February 24, 2011 F/NWR-5

**FILE MEMORANDUM**

**FROM:** Gary Fredricks

**SUBJECT:** Review of the Corps MFR regarding The Dalles Dam Ice and Trash Sluiceway Operations for Overwintering and Kelt Steelhead Passage

**Background:**

I have previously written several file memos (attachments 1-3) regarding The Dalles Dam sluiceway operation. My memos from September 21, 2009, and November 2, 2010, outline the biological reasons why I have recommended extending the winter operations of this sluiceway to improve steelhead passage survival. My memos from November 2, 2010, and January 11, 2011 outline how NOAA would consider the issue of crediting the benefits of this operation against kelt survival benefits included in the 2008 BiOp Supplemental Comprehensive Analysis.

At an ad hoc FFDRWG meeting on January 11, 2011, the participants discussed the difficulty in calculating exactly what the actual credit might be. My cursory analysis indicated that it would be quite small if only B-run steelhead were considered (since they are the sole subject of the kelt credit). Not wanting to repeat history and go down the “wrong rock” approach with the Action Agencies, I asked them to develop a crediting approach that they would accept and NOAA could consider. On February 16, 2011, the Corps issued a draft Memorandum for the Record (MFR) which offered an estimated benefit for the sluiceway winter operation.

**MFR Review:**

The crediting approach used in this document starts with the analysis we used to calculate the 6% steelhead benefit from kelt survival improvements outlined in Appendix J of the 2008 Supplemental Comprehensive Analysis. In that analysis, we concluded that kelt survival benefits could improve returns of an additional 6% of the estimated average of 3000 female B-run steelhead that return to Lower Granite Dam. The Corps uses the 6% of 3000 fish and the number of fallback steelhead estimated at The Dalles Dam during two years of Corps funded research (2352 fish) as bookends for their analysis. I have gone step by step through the analysis and find it very logical and, if anything, somewhat conservative. After all the reductions for issues like passage efficiency, passage mortality, unclipped female B-run composition and conversions rates between The Dalles and Lower Granite dams, the Corps estimates an increase of 27 unclipped female B-run steelhead will arrive at Lower Granite Dam, if the operation proceeds as indicated in the memo. This amounts to a **0.894%** total benefit towards the 6% goal.

I believe this is a reasonable estimate of benefit and it can be applied as an offset towards the BiOp 6% B-run steelhead survival improvement requirement, as long as the annual sluiceway operation proceeds as anticipated in the Corps analysis.

Attachment 1.

September 21, 2009 NWR5/FCRPS

**FILE MEMORANDUM**

**FROM: Gary Fredricks**

**SUBJECT: The Dalles Dam Ice and Trash Sluiceway Operation**

The Dalles Dam is unique in the FCRPS dams that have fish anadromous passage in that it is the only dam without a specific bypass system designed for downstream migrants. During the fall and winter months (September through March) when there is no fish passage spill, the ice and trash sluiceway is the only non-turbine passage route at this dam. Operation of this sluiceway during the fall and winter months for fish passage purposes has been debated in the O&M committees for many years.

Historically, the discussions regarding operational dates have centered around the need for use of the sluiceway in November. Of particular concern has been the use of the sluiceway by adult salmon that, for various reasons, pass downstream through the project. A secondary concern has been for late migrating subyearling fall Chinook salmon. More recently, there have been increasing concerns for early spring migrating kelt steelhead. Because of the concern for kelt passage, the Region initiated sluiceway studies in 2009, to evaluate fish passage during the late fall and early spring periods. The current (2009) Corps Fish Passage Plan (FPP) indicates that this sluiceway will be operated with six open gates (approximately 5 kcfs) from April 1 through the end of November.

**Previous Studies:**

The previous The Dalles Dam sluiceway studies focused on juvenile passage during the peak migration months (April – August) with little effort on what was considered to be the off-season passage period. These studies indicated in general, that about 40-55% of the juvenile migrants that pass the dam pass through the sluiceway when no spill was occurring (Ferguson et al. 2005). The percent of project passage that passes the sluiceway is negatively related to the percentage of spill.

