals (S_2/S_3) will be biased low and will artificially increase estimates of dam survival. This effect has been discussed in more detail in FPC Memos on March 23, 2012; March 24, 2011; March 23, 2012; February 15, 2012; March 24, 2012; January 4, 2013; February 11, 2013; March 22, 2013; March 19, 2013, and December 3, 2013.

In steelhead and subyearling Chinook, the survival estimate post-correction was several percentage points above the single-release estimate, caused by differential mortality between the two control groups. A similar phenomenon was observed in 2012 performance testing at McNary for yearling Chinook, steelhead, and subyearling Chinook.

Test cannot represent run at large due to tagging constraints

JSATS tagging protocol requires rejection of fish based on multiple criteria, including size and condition. Although required by tagging protocols, these rejections severely limit the applicability of results to the actual migration conditions for the run at large. While rejection rates due to injury and disease are lower than in previous performance testing, they still range from 2.0% to 3.2%. Rejection rates due to the minimum size limit of 95 mm are not included in the report. However, Figure 3.8 (d) from the draft report shows that more than 30% of smolts were below the size threshold for subyearling Chinook.

Because rejection due to size was not included in Section 3.1 “Fish collection, rejection, and tagging,” the numbers of handled fish reported in this section underrepresent the total collection required for performance testing.

Distance between R1 and V1 eliminates weaker fish and artificially inflates survival estimates

In the virtual/paired-release design, fish are released upstream of the dam so they achieve a distribution through passage routes that reflects the run at large. Fish that die between tagging and the forebay of the dam are not included in the study. However, this means that fish with lower survival will not be included in the dam passage group, but that mortality will be included in the control groups. This drives down survivals in the R_2 and R_3 groups in comparison to the V_1 group, and will inflate survival estimates (see FPC Memos from March 24, 2011; February 15, 2012; March 23, 2012; January 4, 2013; February 11, 2013; March 19, 2013; March 22, 2013; December 3, 2013). The loss between R_1 and V_1 was 4.4% for yearling Chinook, 4.9% for steelhead, and 4.2% for subyearling Chinook.

Management decisions should not be based on single-dam performance standards

Past FPC memos have reviewed performance standards testing throughout the hydrosystem (June 24, 2009; July 29, 2010; March 24, 2011; February 15, 2012; March 16, 2012; March 23, 2012; January 4, 2013; December 3, 2013). Repeatedly, these memos have raised concerns regarding the use of these studies for project fish passage management decisions. Management decisions should reflect the entire life cycle of the fish, rather than survival at projects considered in isolation. All available data should be utilized, rather than ignored in favor of simplistic but out of date performance standards that do not reflect the current understanding of salmonid population dynamics. The performance standard approach does not incorporate the growing body of scientific data and analyses which indicates that fresh water passage history affects estuary and first-year ocean survival, and the resulting smolt-to-adult return rates. These new data clearly show that powerhouse passage results in delayed mortality and lower smolt-to-adult return rates.

The long-term effects of passage route for juvenile fish have been well documented in recent years. Even fish that survive juvenile bypass systems or powerhouse passage are less likely to survive their first ocean year, and less likely to return as adults, than those that pass undetected through the hydrosystem (Haeseker et al. 2012, Petrosky and Schaller 2010, Tuomikoski et al. 2010, FPC Memos October 6, 2010; January 19, 2011; and July 14, 2011). The effects of project operations on these metrics are not incorporated in the current performance testing requirements.

Acoustic tag studies provide only short-term survivals for specific projects, and current performance testing does not include metrics such as forebay residence time, travel time, or latent mortality. Performance testing cannot fully inform policy makers about methods for improving adult returns. We recommend a decision-making framework for the Columbia Basin that will incorporate the strengths and limitations of each data type as part of a straightforward guide to the results of project operations.

References

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