Until recently, there had not been any specific studies that assessed adult passage through this sluiceway. There have, however, been several years of general adult radio tag passage studies in the lower Columbia River that offer some insight into the potential usefulness of the sluiceway to adults. Keefer et al. (2008) summarized six years (between 1996 - 2003) of overwintering behavior and distribution of radio tagged summer steelhead in the hydrosystem. Steelhead originating from the Snake River system made up the majority of the overwintering population. They estimated that 12.4% of the fish that successfully reached spawning areas overwintered, at least partially, in the hydrosystem. These overwintering fish tended to actively move up and downstream during the overwintering months with the bulk of the upstream movement resuming in March. The downstream movement resulted in a fallback percentage of 20.5% of the overwintering population. Most importantly to the sluiceway operation issue, the largest number of fallback events occurred at The Dalles Dam (28%) with McNary and John Day not far behind with 20% at each dam. An examination of the ultimate fate of the overwintering steelhead population that did not return to the spawning areas indicated that a minimum of 14.5% had unknown fates (presumably died from either natural or human-related causes) within the section of the river covered by the hydrosystem.

Other studies have looked at survival of fallback salmonids. In examining fallback at Bonneville Dam, Boggs et al. (2004) found that in a year with normal spill (2000), 25% of the 55 radio tagged steelhead that fell back at the dam were unaccounted for after the fallback event. In a year with little spill (2001), about 45% of the 33 fallback tagged steelhead were not relocated after the event. The authors went on to say that for all years and species, escapement was higher for fish that did not fall back. While this study was not specific to The Dalles Dam, I believe it does illustrate that fallback at dams is dangerous for adult migrants and that additional non-turbine passage routes are likely to improve survival.

**Recent Studies:**

In the winter of 2008, the Corps contracted through the Pacific Northwest National Laboratory (PNNL) to investigate adult salmonid passage through the sluiceway. The investigation (Khan et al. 2009) used hydroacoustic (transducers and DIDSON) to enumerate adult passage through the sluiceway during two study periods, November 1 through December 15 and March 1 through April 9, 2009. The results indicate that about 1,750-1,800 adults passed the project during each period. Horizontal, vertical and daily passage distribution was similar for each study period. Most adults (64-85%) passed through the unit 1 sluice gates (1-1, 1-2, 1-3), with the second highest passage rate through unit 18 gates (18-1, 18-2) and the lowest rate through the gate at unit 15 (15-2). The lowest individual gate passage was through gates 1-1 and 15-2. Diel passage was well distributed across the 24 hour day and 95% of the passing adults passed through the sluiceway with the remaining five percent passing through the turbine units. Daily passage in the fall was fairly constant across the study period although it tended to fall off somewhat during the last week (after the first week of December). Late winter/early spring passage was more variable with some high passage days in early and late March, although passage was consistently higher after about March 15.

The DIDSON camera work also allowed identification of small targets and the researchers were able to determine that large schools of juvenile salmon (of unknown origin) were passing the sluiceway from late November to mid-December (as well as large numbers of juvenile shad).

**Recommendation:**

The radio tracking studies indicate that adult steelhead fallback has been occurring regularly at The Dalles Dam for many years and that the consequence of fallback, particularly without non-turbine routes, can be quite negative. A longer sluiceway operating season seems justified given the number of adults that were seen passing this sluiceway during the PNNL study and given the potential survival benefits of sluiceway passage. Operation of the sluiceway in this manner would also likely benefit the juvenile salmonids that are observed entering the sluiceway during the fall. Knowing the increase in sluiceway operation will be a contested issue in the region, a second year of data collection will likely be necessary before any long-term operational changes can be made. The value of a second test would be to see if the numbers of fish and the passage distribution is similar across years. Therefore, the second year of study should be conducted under sluiceway operating conditions that are similar to those used during 2008-9 test period. This would rule out any treatment tests with a blocked study design. We could also consider the effects of closing one or two of the least used sluice gates, particularly if this would make adoption of the extended season more likely to occur. The November portion of the gate closure would violate the operational requirements in the Corps’ FPP and should therefore be considered a one-time exemption for the 2009-10 test. The potential detriment to juvenile passage must be considered before any long–term sluiceway gate opening changes are made in the FPP.

**Literature cited:**

Boggs, C. T, M. L. Keefer, C. A. Peery and, M. L. Moser. 2004. Adult Chinook salmon and steelhead fallback at Bonneville Dam, 2000-2001. Technical Report 2004-4 to the U.S. Army Corps of Engineers, Portland and Walla Walla Districts. 49 p.

Ferguson, J. W, G. Matthews, L. McComas, R. Absolon, D. Brege, M. Gessel, L. Gilbreath. 2005. Passage of adult and juvenile salmonids through federal Columbia River Power System dams. NOAA Technical Memorandum NMFS-NWFSC-64.

Keefer, M. L. C. T. Boggs, C. A. Peery and, C. C. Caudill. 2008. Overwintering distribution, behavior, and survival of adult summer steelhead: variability among Columbia River populations. N. A. Journal Fish. Man. 28:81-96.

Khan, F, M. Weiland, and G. Johnson. Evaluation of adult salmonid downstream passage through the sluiceway and turbines at The Dalles Dam during late fall, winter and early spring. Powerpoint presentation to the Corps Portland District Fish Facility Design Review Work Group.

Attachment 2.

November 2, 2010 NWR5/FCRPS

**FILE MEMORANDUM**

**FROM: Gary Fredricks**

**SUBJECT: Preliminary NOAA Recommendation for the Operation of The Dalles Dam Ice and Trash Sluiceway in 2010/11**

Last year, my recommendation regarding this adult steelhead passage issue (my September 21, 2009 file memo) was to conduct another season of sluiceway passage evaluations at this project before implementing any longer term operational changes. The Corps completed the second year of testing and Fenton Khan of the Pacific Northwest National Laboratory reported the results of the tests to the region in their draft final July 2010 report. Several discussions have occurred in the various Regional Forum meetings to review the data and discuss future research and operational changes for this sluiceway. At the most recent meeting, on October 5, NOAA was asked for recommendations on the questions of future research, operation and crediting.

**1. Research.** Two years of general off season passage is sufficient to establish the passage trends and general operational guidelines. However, based on the discussions we have had in the various forum meetings, it seems prudent to conduct one additional of year of monitoring to evaluate the length of time steelhead will hold in the forebay before passing through the powerhouse turbine units. Wertheimer and Evans (2005) reported forebay median, non-spill, residence times for steelhead kelts as 8.0h to 9.6h at the Bonneville and The Dalles dam forebays, respectively. These fairly short residence times would rule out any alternate day on/off type of operation of the sluiceway. However, the number of fish monitored was small and these were all kelts at the lower end of the river system and may have been more actively migrating than overwintering steelhead in the area of The Dalles. Unfortunately, Unit 1 at The Dalles Dam is currently out of service for an extended period. Since the sluice gates over this unit have the automated gates, it is likely this research will be put off until the 2011/12 season. Also, a tentatively planned kelt radio tag study in early 2012 would provide additional information if the on/off study were postponed until then.

**2. Operation.**  Based on the data provided in Khan et al. (2010), for the 2010-2011 winter season, we recommend continued operation of the The Dalles Dam ITS in November as outlined in section 2.4.1.2. of the 2010 Fish Passage Plan. We also recommend extended daily 24 hour operation of four sluice gates over unit 1 and unit 18 (or adjacent units if these are out of service) for the first two weeks in December and the month of March.

**3. Crediting.**  NOAA agrees that improving overwintering and kelt steelhead survival at The Dalles and other dams can be credited against the 6% survival improvement required for Snake River B-run steelhead spawners over the life of the BiOp as defined in Section 8.5.5.8. of the 2008/2010 BiOp and Appendix J of the 2008/2010 BiOp Supplemental Comprehensive Analysis. Our preliminary review (including data in Keefer et al 2008, our PIT tag analysis, other R/T work, etc. ) indicates that this credit likely will be on the order of **0.5 to 1%** over the life of the BiOp, primarily because the action at The Dalles will improve survival for both kelt and prespawn adult steelhead. Final accrediting will require more work to determine the proportion of B-run Snake River fish in the population at The Dalles Dam and the potential survival benefit of operating the sluiceway during the winter period. This crediting process should be included in the AA’s Kelt Management Plan (BiOp RPA 33).

**Literature cited:**

Keefer, M. L., C. T. Boggs, C. A. Peery and, C. C. Caudill. 2008. Overwintering distribution, behavior, and survival of adult summer steelhead: variability among Columbia River populations. N. A. Journal Fish. Man. 28:81-96.

Khan, F, G. Johnson and M. Weiland. 2010 Draft. Hydroacoustic evaluation of overwintering summer steelhead fallback and kelt passage at The Dalles Dam, 2009-2010.

Wertheimer, R. H., A. F. Evans. 2005. Downstream passage of steelhead kelts through hydroelectric dams on the lower Snake and Columbia Rivers. Trans. Am. Fish. Soc. 134:853-865.

Attachment 3.

January 11, 2011 F/NWR-5

**FILE MEMORANDUM**

**FROM:** Gary Fredricks

**SUBJECT:** Recommended winter 2011 operation of the sluiceway at The Dalles Dam.

The subject of winter season (December through March) operation of the ice and trash sluiceway at The Dalles Dam has come up several times this past two years. I presented arguments and supporting data for extending the operation of this sluiceway in a September 21, 2009, file memo. I most recently presented NOAA’s recommended operation in my November 2, 2010, file memo, which was made available to the FPOM coordination team at a meeting on that date. The primary result of that meeting was that some parties would not agree to the operation of the sluiceway unless sufficient crediting could be provided within the context of the 2008 FCRPS BiOp. Unfortunately, the crediting issue was not resolved prior to the end of the normal sluiceway operation on November 30, and no operation of the sluiceway occurred in December. This memo is intended to reiterate our position on the March portion of the proposed operation and to offer some thoughts on research and the crediting issue.

**1. Operation.**  As stated in my November 2, 2010 memo, we continue to recommend 24 hour operation of the sluiceway (four gates) in March to benefit passage of both prespawn (overwintering) and kelt adult steelhead. This recommendation is based on the passage observations of Keefer et al. 2008, and Khan et al. 2009 and 2010 and is further explained in my earlier memos.

**2. Research.**  If the sluiceway is operated in March, we do not recommend any additional research this year. However, if the sluiceway is not operated, it would be prudent to investigate turbine passage of adult steelhead using the hydroacoustic methods that have been used in the past. This work would help address the argument that adult steelhead may not fall back at this dam if the sluiceway is not operated.

**3. Credit.**  Based on discussions in the various regional coordinating committees, it is apparent that most of the fishery biologists involved with this issue believe that there would be some benefit to Columbia River steelhead survival if the sluiceway were opened for at least a portion of the winter period. Nevertheless, the Action Agencies are requesting that a specific FCRPS BiOp related credit be calculated and agreed upon before any new operation can occur. I indicated in my November 2, 2010, memo that it would be acceptable to NOAA if the Action Agencies applied sluiceway derived steelhead survival improvements as an offset towards steelhead survival improvements expected from other prospective actions that were included in the BiOp Comprehensive Analysis. At that time we were specifically focused on the expected benefits of the kelt reconditioning program for B-run Snake River steelhead. Unfortunately, the exercise of parsing down the potential survival benefits to only B-run steelhead resulted in a very small overall credit.

The focus of this approach may have been too narrowly placed on the kelt program and Snake River B-run fish. There are other actions and standards stated in the BiOp that apply to steelhead populations in general where performance enhancing actions might prove beneficial. These include prospective actions where current-to-future adjustment factors were used and the achievement of adult steelhead performance standards. For example, the Action Agencies’ 2009 Progress Report using a three year rolling average conversion rate indicated that the Snake River steelhead DPS is “significantly outside of the adult performance standard”.

Modifying the operation of The Dalles Dam sluiceway is one of the few readily available methods the Action Agencies have to immediately improve survival of steelhead in the FCRPS. The challenge for the Action Agencies is to determine what level of credit they would propose to claim from this action.

As a final note, this crediting issue would be much easier to approach if the Action Agencies would consider implementing methods to improve survival of overwintering and kelt steelhead at all the Lower Columbia River dams where winter downstream passage is an issue.